Book of Abstracts

October 4-5, 2018

Southeastern Institute for Operations Research and the Management Sciences

Welcome Message from the Program Chair

Welcome to the 2018 SE INFORMS conference in beautiful Myrtle Beach, South Carolina. This is the 54th annual meeting of the Southeastern Chapter of the Institute for Operations Research and Management Science. I hope the conference is both an enjoyable and informative experience for you. After the sessions are done for the day, please make sure to find time to enjoy the beaches, restaurants and attractions in Myrtle Beach.

Thank you to all the participants. You are the reason the conference exists and will continue to grow in the future. Please attend as many sessions as you can. There is so much that we can learn from each other. A total of 62 papers are being presented along with 6 workshops and panels. All of the submissions went through the peer review process. There is certainly something that will be of interest for everyone. Thank you for coming to the conference. You can access the conference program online through the URL: https://seinforms2018.exordo.com/programme

Please attend the business meeting on Thursday from 4:30-5:30pm in the Palisades C. At the meeting you can learn how SE INFORMS operates and can learn about ways to volunteer to help make the organization successful. Following the meeting is the President's reception at 6:00pm. This is a great opportunity to meet people and enjoy refreshments.

Thank you to everyone who reviewed papers and volunteered to act as session chairs. The track chairs did a great job coordinating the review process. All of your efforts make this conference successful. Also, thanks to the SE INFORMS officers, especially Donna Schaeffer, Jay Teets, Michelle Hagadorn and Cheryl Aasheim whose guidance was invaluable.

Thank you to my colleagues at Marymount University for their support of time and financial resources that has enabled me to perform my duties as program chair. I also want to thank all the reviewers who contributed their time and expertise reviewing the submissions and providing valuable feedback to the authors.

I found the people in the SE INFORMS to be very supportive and welcoming. Please make sure to say hello to someone that you don't know while you are saying hi to those you know. If I haven't met you before, please introduce yourself so I can meet new friends and potential research collaborators.

I hope you have a great conference. If you have any problems, please see me so that the problem can be resolved.

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A COMPARISON OF PRE-COLLEGE ENRICHMENT PROGRAM PARTICIPANTS AND NON-PARTICIPANTS: COLLEGE ACADEMIC PERFORMANCE MEASURES

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ABSTRACT

This paper analyzes College Grade Point Averages (CGPAs), American College Testing Composite (ACTC) scores and Scholastic Assessment Test Total (SATT) scores of over 1,300 undergraduates at West Virginia University (WVU) who participated in the Health Sciences and Technology Academy (HSTA) to those students who did not (Non-HSTA). Traditionally, pre-college enrichment programs provide academic enrichment to underrepresented youth with the intent of increasing their chances for post-secondary entry and success. Factorial design determined if HSTA participants were better prepared to pursue post-secondary study. Overall, the results reveal that HSTA students outperformed their Non-HSTA counterparts in that there were significant differences in the overall CGPA, ACTC and SATT scores.

INTRODUCTION

Academic measurements such as standardized test scores, specifically the SATT and the ACTC are utilized to measure mental aptitude/abilities and are a determinant of college admission in the United States. However, underrepresented (i.e., African-American, financially disadvantaged, first generation college, and rural) students may not perform well on these entrance exams, which may serve as obstacles to post-secondary pursuit. An important question for educators and policy makers to consider is "Can pre-college/science, technology, engineering, and mathematics (STEM) enrichment programs increase academic achievement outcomes, namely standardized test scores and CGPAs for underrepresented students?" The West Virginia Health Sciences and Technology Academy (HSTA) is a science and math intervention academic enrichment program with a primary goal of addressing the problem of underrepresentation in college enrollment, for certain populations of students, in West Virginia. It aims at promoting the pursuance of careers by African American, financially disadvantaged, first generation and extremely rural students in health sciences as well as STEM fields, mainly through facilitating preparation and enthusiasm prior to their graduation from high school. The HSTA student population is comprised of 37% African-American, 47% low socio-economic, 68% first generation college goers, 75% rural, and 69% female.

This paper seeks to determine if HSTA participants have higher overall CGPAs, ACTC and SATT scores than Non-HSTA participants by considering the following questions:

- What effects do Status (i.e., HSTA and Non-HSTA) and Race (i.e., African American/Black and White/Caucasian) have on the academic performance of the populations?
- Is there any interaction between the aforementioned factors (i.e., Status and Race)?

There is minimal research that examines whether participants/graduates of pre-college enrichment programs have been better prepared to pursue 4-year degrees compared to those who have not. The purpose of this study is to exemplify that African American and Caucasian students who receive the HSTA intervention are more likely to attain higher standardized test scores and CGPAs because they receive

services that are equivalent to a gifted program providing them with a competitive edge to do well on these tests. Essentially, HSTA makes a difference in the lives of students in both the development of their skills and knowledge as well as their access to higher education [14].

LITERATURE REVIEW

A review of the literature found that only a limited number of out-of-school-time (OST) programs have performed empirical studies of their offerings [4] [11] [15] [19]. Even fewer have established experimental-control designs analyzing standardized test scores targeting graduates of academic enrichment programs [16] [25]. Watt, Huerta & Lazano [26] conducted a control-experimental study of GEAR UP and AVID students' educational aspirations, among other factors. The study examined mathematics achievement scores. The control group scored slightly higher than the GEAR UP, AVID, and combined GEAR UP/AVID groups, but the results were not statistically significant. Another study on GEAR UP students' college readiness performed by Bausmith and France [2] utilizing standardized test measurements showed promising results for students in low-income schools. Fashola and Slavin [8] examined several programs for students at risk that have employed empirical studies revealing positive outcomes for elementary and middle school students. In the realm of pre-college enrichment programming, it is rare to find studies comparing standardized test scores of program participants to those of non-program participants at the college level [2]. The current study addresses this gap in evidence by comparing the scores of students who attended HSTA to a matched cohort of non-HSTA students' ACTC, SATT, and CGPA.

METHODOLOGY

The researchers obtained internal data from the WVU registrar's office for students enrolled during the 1997 through 2011 academic calendar years. The data set includes demographics (i.e., race), ACTC and SATT scores, enrollment status, and cumulative CGPAs for all undergraduate students in this time frame. After data was received, a one (HSTA) to three (Non-HSTA) match was performed based on race, gender and enrollment status for the undergraduate student populations. We used the statistical software SAS 9.4 for Windows during the data analysis process. The final data set comprised 327 HSTA and 981 Non-HSTA students totaling 1,308 participants. The participants' demographics are 384 Blacks and 924 Whites students.

Factorial Experiment Design

The Encyclopedia of Survey Research Methods describes factorial designs or fully crossed designs as a "form of true experiment" because the researcher can manipulate or vary multiple factors/independent variables in the research design. This is advantageous because the researcher can examine the main effects of two or more independent variables simultaneously as well as interactions between the variables. An interaction occurs "when the effects of one variable vary according to the levels of another variable" and is only "detected when the variables are examined in combination" [12, pp. 261-262]. In general, factorial designs are most efficient for this type of experiment given that an examination of each complete trial/replication of the experiment and all possible combinations of the levels of the factors takes place. In order to examine the effects of race on the academic performance of HSTA and Non-HSTA students, there are two different factors, which considers membership in HSTA as the first level of the design and lack of membership as the second level, as presented in Table 1 below.

		Treatment Combinations	
Race	**Factor Name**	**HSTA**	**NON-HSTA**
African American/Black	A	1	-1
White/Caucasian	B	1	-1

Note: Using "+" and "-" notation represents whether the students belong to HSTA group or not.
Table 1. Factor Definition

For the treatment combinations, the contrast coding of 1 and -1 reflects the comparisons made between HSTA and Non-HSTA students. Since the sample size for the treatment combinations are unequal, we have an unbalanced experimental design. Additionally, all of the factors in the experiment are fixed. In this study, we took advantage of 2^k factorial design. This is the special case of the factorial design with *k* factors occurring only at two levels to investigate the effect of Status and Race on the academic performance of students (See Figure1):

- Status at two levels: HSTA, Non-HSTA
- Race at two levels: African American/Black, White/Caucasian

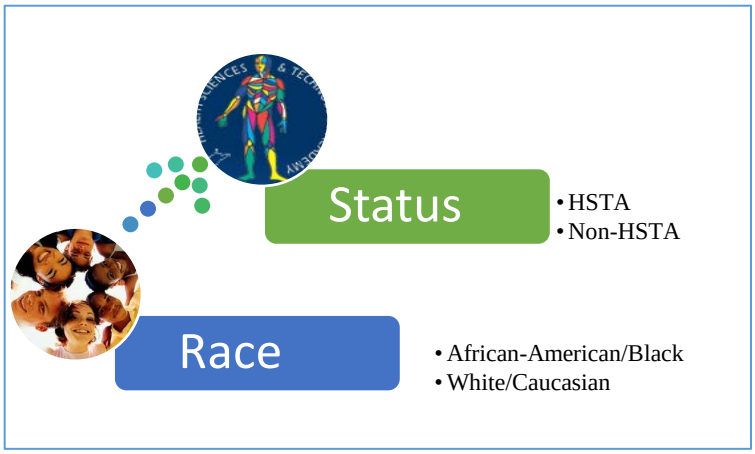

Figure 1. Design of Experiment

The following SAS code depicts an example of the combinations and interactions for the dependent variable ACTC score.

```
DATA HSTA;
INPUT STATUS RACE ACTC;
DATALINES;
1       1       20
-1      1       15
-1      1       .
-1      1       .
1       2       .
-1      2       24
-1      2       19
-1      2       28
```

```
1       1       26
-1      1       21
-1      1       17
-1      1       .
1       1       18
-1      1       26
-1      1       20
-1      1       18
;
proc glm plot=meanplot(cl);
  class STATUS RACE;
  model ACTC=STATUS RACE STATUS*RACE;
  lsmeans STATUS RACE STATUS*RACE   / cl pdiff=all adjust=tukey;
run;
ods graphics off;
```

Note that the (.) represent missing data and that all the DATALINES that appear in the final SAS code are not in the above code. As previously mentioned, the Status happens at two levels of HSTA (1) and Non-HSTA (-1) and the race at two levels of Black (1) and White (2). The response variables examined were the overall CGPA, ACTC, and SATT scores.

To conduct the experiment, we used the SAS procedure, PROC GLM (General Linear Model) instead of PROC ANOVA (One-way analysis of variance). PROC GLM is similar to PROC ANOVA and uses many of the same options and statements. However, PROC GLM can compute contrasts and analyze unbalanced designs. In addition, the least squares means (LS-means) statement is used for unbalanced and fixed effects procedures in SAS. It is also important to note that the statement contains only classification variables. An LS-means "estimate the averages you would have seen if your data had been balanced; they indicate how a given factor affects the response, all other things being equal;" thereby, providing "an estimate for certain linear combinations of population parameters. The particular linear functions are defined by population marginal means of the corresponding means for balanced data" [3, pp. 1-2]. Determining LS-means as opposed to arithmetic means in an unbalanced experiment considers that the sample sizes in all groups are different and assumes an even distribution of Status and Race in the underlying population. Thus, an LS-mean is equivalent to the mean for unbalanced experimental designs [3]. The class statement tells SAS that we have a categorical variable in our data set. The most common usage of the class statement will most likely be in the univariate, means, and GLM procedures. It is required for the GLM procedure only if we have a categorical variable such as race. The model statement specifies which model to analyze for the data. The dependent or response variable is always positioned on the left side of the equal sign while the independent variable(s) come after the equal sign. In the above code, we consider ACTC as the dependent variable; however, the model is repeated for all considered dependent variables. Additionally, the (*) is used in the model and lsmeans statement to tell SAS to consider all the possible interactions between the factors.

The GLM procedure produces the Type I (sequential) and Type III (partial), Marginal Sums of Squares for each model. Both provide the results on the significance level for each of the fixed effects in the model statement. However, the marginal (Type III) Sums of Squares are preferable in most cases since they correspond to the variation attributable to an effect after correcting for any other effects in the model. Type III Sums of Squares also provide estimates, which are not a function of the frequency of observations in any group, (i.e., for unbalanced data structures), where we have unequal numbers of observations in each group. As such, the group(s) with more observations does not per se have more importance than group(s) with fewer observations. Thus, this test is unaffected by the frequency of observations.

RESULTS

We conducted analyses on each of the dependent variables (i.e., ACTC, SATT, and CGPA) and the two main factors (Status and Race) to determine model validity (Table 2 below).

Model	CT	$\bar{X}$	df	SSE	SS	MSE	COV	R^2	F Value	Pr > F
ACTC	1115	22.07	3	14589.56	1343.26	447.75	16.41	0.084	34.13	***
SATT	397	1003.19	3	9933131.29	1608516.20	536172.07	15.82	0.14	21.27	***
CGPA	1271	2.75	3	936.41	38.59	12.86	31.20	0.04	17.42	***

Note: *CT* = Corrected Total; *SSE* = Sum of Squares Error; *SS* = Sum of Squares; *MSE* = Mean Squares Error; *COV* = Coefficient of Variation; R^2 = R-Square; *significance level* = *** $p < 0.0001$

Table 2. Predictive models by Dependent Variables for Status and Race (All Participants)

In table 2, we can see that there is a significant difference for each model at the <.0001 level; however, the R^2 for the ACTC and the CGPA models are extremely low and for the SATT only 14% of the variation is accounted for by the model. Although this may seem problematic given that R-square estimates determine strength of relationship between the model and the response variable, we might attribute a low R-square to the wide range in the test scores and CGPAs. Academic performance measures might be lower, in particular for some Black students, due to outlying factors such as stereotype threat [23] [24]. Stereotype threat is a phenomenon in which "individuals from stereotyped groups display impaired performance by virtue of a predisposition of conforming to or fear of reinforcing the negative stereotype of the group. Thus, culturally tolerated stereotypes (e.g., African Americans are intellectually inferior to Whites, males are better at math than females) can hinder an individual's academic performance if the individual identifies with the group" [22]. Several empirical studies have validated that the stereotype threat phenomena results in lower academic performance among certain underrepresented groups [1] [10] [17] [18]. Despite this, we see that the models are highly significant. The coefficient of variation shows that there are higher variance in the CGPA compared to the ACTC and SATT, with SATT showing the lowest degree of variation in the distributions.

Tables 3 through 5 provide the models displaying significance levels of the main effects and their interaction. The results indicate significance for the main effects; however, the interaction between Status and Race is not significant for each of the dependent variables. The generalized linear models for the Type III SS showed statistically significant differences in the mean scores at the $p < 0.001$ or lower for ACTC, SATT and CGPA.

Source ACTC	DF	Type III SS	F Value	Pr > F
STATUS	1	158.690523	12.10	0.0005
RACE	1	1055.738498	80.47	< 0.0001
STATUS*RACE	1	43.471740	3.31	0.0690

Table 3. GLM Procedure for ACTC Score

Source SATT	DF	Type III SS	F Value	Pr > F
STATUS	1	395514.6940	15.69	< 0.0001
RACE	1	811862.7562	32.20	< 0.0001
STATUS*RACE	1	6433.9338	0.26	0.6137

Table 4. GLM Procedure for SATT Score

Source GPA C	DF	Type III SS	F Value	Pr > F
STATUS	1	10.08452170	13.66	0.0002
RACE	1	20.44710571	27.69	< 0.0001
STATUS*RACE	1	0.00761846	0.01	0.9191

Table 5. GLM Procedure for CGPA

Tukey's Honestly Significant Difference (HSD) adjustment for multiple comparisons revealed that the difference in the mean scores between HSTA and Non-HSTA students on the ACTC, SATT and CGPA is -0.93, -77.89, and -0.22, respectively. Analyses of the variable Race also produced statistically significant differences in the mean scores between Black and White students at the $p < 0.0001$ for ACTC, SATT and CGPA. In Tables 6 and 7 below, the HSD adjustment for Confidence Limits (CL) also revealed that the greatest mean difference appeared in the SATT scores (-111.60). The differences were not as prominent for the ACTC and CGPA variables.

	$\bar{X}$	95% CL		Difference Between Means	Simultaneous 95% CL LSMean(i)-LSMean(j)	
		Lower	Upper			
ACTC						
HSTA	22.22	21.78	22.66	-0.93	-1.45	-0.41
NHSTA	21.29	21.29	20.99			
SATT						
HSTA	1045.83	1012.01	1079.65	-77.89	-116.55	-39.23
NHSTA	967.94	949.20	986.67			
CGPA						
HSTA	2.86	2.75	2.96	-0.22	-0.34	-0.10
NHSTA	2.63	2.57	2.69			

Table 6. LS-Means for Dependent Variables by Status Adjustment for Multiple Comparisons: HSD

	$\bar{X}$	95% CL		Difference Between Means	Simultaneous 95% CL LSMean(i)-LSMean(j)	
		Lower	Upper			
ACTC						
Black	20.55	20.11	21.00	-2.40	-2.92	-1.87
White	22.95	22.68	23.23			
SATT						
Black	951.08	920.32	981.58	-111.60	-150.26	72.94
White	1062.96	1039.26	1086.11			
CGPA						
Black	2.58	2.48	2.68	-0.32	-0.44	-0.20
White	2.90	2.83	2.96			

Table 7. LS-Means for Dependent Variables by Race Adjustment for Multiple Comparisons: HSD

The Tables 6 and 7 also provides the 95% confidence limits for the test scores and CGPA lsmeans as well as the 95% simultaneous CLs for the mean difference of the variables indicating that we can be 95% confident that all the confidence intervals contain the true differences. In addition, Figures 2 through 4 illustrate the 95% confidence limits for the interaction between Status and Race for ACTC and SATT.

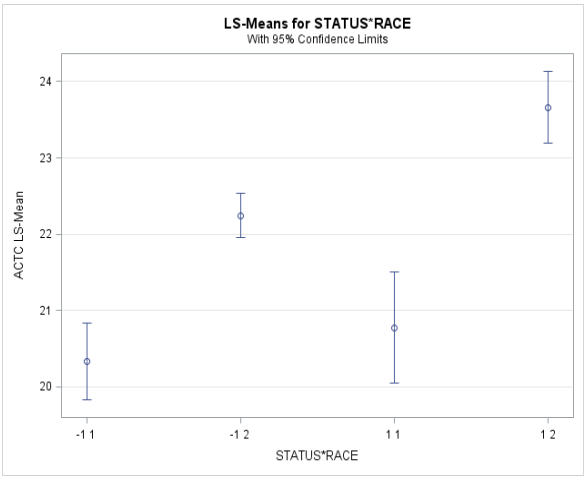

Figure 2. Graph depicting 95% CL for ACTC for Status by Race

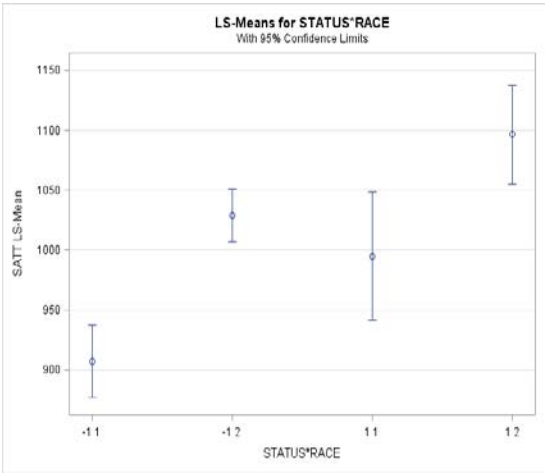

Figure 3. Graph depicting 95% CL for SATT for Status by Race

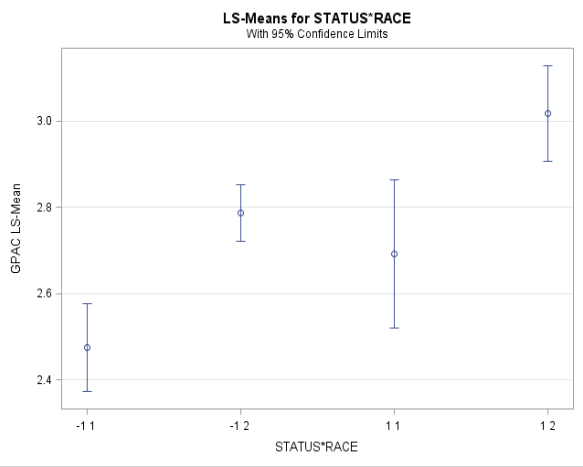

Figure 4. Graph depicting 95% CL for CGPA for Status by Race

Although the GLM models did not show significant difference in the interaction between Status and Race (recall Tables 3 through 5); however, the HSD analyses revealed significant differences in the test scores and CGPA when comparing across groups by Status and Race (See Tables 8 through 10). The ACTC lsmeans showed significant difference in test scores between HSTA White participants and the other groups including HSTA Blacks. ACTC lsmeans for each group is 20.78, 23.66, 20.33, and 22.25 for HSTA Black, HSTA White, Non-HSTA Black and Non-HSTA White populations, respectively. The mean difference between HSTA White and the other groups ranged from 1.41 to 3.33. The mean difference between the HSTA and Non-HSTA Black population scores was 0.45.

i/j	N-HSTA Black	N-HSTA White	HSTA Black	HSTA White
N-HSTA Black	--	***	ns	***
N-HSTA White	***	--	*	***
HSTA Black	ns	*	--	***
HSTA White	***	***	***	--

* $p < 0.05$, ** $p < 0.001$, *** $p < 0.0001$, ns = not significant

Table 8. LS-Means for Dependent Variable ACTC by Status and Race Adjustment for Multiple Comparisons: HSD Pr > |t| for H0: LS-Mean(i)=LS-Mean(j)

SATT lsmeans scores for interaction between the main effects showed that HSTA African American students' scores were significantly different from their Non-HSTA counterparts (995.00 vs. 907.17, p = 0.0269). The results also revealed that HSTA Black students SATT scores were not significantly different from the Non-HSTA White population (p = 0.6620). Comparably, HSTA White students also performed better on the SATT score than their Non-HSTA counterparts (1096.67 vs. 1028.71, p = 0.0236). Significance levels for Status by Race are presented below in Table 9.

i/j	N-HSTA Black	N-HSTA White	HSTA Black	HSTA White
N-HSTA Black	--	***	*	***
N-HSTA White	***	--	ns	*
HSTA Black	*	ns	--	*
HSTA White	***	*	*	--

* p < .05, **, p<.001, ***p < .0001, ns=not significant

Table 9. LS-Means for Dependent Variable SATT by Status and Race Adjustment for Multiple Comparisons: HSD Pr > |t| for H0: LS-Mean(i)=LS-Mean(j)

The CGPA scores revealed that the HSTA African American students' CGPA was not significantly different from their Non-HSTA counterparts (2.69 vs. 2.47; p = 0.1416). However, it was also not significantly different from Non-HSTA White students (2.69 vs 2.79; p = 0.7424) which is only a 0.10 difference in range. Conversely, Non-HSTA Black students' CGPA was significantly different from Non-HSTA White and HSTA White students (3.02). Table 10 below presents significance levels across groups.

i/j	N-HSTA Black	N-HSTA White	HSTA Black	HSTA White
N-HSTA Black	--	***	ns	***
N-HSTA White	***	--	ns	*
HSTA Black	ns	ns	--	*
HSTA White	***	*	*	--

* $p < 0.05$, ** $p < 0.001$, *** $p < 0.0001$, ns = not significant

Table 10. LS-Means for Dependent Variable CGPA by Status and Race Adjustment for Multiple Comparisons: HSD Pr > |t| for H0: LS-Mean(i)=LS-Mean(j)

The mean SATT and CGPA differences between HSTA White students and the other groups ranged from 189.5 to 101.67 and 0.55 to 0.33, respectively. HSTA Black students outperformed their Non-HSTA counterparts on the SATT test (mean difference = 87.83); however, there were no significant differences between the groups on the CGPA (mean difference = 0.22). Although significant differences were found between the Non-HSTA Black and White students on the SATT and CGPAs, findings showed that the mean differences in SATT (33.71) and the CGPAs (.10) for HSTA Blacks and Non-HSTA Whites were not significantly different. The simultaneous 95% confidence limits for the difference between the means for SATT and CGPA of HSTA Blacks and Non-HSTA Whites is -42.25 to 109.67 and -0.14 to 0.34, respectively. Recall the SAS code for HSTA (1) and Non-HSTA (-1) status as well as the codes for the Black (1) and White (2) categories. The Status and Race categories are represented by these codes in Figures 5 through 7, which provide a graphic of the HSD significance levels. The graphics indicate no significant difference in the SATT and CGPA between HSTA Blacks and Non-HSTA White students.

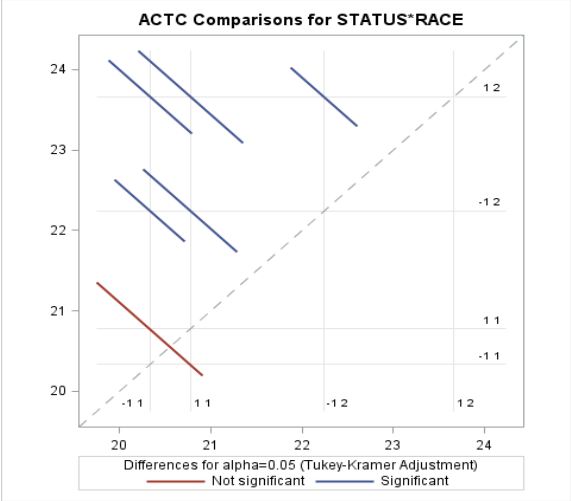

Figure 5. Graph depicting significance level for for ACTC for Status by Race

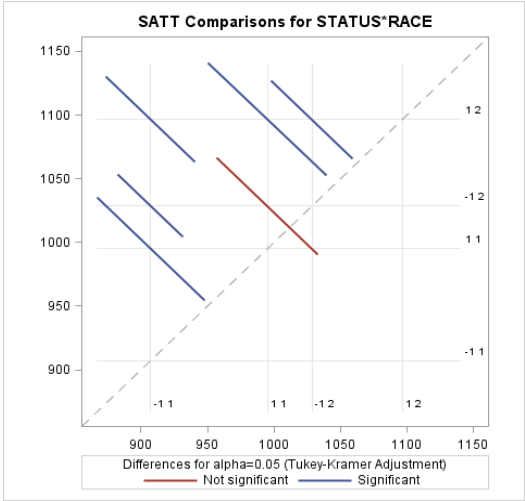

Figure 6. Graph depicting significance level for SATT for Status by Race

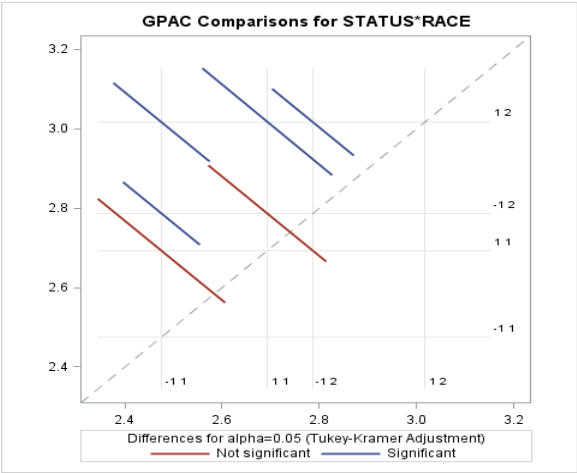

Figure 7. Graph depicting significance level for CGPA for Status by Race

CONCLUSION

The purpose of this study was to analyze the academic performance of HSTA (a pre-college/STEM enrichment program) participants relative to their Non-HSTA counterparts. As an academic and science intervention program, HSTA has become an important element to enhancing the academic performance of underrepresented students in West Virginia. Although there is research showing that such programs can have a tremendous impact on increasing pursuit of higher degrees in math and science, including Master's, PhDs, and MDs [5] [14] [21], there is still the need for more empirically based studies [7] [20]. Such studies could reveal the mechanisms through which these impacts occur. This study offers some evidence that HSTA may aid in increasing standardized test scores, an integral component of college acceptance and a probable tool to measure college success. There are few studies comparing standardized test scores of high school academic enrichment/STEM program and non-program participants who have gone to college [2]. More specifically, a comparison of CGPAs for academic enrichment program and non-program participants is warranted, and this study is the beginning of such endeavors. We recognize that a possible limitation to this study is the selection bias into the program for HSTA participants. HSTA participants are required to have a 2.5 high school GPA to enter the program and must successfully graduate with a 3.0 high school GPA, which may bring into question the validity of this study [22]. However, it can be argued that the

impetus for programs such as HSTA is to provide the necessary academic enrichment; thereby, germinating the seeds for growth and maturity in academia and beyond. As a pre-college/STEM enrichment program, HSTA participants receive the essential tools to improve upon the gatekeeper qualifications for students who historically exhibit lower standardized test scores. One of HSTA's primary goals is to prepare students to pursue post-secondary study and ultimately a career in Health Sciences/STEM related areas by creating community/academic partnerships, fostering parental/family involvement, and implementing core program components. Thus, HSTA diligently seeks to create positive educational environments and outcomes while attempting to dismantle the phenomena of stereotype threat performance for its participants [24].

The results of this study indicate that HSTA White participants show enhanced academic performance on standardized tests [14]. HSTA White students are surpassing their HSTA and non-HSTA counterparts on all of the academic measurements. The HSTA Black participant population showed significant differences in their SATT scores from the Non-HSTA Black students, and they are doing slightly better in other areas. Furthermore, significant findings indicate that on some of the academic measurements (SATT and CGPA), HSTA Black students are not performing under par in comparison to Non-HSTA Whites. Essentially, these findings suggest that there is a relationship between program participation and higher standardized test scores; however, further research is needed in order to substantiate that successful STEM enrichment programs may have the potential to affect this type of evaluation – an important indicator of acceptance into post-secondary institutions.

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Abstract

In August 2007, a small southern undergraduate liberal arts institution adopted a tobacco free campus policy. The objective of this study is to compare student attitudes towards a tobacco free campus policy at a small public institution of higher education immediately after policy implementation and seven years later. This study relies on responses from two cross sectional studies with purposive convenience samples. A randomized anonymous student attitudes survey (n=794) was conducted in 2008 regarding the new tobacco free campus policy, and a follow-up survey (n=885) was completed in 2015 to compare student attitudes across time. Descriptive analyses and chi-square tests were performed to compare the responses from the two samples. Results indicate that statistically significant changes in tobacco use rates and policy reactions occurred between 2008 and 2015. This paper will discuss the survey results, lessons that can be learned from the implementation of this higher education policy and recommendations to implement a successful health policy.

*Keywords***:**

Cross-sectional designs

Demographics

Higher Education

Purposive convenience samples

Tobacco-free campus policies

Student attitudes

Social marketing

Survey

1. Introduction

In August 2007, a small southern undergraduate liberal arts institution adopted a tobacco free campus policy. This policy was a Presidential mandate with minimal input from the faculty and staff which resulted in an ongoing discussion about whether the policy would have a negative impact on student retention and enrollment. The policy prohibited cigarette use, e-cigarette use and chewing tobacco. It also prohibited campus organizations from accepting money or gifts from tobacco companies and banned tobacco advertisements on campus. Policy enforcement was the responsibility of campus police. Fines for the policy violations were $15 for the first offense increasing to $25.00 for the third offense. Additional offenses required an appearance in front of the judicial committee. The policy was included in the student handbook and posted on the institution's website. Because of this ongoing faculty discussion, a student attitudes survey of the policy was administered in the spring semester of 2008. The survey examined student

attitudes towards the policy based on their smoking status, if it impacted their attending the university, if the smoking cessation program had any impact on their tobacco use and if students would report violators of the policy. The study established the number of students that used tobacco and if gender was a factor in tobacco use. This study was published in the Academy of Health Care Management Journal (vol. 7, no. 1) in 2011. A second survey was implemented in the spring of 2015 to compare student attitudes towards the tobacco policy (Figure 1). This study compares the results from the two surveys and what lessons can be learned from how the policy was implemented.

FIGURE 1 Student Attitudes - Tobacco Free Campus Policy

A tobacco free campus policy has been in place at NoNAme University since the fall semester 2007. This brief anonymous survey will ask for your opinion on this policy. PLEASE CIRCLE YOUR ANSWERS. IF YOU HAVE ALREADY ANSWERED THIS SURVEY IN ANOTHER CLASS, DO NOT COMPLETE.

1) Do you use tobacco products? If yes, circle all that apply. **YES cigarettes chew e-cigarettes NO I DO NOT USE**
2) If **YES to no. 1**, do you think the smoke free campus policy has decreased your use of tobacco products? **YES NO**
3) If **YES to no.1**, have you thought about quitting as a result of the tobacco free campus policy? **YES NO**
4) If **YES to no. 1**, are you aware of the free tobacco cessation services available on campus? **YES NO**
5) **If YES to no. 1**, have you attended cessation services on campus? YES NO
6) E-cigarettes contain nicotine but no tobacco. Should they be included in the tobacco free policy? **YES NO**
7) Were you aware of the tobacco free policy at Lander when you applied for admission? **YES NO**
8) If **YES to no.7**, did you attend in part because you wanted to go to a University that was tobacco free? **YES NO DID NOT AFFECT MY DECISION**
9) Do you agree with the Lander tobacco free policy? **YES NO NO OPINION**
10) Would you encourage your friends to come to Lander because of the policy? **YES NO DOES NOT MATTER**
11) Have you witnessed faculty using tobacco on campus? **YES NO**
12) Have you witnessed students using tobacco on campus? **YES NO**
13) Would you report faculty violating the tobacco free policy? **YES NO**

14) Would you report students violating the tobacco free policy? **YES NO**
ALL STUDENTS RESPOND. CIRCLE ALL THAT APPLY
GENDER: MALE FEMALE
CLASS STATUS Freshman Sophomore Junior Senior
MY AGE IS: 17-21 22-25 26-29 30-33 34-39 40 or older

THANK YOU FOR YOUR INPUT. 2/2015

2. Literature review

The American College Health Association (ACHA) supports tobacco-free environments and supports efforts to minimize exposure to smoke. (ACHA, 2011). Studies have indicated that students continue the behavior learned in college throughout their lives. Therefore, it is important to target this population to change their unhealthy behavior. Recent research suggests that college smoking cessation programs are more effective if performed by peers. Ramsay and Hoffmann (2004) developed a pilot demonstration project to assess smoking cessation program effectiveness on college students. Their pilot study was based on literature that indicated there were many programs available to undergraduate students, but few were successful. Their discussions with student groups indicated that they would be more likely to ask for assistance from someone in their age group to stop smoking. The peer facilitators were trained by the American Lung Association. Of the 68 participants who completed the program, 60 (88.2 percent) quit using the program. The peer facilitators adapted the program to student life pressures such as taking exams and writing papers. The results of this study indicated that few students accessed the nicotine succession program which involved no peer component which supports this study. The study also indicated that a smoke free environment supported students' quitting.

In addition to campus tobacco policies, there are other influences in a students' life that must be considered when analyzing data on tobacco free campus policies. Rigoti,and Wechsler (2005) examine the exposure of college students to tobacco marketing events at bars, nightclubs, and other social venues. Using the 2001 Harvard College Alcohol Study of 11,000 respondents which asked students how often they attended social events that were sponsored by tobacco vendors. Results indicated that tobacco sponsored events increased the student smoking rate and had a negative impact on cessation efforts. NoName has also established a policy against organizations accepting money or gifts from tobacco companies , indicating support of this issue.

College smoking appears to be popular among both male and female students (Rigotti et al, 2000). According to Nichter, Nichter, Lloyd-Richardson, Flaherty,Carkoglu & Taylor (2006), smoking occurred among both genders while drinking alcohol at parties and on weekends although according to Ickes, Rayes, Higgins & Hahn (2017), females were more supportive of tobacco free policies. This study supports this research. Trinidad, Gilpin and Pierce (2004) examined compliance with California's high school

smoke-free campus policies before and after their implementation in 1995. Smoking prevention education programs were also implemented. Results indicate that student smokers' compliance to this policy increased from 43.7 percent in 1995 to 71.5 percent in 2002. Although this cohort was younger than the target population of this proposal, the study also supports that smoke free policies have a positive impact on students' smoking behavior. It is critical that smoking prevention programs are implemented in conjunction with smoking bans. Borders, Xu, Bacchi, Cohen & SoRelle-Miner (2005) performed a web-based survey on 13,000 undergraduate students in the state of Texas. Interestingly, preventive education programs decreased the odds of smoking by about 23 percent. Smoking cessation programs, however, were underutilized by students which is also a result of this study.

The literature review indicates that smoke free policies lower the prevalence of smoking. However it is important to collaborate with the targeted group prior to the policy implementation to encourage compliance. Students smoke as a result of social activities such as drinking or fraternizing with friends who smoke so educational institutions establishing a ban on accepting money or gifts from tobacco companies and to ban advertisement of tobacco companies may have an impact on student tobacco use. The literature review also emphasizes that traditional smoking cessation programs for students have not been successful but developing a program in conjunction with student peers may have an impact. Finally, for the policies to be effective, holding non-compliant individuals are the key to an effective policy (Van Buren, (2015) which did not routinely occur at NoName university.

3. Materials and methods

The registrar provided a list of classes for the spring semester 2015 and the number of unduplicated enrolled students (n=2539) (Kirkpatrick, March 2, 2015). A randomized table was applied to the list of classes by level of difficulty to ensure that student class status was equally represented. Permission to administer the surveys was requested of the instructors. Surveys were hand delivered to the instructors in an envelope and were picked up by the instructors once the surveys were completed and returned to the primary investigator in the same envelope. The University Institutional Review Board approved this study protocol.

Common measures among both student surveys included demographics, tobacco use rates, policy awareness and reporting policy violations. Responses were received from 885 students who represented nearly 35 percent of the student body. The 2015 survey included three additional questions on e-cigarette use and witnessing and reporting faculty violations of the policy.

Descriptive analysis and a Pearson chi-square test of independence were conducted to determine whether there were any statistically significant differences across characteristics and survey responses among participants in 2008 versus 2015.

Table 1: Users by Type of Tobacco 2015

	Frequency	Percent
Cigarettes (n=123)		
Yes	80	65.04
No	43	34.96
Chewing tobacco (n=123)		
Yes	35	28.46
No	88	71.54
E-cigarettes (n=123)		
Yes	46	37.40
No	77	62.60
Type of User (n=153)		
Cigarettes only	50	32.68
Chew only	23	15.03
E-cigarettes only	18	11.76
Cigarettes & Chew	4	2.61
Cigarettes & E-cigarettes	20	13.07
Chew & E-Cigarettes	2	1.31
All products	6	3.92
No response	30	19.61

Survey respondents in 2015 reported using a variety of tobacco products as summarized in Table 1; however, cigarettes were by far the most popular form of tobacco consumed with 53 percent of users reporting to be cigarette smokers. However, 38 percent of cigarette smokers also reported using another form of tobacco with e-cigarettes being the most popular combination. Another 12 percent claimed to only smoke e-cigarettes, while 15 percent of users only used chewing tobacco. Twenty one percent of users consumed multiple forms of tobacco. Although 20 percent of users did not answer this question, the reporting of e-cigarette use is indicative of their increased popularity of tobacco use.

Table2: Demographic Characteristics of Survey Participants by Tobacco Use Status

	2008 Participants (%)			2015 Participants (%)		
	All Students	**Users**	**Non-users**	**All Students**	**Users**	**Non-users**
Tobacco status						
User	**22.4**			**17.37**		
Non-user	**77.6**			**82.63**		
Gender						
Male	34.6	50.0	30.2	34.18	55.33	29.75
	65.4	50.0	69.8	65.82	44.67	70.25
		χ^2=23.9	*P-value = 0.000*		χ^2=36.08	*P-value = 0.000*
Class rank						
Freshman	27.2	28.7	26.8	30.00	25.33	30.99
Sophomore	24.5	21.4	25.5	22.44	18.00	23.38
Junior	24.9	23.6	25.3	23.72	31.33	22.11
Senior	23.3	26.4	22.4	23.84	25.33	23.52
		χ^2=2.26	*P-value = 0.519*		χ^2=7.53	*P-value = 0.057*

Age Group							
17-21	**71.2**	64.6	73.2	**71.90**	63.82	73.61	
22-25	**22.6**	30.9	20.1	**25.00**	28.95	24.17	
26-79	**2.2**	2.3	2.1	**1.72**	3.95	1.25	
30-33	**1.1**	0.6	1.3	**0.23**	0.66	0.14	
34-39	**2.8**	1.7	3.0	**0.34**	1.97	0.00	
40 or older	**0.1**	0	0.2	**0.80**	0.66	0.83	
		χ^2=10.48	*P-value = 0.063*		χ^2=23.86	*P-value = 0.000*	

Table 3: Differences of Opinions on the Tobacco Free Campus Policy

	All Students (%)			Users (%)			Nonusers (%)		
	2008	**2015**	**Δ**	**2008**	**2015**	**Δ**	**2008**	**2015**	**Δ**
Aware of the tobacco free policy									
Yes	58.6	71.4	12.8	42.7	62.1	19.4	63.5	73.4	9.9
No	41.4	28.6		57.3	37.9		36.5	26.6	
	P-value = 0.000			*P-value = 0.000*			*P-value = 0.003*		
Want to attend tobacco free campus									
Yes	11.3	9.6	-1.7	0	5.3	5.3	13.6	10.5	-3.1
No	21.5	10.9	-10.6	54.5	30.5	-24	14.3	7.2	-7.1
No effect on decision	67.2	79.5	12.3	45.5	64.2	18.7	72.1	82.3	10.2
	P-value = 0.001			*P-value = 0.030*			*P-value = 0.011*		
Support tobacco free policy									
Yes	57.8	51.1	-6.7	17.6	22.2	4.6	69.4	57.3	-12.1
No	24.5	13.7	-10.8	61.4	45.1	-16.3	13.8	6.9	-6.9
No opinion	17.7	35.2	17.5	21.0	32.7	11.7	16.8	35.8	19
	P-value = 0.000			*P-value = 0.011*			*P-value = 0.000*		
Encourage friends to attend									
Yes	23.4	18.6	-4.8	8.6	7.8	-0.8	27.7	20.9	-6.8
No	24.7	3.4	-21.3	59.4	11.8	-47.6	14.7	1.7	-13.0
Does not matter	51.9	77.9	26.0	32.0	80.4	48.4	57.6	77.4	19.8
	P-value = 0.000			*P-value = 0.000*			*P-value = 0.000*		
Willing to report student violators									
Yes	18.9	18.4	-0.5	4.7	9.9	5.2	22.8	20.1	-2.7
No	81.1	81.5		95.3	89.4		77.2	79.9	
	P-value = 0.624			*P-value = 0.110*			*P-value = 0.234*		

In 2015, Table 3 indicates that roughly 71 percent of respondents in the second round of the survey understood that they were applying to a tobacco free campus compared to the 59 percent in the first round. The 2015 survey also reports that 80 percent of students claimed the policy had no impact on their enrollment decision, which was an increase by 12 percentage points from the first survey. This change is due to a smaller percentage of students who said that a tobacco free policy negatively impacted their desire to attend. Similar overall patterns are observed between tobacco users and non-users. While most students supported the policy in the second survey, the support rate declined by seven percentage points from 58 percent to 51 percent. This decline appeared strongest among non-users with a decrease of 12 percentage points to 57 percent. Surprisingly, a segment of the 2015 user group (5.3 percent) indicated that they wanted to attend because of the policy which may perhaps indicate they were searching for an environment that would support their cessation efforts.

This apathy towards the policy is also evident in the response to the survey question 'Would you encourage your friends to come to this university because of the policy.' In the 2015 survey, only 3 percent of participants discouraged their friends from attending because of the policy, which is down from 25 percent. In 2015, 78 percent of participants

indicated that the policy did not matter to their recommendations of friends, up from 52 percent. A positive trend occurred as the number of users who would voice negative reviews to their friends because of the policy dropped 48 percentage points to 12 percent. Roughly 80 percent of users now said that the policy would not influence, while nearly the same percentage (77 percent) of users said that the policy did not matter. These statistics could very well indicate that due to the lack of policy enforcement, the tobacco free policy was less likely to influence in either direction the students' perceptions of the university.

Also, Table 3 reports statistics that only 18 percent of students were willing to report any fellow students who have violated the tobacco free policy. It is not surprising that tobacco users are less likely to report student violations (10 percent compared to 20 percent of non-users in 2015), and while this number increased from 5 to 10 percent between surveys, these differences were not found to be statistically significant using a chi-squared test. Participants of the 2015 survey were also asked if they would be willing to report faculty members who had violated the policy and nearly 21 percent indicated that they would. Roughly 33 percent of participants claimed to have witnessed faculty violations and approximately 71 percent claimed to have witnessed student violations. Naturally, these statistics were higher among tobacco users (44 and 77 percent respectively) who likely smoke in common areas.

Table 4 chi-squared test results indicate that for most survey questions, statistically significant changes in policy reactions occurred within each gender group. Consistent with the 2008 results, there was a statistically significant difference in the reaction to the tobacco free policy across genders in 2015. Statistically significant differences were found across genders in all questions related to the policy. Females were more aware, supportive and influenced by the policy than were males. They were also more likely to encourage their friends to attend and their willingness to report faculty and student violators. Both males and females were more likely to be aware of the tobacco free policy in 2015 than they were in 2008. Despite this increase in awareness, the tobacco free policy lost support among both genders with more students reporting that they had no strong opinions regarding the policy.

Table 4: Differences of Opinions on the Tobacco Free Campus Policy across Years by Gender

	Males (%)			Females (%)		
	2008	**2015**	**Δ**	**2008**	**2015**	**Δ**
Aware of the tobacco free policy						
Yes	47.1	66.5	19.4	63.8	74.3	10.5
No	52.9	33.5		36.2	25.7	
	P-value = 0.000			*P-value = 0.004*		
Want to attend tobacco free campus						
Yes	10.4	6.4	-4.0	11.5	11.4	-0.1
No	27.1	16.0	-11.0	19.9	8.4	-11.5
No effect on decision	62.5	77.5	15.0	68..7	80.3	11.6
	P-value = 0.103			*P-value = 0.001*		
Support tobacco free policy						
Yes	43.1	40.9	-2.2	65.6	56.5	-9.0
No	34.1	21.3	-12.8	19.7	9.7	-10.0
No opinion	22.9	37.8	15.0	14.8	33.8	19.0
	P-value = 0.000			*P-value = 0.000*		
Encourage friends to attend						
Yes	15.3	15.3	0.0	27.6	20.1	-7.5
No	35.5	6.1	-29.3	19.2	2.1	-17.1
Does not matter	49.3	78.6	29.3	53.2	77.8	24.6
	P-value = 0.000			*P-value = 0.000*		
Willing to report student violators						
Yes	12.1	13.6	1.5	22.3	21.1	-1.3
No	87.9	86.4		77.7	78.9	
	P-value = 0.557			*P-value = 0.621*		

Given these results, simply having a tobacco free policy is not sufficient to encourage changes in behavior. Meier, Wechner, Miller & Weiner (2012) reported that when a midwestern university implemented a tobacco ban campus policy, the institution immediately implemented a multi-media campaign about the ban and the negative health effects of tobacco use which resulted in a significant decrease in smoking and smokeless tobacco use among on campus residents. In a recent report from Middle Tennessee which established a tobacco free campus policy in 2012, which indicated there was weak enforcement and consequently, smoking across the campus continued (Wigdor, 2017).

Consistent with the results from the 2008 survey, there was a statistically significant difference in the reaction to the tobacco free policy across genders in the 2015 survey. Table 5 reports statistically significant differences were

found across genders in all questions related to reactions to the policy. Statistically significant differences were found across genders in all questions related to the policy. Females were more aware, supportive and influenced by the policy than were males. They were also more likely to be advocates of the policy by encouraging their friends to attend and by their willingness to report both faculty and student violators to enforcement authorities. Table 5 chi-squared test results indicate that for most survey questions, statistically significant changes in policy reactions occurred within each gender group. Both males and females were more likely to be aware of the tobacco free policy in 2015 than they were in 2008, but the awareness among males increased the most. Despite this increase in awareness, the tobacco free policy lost support among both genders with more students reporting that they had no strong opinions regarding the policy. Females were also much less likely to encourage their friends to attend because of the policy than in 2008 while males were much less likely to let the policy impact their decision to attend than in 2008. There were no statistically significant changes in students' willingness to report student violators within gender groups.

Table 5: Differences of Opinions on the Tobacco Free Campus Policy across Years by Gender

	Males (%)			Females (%)		
	2008	**2015**	**Δ**	**2008**	**2015**	**Δ**
Aware of the tobacco free policy						
Yes	47.1	66.5	19.4	63.8	74.3	10.5
No	52.9	33.5		36.2	25.7	
	P-value = 0.000			*P-value = 0.004*		
Want to attend tobacco free campus						
Yes	10.4	6.4	-4.0	11.5	11.4	-0.1
No	27.1	16.0	-11.0	19.9	8.4	-11.5
No effect on decision	62.5	77.5	15.0	68..7	80.3	11.6
	P-value = 0.103			*P-value = 0.001*		
Support tobacco free policy						
Yes	43.1	40.9	-2.2	65.6	56.5	-9.0
No	34.1	21.3	-12.8	19.7	9.7	-10.0
No opinion	22.9	37.8	15.0	14.8	33.8	19.0
	P-value = 0.000			*P-value = 0.000*		
Encourage friends to attend						
Yes	15.3	15.3	0.0	27.6	20.1	-7.5
No	35.5	6.1	-29.3	19.2	2.1	-17.1
Does not matter	49.3	78.6	29.3	53.2	77.8	24.6
	P-value = 0.000			*P-value = 0.000*		
Willing to report student violators						
Yes	12.1	13.6	1.5	22.3	21.1	-1.3
No	87.9	86.4		77.7	78.9	

	P-value = 0.557	*P-value = 0.621*

Discussion

Approximately 7 percent of adults with an undergraduate degree smoke compared to those individuals with some college (18.5 percent) and (34 percent) with a GED certificate (CDC, 2015). However, according to the American College Health Association's Fall 2016 undergraduate student health assessment, 10 percent of the student population reported cigarette use within the last 30 days (13.1 percent-male vs. 8.6 percent -female) which is higher than the national estimate. College life for students can have both social and environmental stressors which can increase tobacco use (Ballie, Callaghan & Smith, 2011). Tobacco and smoke free environment policies can be an effective public health tool to reduce tobacco use and secondhand smoke exposure if there is enforcement of the policy. In 2017, there were over 1,800 one hundred percent smoke free campus sites. Of these**,** 1,500 were also 100 percent tobacco-free, with 1,400 also prohibiting e-cigarette use. This number has grown substantially from the 586 campuses with 100 percent smoke free campus policies in 2011 when the first national survey was implemented (Americans for Nonsmokers Rights, 2017).

This study used cross sectional data from purposive convenience samples in 2008 and 2015 to compare the student attitudes towards a tobacco free campus policy. There was a statistically significant decrease in student self-reporting as tobacco users which is a positive public health outcome. In 2015, the number of students increased who indicated they were applying to a tobacco free campus which would be logical because the policy had been in place for many years. However, a large majority of the 2015 respondents claimed the policy had no impact on their attendance. However, there was an increase of tobacco users that indicated they wanted to attend because of the policy. The results also indicated that the policy lost support from non-tobacco users and only a small number of students would discourage their friends from attending; a large decrease from the 2008 survey. Seven years later, there was more apathy towards the policy. This attitude could be the result of the lack of enforcement by the campus policy. Data collected between 2005-February 2015 by the campus police, who were responsible for policy enforcement, indicated there were only 57 smoking complaints and 23 smoking violations over this 10-year period (A.Fulbright personal communication, February 10, 2015). These data are surprising considering the percentage of students who witnessed both student and faculty violators of the policy (71 percent and 33 percent). These data could point directly to the lack of enforcement of the policy.

Three years later, there was a two-week marketing campaign in September of 2010 to remind faculty, staff and students of the policy and that there would be increased enforcement of the policy. There was also a reminder of the smoking cessation program available from the Wellness Center. Unfortunately, there was no collection of user data of the wellness program. Based on the 2015 survey data results, it appears that the 2010 campaign was not effective. The

ACHA in its position statement on tobacco use on campuses indicates there should be a routine enforcement plan to report violators (ACHA position statement, 2011) which is reflected in the data collected by campus security.

Asking students if they witnessed and were willing to report faculty violations of the policy were two new questions for the second survey. In 2015, 33 percent of survey participants reported witnessing faculty members violating the tobacco free policy, while 71 percent reported witnessing violations by students. Survey participants were also more likely to report faculty violations (21.4 percent) than student violations (18.4 percent). Additionally, only 18 percent of students would report their peer violators even though a large majority of the students witnessed student violations, which again could be attributed to their apathy about the policy (Niles & Barbour, 2011).

Anecdotal information indicated it was very easy to hide from the campus police. Many of the students and faculty would go smoke in their cars. Also, because the policy was limited to the campus property, the smokers could step off the campus property and smoke on the sidewalk, so individuals were still exposed to secondhand smoke. The proximity to a smoke zone sidewalk next to the college campus could negatively impact the tobacco free policy (Hahn et al, 2012). These statistics also supported by both the 2008 and 2015 respondents' low percentages of 5 and 7 percent who indicated they had considered quitting because of the policy. Gender research also supports their attitudes. Typically, females are more supportive of these types of policies (Ickes, Rayens, Wiggins, & Hahn, (2017); Thomson, Oomen-Early, & Armstrong, 2012). In a recent survey on attitudes towards a tobacco free policy, opposition was strongly associated with males being more opposed than females (Braverman, Hoogesteger, Johnson & Aaro, 2015).

There are limitations to this study based on the study design. With a purposive convenience sampling, there will likely be a bias which limits its general application to the literature. However, the sampling was intentionally purposive because the investigators wanted to assess the attitudes of the impacted population. As with any survey, the data is self-reported which could include self-biases. Research indicates that when a behavior is considered negative, there may be under or over reporting of that behavior depending on the behavior's social acceptability (Brener, Billy & Grady, 2003). Also, the institution is in the south which has higher rates of tobacco use so the results may be biased against a tobacco free policy. In 2015, South Carolina ranked 14th in the U.S. for adult smoking rates (World Life Expectancy, 2017).

Despite the study limitations, there are lessons to be learned from this policy initiative. The literature has indicated that tobacco free campus policies have been effective in changing behavior (Fallin, Roditis, Giantz (2015); Lee, Rameny, Goldstein (2013); Seo, Macy, Torabi et al, 2011). Several educational institutions have reported that there has been a reduction in smoking because of the policies (Seo, et al, 2011). Although a tobacco free policy was implemented many years ago at this institution, there was no aggressive marketing campaign regarding the policy or the smoking cessation program. Despite the proactive approach to instituting some tobacco-free policy years before they became popular on higher education campuses, the study indicates that there was ineffective marketing of the policy and weak enforcement of policy violations which weakened the policy as a public health tool. In addition, due to

the lack of enforcement less than 20 percent of students reported a willingness to report violators of the policy which increases the challenges associated with policy enforcement. Support for the tobacco free policy has declined; however, there appears to be little to no effect on enrollment, which was the initial fear of faculty when it was first introduced

The lack of these types of activities lessened the impact of the policy (Baillie et al, 2011; American College Health Association, 2012; Mamudu et al, 2012; Rusette, Harris, Schuldberg & Green, 2014). The way the policy was initially introduced in 2007 had an impact on policy compliance and enforcement. This policy had a 'top-down' implementation. Both students and faculty found ways of ignoring the policy by smoking in their vehicles or smoking on the public sidewalks next to the campus. Based on these survey results, the following are recommendations to increase the impact of public health tool:

1) The senior administration implementing this health policy utilized a top-down approach which excluded input from the stakeholders of employees and students. This type of approach can create resentment with an increased likelihood to be noncompliant because there was little to no input from their stakeholders(Anderson, 2014). Including all employees and students in this organizational change from the onset, could have made a difference in the implementation and impact of the policy.

2) Based on the recent data results and the data reported by the campus police in 2015, the one marketing campaign in 2010 should have been routinely repeated to increase the impact of the policy effectiveness as a public health tool. Marketing a policy reminds stakeholders that the administration considers the policy important. The marketing plan focused on student and staff compliance and should have included a social marketing component. This component applies typical marketing strategies to improve high-risk health behaviors (Thomas, 2015). The plan should have included specific alternative behaviors to a high-risk behavior such as tobacco use. This component could have increased policy compliance.

4) It was clear that there was no routine data collection of policy compliance nor the tobacco cessation program. Any organizational policy should include an evaluation program to assess effectiveness and to make any needed changes.

A finding that should not be ignored is the 2015 survey question regarding student e-cigarette use which highlights its increased component of tobacco use. Respondents indicate that 38 percent of the tobacco users combined cigarette smoking with e-cigarette use. Future research should continue to be focused on tobacco free campus policies that include e-cigarettes and hookah because of their increased popularity. E-cigarettes have been touted as a 'healthy' option to smoking cigarettes, but recent research has indicated there are negative health effects. According to Capponnetto et al (2012), e-cigarettes are becoming a popular phenomenon worldwide illustrating the need for more effective types of tobacco control. According to Littlefield, Gottlieb, Lee & Trotter (2015), e-cigarette use with alcohol

may contribute to riskier health behaviors in college students .This form of tobacco use is relatively new, but this type of tobacco use could become a major public health issue particularly for this demographic. Campus free tobacco policies are crucial to the elimination of the use of non-smoking forms of tobacco. If non-smoking forms are not addressed in the campus polices, there may be unintentional movement from smoking to non-smoking forms (Choi et al, 2012).

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A fuzzy decision support system in big data analytics not affected by the v's

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ABSTRACT

Big data is characterized by many V's and none of them is capable of generating any stable values that can be feasibly adopted. The volume V indicates that no matter how much data you receive in big data there is always more data to come that is not feasible to store. The velocity V indicates that data comes at a high speed, like in live streams, and no matter how well you align with this speed the data will flood your data stores, even when the Blockchain technology is used. The variety V indicates that data in big data is just too variable to feasibly store because the minute you though you extracted a valuable data subset to send to analysis new data has had come by, and process and findings change. The veracity V indicates that there may be just too much uncertainty associated with data in big data to the point where the data itself becomes irrelevant and uncertainty management becomes infeasible to process.

Because of those V's, and maybe others, in big data, the data itself should not be the main objective in big data analytics, but the decision support generation capabilities that can be maintained on the big data for the life of the decisions in question. These decision support capabilities should be computed according the acceptable and sound decision theoretic methods reported in the literature. This way, feasibility can be achieved. Hadoop, and many other software tools in the market, are so far only a market response to the hype added to big data that has been well commercialized but still remain without a direct significance associated with a generation of business value to adopters. This study is however only concerned with fuzzy expert systems as a decision support capability.

This study proposes a big data analytic model that establishes a stable big data environment where a fuzzy expert decision system is generated such that the big data v's do not significantly affect this decision support capability.

A numerical example is provided to demonstrate the working of the proposed big data fuzzy decision support system.

A New Look at Academic Dishonesty in Higher Education

Abstract: This study will investigate current rates of academic dishonesty at two small universities in the southeastern area of the United States. The survey tool administered in this study has been widely used throughout the world to determine the factors affecting academic dishonestly in college students. As technology has exploded over the last decade, it is expected to have enhanced the opportunities to commit academic dishonesty. The availability of test banks and other pertinent information online may allow college students increased opportunities to cheat. The impetus for this study is both logical and anecdotal. University faculty have long been frustrated with the academic dishonesty of students. The accelerated change due to information technology has created an environment that is quite new in nature to higher education. It is necessary to determine the changes in the ideals and attitudes of students toward academic dishonesty to develop new and improved techniques for dealing with this issue. This study will both identify groups more likely to commit academic dishonesty while examining factors that are significant variables.

A View of Modern Service Economics

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ABSTRACT

Service is a subject that involves technology, business, education, and societal innovation and is important to individuals in practically all forms of life. To many people, service represents something they cannot do themselves, or do not want to do, or perhaps more importantly, something that can be done more efficiently or in a less costly manner by a specialized business entity. Many activities in this domain, such as medical provisioning and transportation, have always been regarded as service, even though the providers do not normally regard themselves as service providers. Service currently constitutes more 90% of the GNP of developed nations, so analysts have begun to give some attention to up-to-date models of the new commercial environment. Traditionally, economic theory was based on tangible resources and embedded value; the modern economy based on service involves intangible resources, the co-creation of value, and economic relationships. Most commercial, governmental, and educational endeavors actually involve service, as do most products and social activities. The study of service economics subsumes tradition economics, as well as manufacturing, supply chains, transportation, finance, law, medicine, government, education, and practically all other undertakings in the modern commercial ecosystem. This paper explores the nature of modern service economics and includes the application of comparative advantage to service, a subject that hasn't heretofore been covered in the literature. The subject matter builds on the original work of Adam Smith and David Ricardo (Mill, 1844).

Keywords: service, service science, service collective, collaboration, wealth, service value, service domain, service requisite, comparative advantage.

A QUICK SURVEY OF MODERN SERVICE ECONOMICS

In its most general sense, service is regarded as a provider/client co-creation that creates and captures value for both entities, and encompasses practically everything we do in everyday life. [Katzan 2017] Whereas traditional economics focuses on the exchange of goods, service economics concentrates on the value obtained by the instantiation of a service process. Services are derived from societal needs, such as medical care, transportation, fire and personal safety, and education. Service may involve the use of a product, such as an automobile, but is not the product per-se. Products, on the other hand, are developed from anticipated needs and are created independently of the specific entity that will eventually use them. The framework for service is created beforehand and a service is established when a given need arises – that is, when that specific service actually takes place. Service of various kinds is widely available, and differing approaches to the subject matter exist. Service, therefore, is the use of knowledge and skills for the benefit of another entity, and service economics is a subject that studies the nature of wealth generated by service. [Fawcett 1870]

Service is the primary activity of persons and organizations in the 21st century, yet very little is known about the subject. There are no theories of best practice, and no principles of precisely what constitutes good service. From a business viewpoint, service sustainability has not even been considered. People are interested in service, and its academic basis known as service science, because it will eventually change the predominant economic focus in developed countries from products to service. The subject is important to providers and consumers of service, since most service providers, such as individuals, businesses, governments, and other organizations, are also consumers of service. [Katzan op cit.]

Service Concepts

At the elementary level, service is straightforward and a conceptual view of the subject matter is easily acquired. It is work performed by one person or group that benefits another person or group. Clearly, the provider and client have differing roles and they need to exchange information to execute the service event. If one were to consider the interactive component of basic service, it would understood to be a social activity that is consumed at the point of production. The service provider and the service client co-produce a service. Thus, service is a process, usually referred to as a service event, characterized by customer participation, simultaneity, perishability, and heterogeneity. Customer participation refers to fact that the customer brings an asset to the event and that is the domain within the event takes place. Simultaneity refers to the unique instance where the service is produced and consumed at the same time. Perishability denotes that if the opportunity to engaging in the service event by the provider or client is not taken, then the opportunity is lost. Lastly, heterogeneity specifies that each service event is unique.

With service, both participants contribute in the interchange and both benefit, even though the sense of participation is diverse and varies between different forms of service execution. The domain of service providers includes individuals, teams, products, electronic systems, groups, and ad hoc units organized to execute a particular service delivery scenario. Similarly, service clients include persons, groups, social organizations, governments, and commercial entities. In some cases, the object receiving the service is the responsibility of the client, as in cleaning and repair services. In this instance, the entity receiving the service is known as the service object. A service is often complex requiring supplementary and subsidiary services, so that a complex chain of services, called a *service system* is necessary to achieve a particular result. Even though most social, commercial, educational, and governmental activities are actually service, most people don't give the subject much thought. Actually, a complete knowledge of the diverse forms of service would require a lifetime of study. [Jevons 1880]

Service Process and Organization

At the global level, an organizational entity that provides a service normally goes through a service lifecycle consisting of service commitment, service production, service availability, service delivery, service analysis, and service termination. As such, the service organization can be characterized, as being composed of as a layered set of activities that constitute a value chain for services, comprised of people, technology, and organizations. This is essentially a process view of generic services supplied by a governmental or economic entity, such as a governing

body, a business, an institution, or an individual acting in a service capacity. Service commitment refers to the formal agreement to provide a class of services to a service audience by a principal or trustee with proper administrative control over the service domain. The agreement, such as a charter, to provide fire service by a municipality and the establishment of a health clinic are common examples. The mayor of a city is a common example of a service principal. Service production pertains to the operational aspects of service provisioning that encompass service design, infrastructure, availability, quality management, and back-office processing. The producer is the agent of the principal in a prototypical principal-agent scenario. The principal and the agent may be the same economic entity or different entities in a distinct service relationship. The producer is responsible for insuring the resources are available to execute a service, including those persons charged with performing that service. Service availability denotes the time when a service is available, including initiation and termination dates. Service delivery is the comprehensive class of activities usually regarded as the "service" and is the layer where the service client comes into the picture. The doctor/patient relationship is a good example of this layer. The service provider, who could have a dual role as a producer, is an agent of the producer as the primary source of service revenue and is the primary supplier of service. Service delivery normally consists of several inherent services constituting a service value chain. Service analysis refers to the measurement activities and the determination of value propositions needed to sustain service operations. Service termination reflects the inevitable consequence of evolving services where a total service operation has to be retired, because of insufficient activity or realigned opportunities. [Katzan 2009]

Service Economy and Service Economics

In the traditional world of economics, the efficiency of labor, production processes, marketing, and sales is paramount to a successful and sustainable enterprise. The concepts apply as well to non-profit organizations as they do to profit-making business, and equally well to education and government. Because the interactions in service are more complicated, the initial success of a particular service within a specific application domain engenders an increased demand that leads to additional service provisioning and also a larger client population.

Service economy and economics are related terms concerned with the value proposition of a service and how it is provisioned and consumed. Service economy is the study of the nature of services that underpin the activities of persons, organizational entities, institutions, governments, and nations. It is based on derived value that enables one entity to be more successful as a service provider than another. Service economics is the study of the interactions of service entities that essentially constitute a service experience. Service economy operates at the general level, and service economics operates at the detailed level. A service economy is concerned with how a service is formulated through a life cycle of commitment, production, availability, delivery, analysis, and termination. Most services adhere to this life cycle. The service interaction in service economics incorporates activities, primarily based on the client, that include service acquisition, invocation, execution, and service termination. These topics will be expanded upon in subsequent pages.

Learning and Applying Service Concepts

It is important to recognize that service is a science, as is chemistry or biology, in the sense that knowledge of the subject matter increases the ability to provide and consume service. [Jevons 1880] There is a body of knowledge supporting the subject of service science together with characteristic problems and a wealth of appropriate solutions. The mistake that people make about the subject matter is that they think they can learn all they need to know about service without studying it, because a good service process or product is often viewed as an end result, rather than a process. It is commonly thought that all that is needed is the desire and the wherewithal to execute the service and somehow the results will be commensurate with the perceived needs. The key point is that people do not become familiar with a subject until the underlying principles have been exposed. The nature of service should be considered when any political, financial, or business question arises. Service systems are socially constructed forms of interaction wherein entities exchange beneficial forms of action through the combination of people and technologies that adapt to the changing level of information in the system. Thus, service is a social reality constructed through a dynamic process replicated and maintained by social interactions within a service and between services.

Service economics deals with the value derived from services, how that value is derived, and how it can be enhanced by modern technology. Certainly, wealth derived from service provisioning is an important consideration in the availability of service, but there are other non-monetary benefits to be derived from service, such as success, happiness, and opportunity.

STRUCTURAL DYNAMICS OF SERVICE

Most services adapt a common structure that essentially determines how the provider and client interact in order to execute a service process. Ordinarily, the total service process incorporates several well-known steps that constitute what is commonly regarded as the service: service acquisition, service invocation, service execution, and service termination. Clearly, this is a provider view of service. The prevailing opinion is that the client is involved as a secondary participant. However, what would occur if there were no clients? Without clients, a doctor is a person with an MD degree, and a bricklayer is someone that knows how to position bricks or similar objects. Thus, a client provides a service to the provider by engaging in the service process as being a receiver of service. The concept is that there is a certain duality in services, wherein the client depends on the provider and the provider depends on the client. We will refer to this phenomenon a service duality. Thus, the common practice of denoting the client as a secondary participant is not valid in the modern view of service execution. The provider and the client, in the most general sense regarding service, are on an equal footing.

Service Collective

In many instances, the provider and client are not singular but are groups. A group of service providers, known as a provider set, is a collection of service systems designed to support a particular endeavor in its respective domain, such as a university, medical group, or even a newspaper. Each element in the set provides a specific service to a client. Associated with the provider set is a client set composed of elements that functions in a complementary manner with provider set elements to instantiate a service event. A service is thereby an interaction between

an element from the provider set and an element from the client set, represented as a mapping between the sets. Accordingly, the collection of mappings is a service set. It follows that a service collective is a 3-tuple consisting of a provider set, a client set, and a service set, all of which can interact through an eclectic platform designed to sustain a unified service system. A unified service system is created when a client set is combined with the provider and service sets, and the inherent process is called unification.

Examples of service collectives are commonplace. A university, for example, provides services to students. The provider set would consist of administrative, student, and academic services. The students comprise the client set. Similarly, a newspaper consists of sections, such as sports news, national news, international news, financial news, and so forth. The readers of a publication are the clients. In both instances, not all clients use all of the services, and a single section of providers does not supply all of the services.

A service value chain is a progression of activities adopted to materialize a service. Not all service resources perform functions that are specifically evident in a provider/client interaction. In fact, there are three major stages in a service value chain: service commitment, service production, and service delivery. The three stages are collectively referred to as service provisioning. When practitioners refer to service, they normally intend the service delivery stage.

In many cases, the provider set operates as a connected service system that interacts through shared information to provide a service. Two forms are clearly distinguished: flow and interactive. In a flow system, information is passed between service providers in a sequential basis. Operationally adjacent providers are coupled to provide service delivery. Essentially, one provider performs the initial step in a service procedure; a second provider performs a second step; and so forth. In an interactive system, members of a collection of providers interact on a needs basis to execute a service. Thus, the provider set can be viewed as a partitioned set in which sections demonstrate coupling or cohesion.

Collaboration

In some instances, a set of service providers collaborates to execute a service. A primary service is the core service for which the provider and the client interact to produce demonstrable value. Accordingly, the key person, in a human instance, is the primary service provider, and in all but exceedingly simple cases, that person has helpers that provide secondary services. A secondary service is a service that ordinarily does not exist separately as a primary service and plays a supportive role to a core service. A doctor that supports a surgeon is functioning as a secondary service provider. It is important to note at this point that the name “secondary service provider” does not imply capability, but what is actually performed during the execution of a service process. The notion of a secondary service traditionally encompasses separate functions involved in the performance the core service process, existing in close physical and temporal proximity. A core service is dependent upon a secondary service, and the reverse is also true. The cohesion between core and secondary service processes is high. When this phenomenon occurs, the core and secondary service providers are regarded as collaborating in the service process. Examples of secondary services are numerous and have a substantial variation. Three

instances are the weigh in and blood pressure checks associated with a doctor's visit, the acceptance and delivery of garments at a dry cleaning establishment, and the routine support functions performed in support of an automobile mechanic. When two service providers are cooperating to perform a task, or set of tasks, but working independently as with a couple of masons building a structure, the concept of core and secondary service processes does not necessarily apply, since the cohesion of the two participants is low.

FUNDAMENTALS OF SERVICE ECONOMICS

Service economics is a subject that studies the nature of wealth generated by service. [Fawcett 1870] It is an important subject because the modern view of the service economy must be considered when any political, financial, or business question arises. People do not generally become familiar with a topic until its underlying principles have been identified. Service is largely a utilitarian discipline [Mill 1861], wherein a coherent set of underlying principles are not yet available, so that in everyday affairs, it is not prudent to defer analyzing the subject until those principles have been verified or confirmed. Every social question involves service, so that service economics would necessarily involve the following endeavors: production, exchange, distribution, and commerce. Another consideration is that the focus of economics has changed from land, labor, and capital to participants, knowledge, and capital. Capital is an important component, but not a defining characteristic, and necessarily encompasses wages and infrastructure.

Wealth and Service Value

Wealth is an important part of the end result of any commercial activity. Like service, wealth is a term with a many different meanings. In business, wealth refers to money and things that have exchangeable value. In government, wealth refers to the capability of having commercial and political power using money as a facilitator. In education, wealth is usually reflected in facilities and instruction. A wealthy country would have more exports than imports resulting in an importation of money, using the precise form of money available at the time. Mill [Mill 1885] wrote that the wealth of a country is dependent on the skill that its labor is employed, and Smith [Smith 1776] remarked that labor is the basis of all production. Thus an increase of wealth is not only an increase in money, but it is the potential for providing service. Early political economists considered wealth as anything with exchange value. [Fawcett 1870] However, many things with useful purpose, such as the air and sunlight, are not wealth unless modified by human intervention. Money, as a public instrument, is solely a measure of value and a medium of exchange. A wealthy person or organization has a large collection of desirable or necessary items, or the means of obtaining them, provided that they are not provided by nature without some form of labor. Another consideration is that wealth is increased by producing where and by whom it is produced most expeditiously. [Ricardo 1817]

Although service can and does involve products, it is not a material product of nature, so that service wealth, in its most basic form, is useful activity that produces value through human involvement. Service wealth lies in the potential for providing service, so that service-provisioning agents are the basis of all service. Clearly, humans, products, and informational

resources can provide service. Thus, value is established by an exchange of service through a provider-client relationship. Service is usually associated with business, where value is produced through the manipulation of goods, capital, people, and events. Thus, service is a refinement of the business process.

A vertical is used to establish the value of service, consisting of value, price, and cost. The difference between cost and price yields the margin, and the difference between price and willingness to pay is the service value.

There is no explicit exchangeable value in service, per se, because you can't purchase someone else's service. A service is established at the point of instantiation and ends when the service is complete. The particular service under consideration is then finished. It no longer exists – only a record (or memory) of that service persists, along with tangible or intangible results, as determined by the specific incident. Separate from the actual service process, the facility of obtaining service, in the general view of society, can be scheduled, rescheduled, unscheduled, transferred, and purchased. The access to service is transferable, but the actual performance of service is not. Moreover, it is possible to purchase the ability to obtain a service, and it is possible to pay for actually receiving a service by the client or a client's advocate.

A clarification is in order. One might view the purchase of an airline seat or of an automobile, as a product that can provide a service, as something of exchangeable value. The purchase of a seat or an automobile is an entity capable of providing or sustaining a service is a service facilitator, but it is not a service per se. A service is the execution, or more properly the instantiation, of a process that provides the service, as in the airline or automobile form of transportation.

On the other hand, there must be some explicit value in service, since it serves as the basis of the modern economic system. Thus, the wealth inherent in service results from the co-creation of value. The execution of a service yields two or more distinct values: the act of performing or receiving the service and the result of having the service process performed. Accordingly, a service value can have two related components: commercial value and personal value. The result may be tangible or intangible, as covered previously. During the act of performing a service, it is useful to recognize two things: the provisioning dimension and the "receiving" dimension, to which we can add the service object dimension that may coincide with the receiving dimension.

When a service provider executes a service, including auxiliary and supplementary services, it is done for an economic value – salary, a fee, or another form of compensation. When a service client receives a service, it is often the case that a personal value is obtained – a state that is inconvenient or impossible to achieve independently.

The reasons are clearly evident, since most services result from one or more of the following circumstances: (1) Something you can't do; (2) Something you don't want to do; and (3) The opportunity cost of the client performing the service. There are, of course, two points of view: that of the element of the provider set and the element of the client set. From the provider's

perspective, the service value lies in the performance of the service process, and from the client's perspective, the service value results from the end state after the service is performed.

The Domain of Service

It is clearly obvious that the work of a professional entity is a service. Retailing is a service by changing the ownership property of an item within its domain. Employees of an organization provide a service, as does the mayor of a city or governor of a state. Federal, state, and local governments provide a service to their constituents. Police and fire departments provide a service. The religious clergy provides a service. Educators and parents provide a service. Products provide tangible and intangible services. Most forms of commercial and social activity involve service of some sort. Yet, we, as a society, actually know very little about service; we can elicit no principles of good service behavior, and very little evidence of best practices – in spite of the fact that at least 80% of persons are engaged in service – through commercial or social activity.

Service Structuralism

The thesis of service structuralism concerns the concept that what really matters about service is not the concrete elements of provider, client, and object, but rather the manner in which the elements relate to each other. Thus, a service system is a collection of abstract objects with relations on how the objects interact to each other, so that a structure is an abstract form of a system. Only when concrete objects are abstracted from the service system can principles of behavior be developed.

A property is an attribute or characteristic of a service element. There are two forms of study: conceptualism and realism. In the former case, properties exist but are dependent upon the mind. In the latter case, properties exist independently of the mind. We are concerned with realism for the development of principles that govern service. Again, there are two forms. With in rebus realism, a property exists only if it has instances. With ante rem realism, a property can exist if it has no instances. This paper takes the ante rem view of service economics. To sum up, what we are concerned with in service economics is not the characteristics of the provider, client, and service event, but the relationship between the various constituent elements.

Service Requisites

Service economy is a discipline that investigates the operational conventions that govern the production, exchange, and distribution of value resulting from the execution of service process, service event, or use of a service artifact. Value is a demonstrable result of the application of the operational conventions.

The value of a service essentially incorporates three entities: the service provider, the service customer, and the service object. The important element, as least at this point, is the junction where the three entities interact. Recall that the customer is typically more concerned with the result than the service process. The service provider is more concerned with the service process,

because if the service is performed correctly, then the result will be satisfactory. The service object is independent of the service process, unless it coincides with the customer.

The basis of classical economics stems from the writings of Smith (op cit.) and Mill (op cit.) and is recorded in the publication of Fawcett (op cit.), and is synthesized from the coordination of land, labor, and capital, serving as the input to production. Within a background of classical economics, the tenets of service provisioning are specialization, division of labor, and comparative advantage. A client arranges for service with a specific provider to obtain the knowledge and experience in a particular domain. The service process is designed to utilize the notion of service itself – the division of labor – to enhance efficiency and achieve quality of the service experience. Comparative advantage results from the practice of employing a service provider with the most prudent infrastructure to achieve the highest quality results from the service process.

The basic tenets of service model those of classical production that have stood the test of time. Specialization allows the service producer to take advantage of existing abilities. [Fawcett *op cit.*] Division of labor allows specialization to be applied where it is most applicable, and comparative advantage permits outsourcing to be employed to provide service efficacy. The three basic tenets expedite large-scale provisioning, yielding a better quality of service and efficient operations.

The Role of Comparative Advantage in Service

A familiar topic in economics is comparative advantage, wherein the term refers to the ability of a nation to produce a good or service at a lower opportunity cost than another nation. In this instance, opportunity cost reflects the use of resources that could be used to produce a good or service that would yield a greater reward. The concept of comparative advantage was formulated in a 1817 book by David Ricardo entitled *The Principles of Political Economy and Taxation.* [Ricardo *op cit.*] In the modern view of things, comparative advantage is commonly achieved through outsourcing in which a non-core business operation is transferred to another organization to reduce costs. Service outsourcing and offshoring is particularly appealing to modern business because many services can be digitized thereby facilitating inter-country operations.

Focus of Service Economics

The view of service economics was described earlier as being focused on the participants, knowledge, and capital. The participants in a generic view of service are the provider and the client sets that result in the notions of collaboration and duality. Technological, organizational, and human elements are traditionally combined to create service.

Knowledge, as in the case of professional endeavors, and capability, as in the case of manual procedures, are paramount to service. Knowledge and capability supersede specialization, provide the basis for division of labor, and often constitute the requirement for outsourcing.

Capital takes on its traditional value, as the part of wealth that is advanced to establish infrastructure, stock, and supplies and to cover wages until service renders a return on investment. Owners of capital will ordinarily appropriate funds unless they are rewarded with a share of the value generated by service – referred to as the profits of capital. It has three component: interest on the money expended, compensation for risk, and the variability of the service domain. If the profits of the capital investment are not greater than the interest on the funds, for example, then clearly the investment would not be made – unless special considerations apply.

Participants, knowledge, and capital are the forerunners of further work on service economics.

SUMMARY

It is generally recognized that service is a provider/client collaboration that creates and captures value for both participants. Both entities contribute in the interchange and both benefit, even though the sense of participation is diverse and varies between different forms of service execution. An example is the relationship between a doctor and patient that relies on the participation of both persons, since both entities are required in order for the service to be instantiated. Moreover, a doctor's service varies between patients and yields different results, depending on the situation. This characteristic is typical of most service. The entity supplying the service is known as the service provider and the entity receiving the service is known as the service client. The domain of service providers includes individuals, teams, products, electronic systems, groups, and ad hoc units organized to execute a particular service delivery scenario. Similarly, service clients include persons, groups, social organizations, governments, and commercial entities. In some cases, the object receiving the service is the responsibility of the client, as in cleaning and repair services. In this instance, the entity receiving the service is known as the service object.

Most commercial and social activity involves service, yet very little is known about the subject. This paper covers the structure and operation of services, as well as a lifecycle of service processes. The relationship between service and traditional economics is explored as a basis for the study of service economics.

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A WAY TO PREDICT MARKETING STAFF TURNOVER IN QUICK SERVICE RESTAURANTS

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ABSTRACT

The restaurant and accommodation industry capitalizes on serving two basic human needs by providing safe food and safe shelter and operates at the forefront of the service industry. Employees are critical members of the service industry where the quality of employee-customer interaction determines overall customer satisfaction. Employees possess the capacity for empathy, the ability to recognize and respond to varying customers' needs. Therefore, the trend towards replacing employees with automation and self-service technology has apparent limitations. The future of customer service and satisfaction will be defined by a currently unquantified balance of technology and the number of employees per business units. The quality of management is one of the primary reasons employees quit their employers. Managerial practices define organizational culture and affect all internal motivators of employees' turnover including: salary, recognition and reward; professional development, and the perception of work conditions. Therefore, soft skills are important for hiring professionals to understand and master. With few exceptions, the turnover rates in quick service restaurants, (QSR), are above 150 percent and continue to increase in 2018 (Lazzari, 2018). According to Lazzari (2018) the persistently low wage in QSR, the trend towards replacing people with self-serve technologies, and the natural turnover of employees who seek upward mobility in other business sectors combine to promote a challenging labor environment for QSR operators. Those operators need to deploy the soft skills related to turnover rate in order to reduce turnover rate. This study is directed toward identifying those soft skills that are associated with higher and lower turnover rate.

INTRODUCTION

Although the overall unemployment rate remains low within the U.S. staff turnover rate remains a challenge within the restaurant industry. Ruggless (2018) reported the U.S. unemployment rate at approximately 3.9 percent yet, 46 percent of surveyed restaurant operators reported increased employee turnover rates. According to Ruggless, employers continue to focus on the following employee motivators; wages, promotion, training and orientation practices, educational programs and tuition reimbursement; and harassment policies in the effort to create employee satisfaction and promote retention.

Restaurants are high employee-customer contact marketing environments and service-oriented therefore, there are inherent limitations to the trend of moving service activities away from the employees and into the customers' responsibilities. Lovelock and Young (1979) argued that inefficient customers will create bottle-necks in service lines and might negatively impact overall customer satisfaction within the service industry. Restaurant operators are using technology, self-serve kiosks, smartphone apps, and internet-based ordering to shift the service responsibility away from employees and into the customer realm of responsibilities, however, consumers cannot be held to account or managed when a structural breakdown occurs, and throughput is

negatively affected. Some turnover related factor such as overall economic environment are externalities that restaurant operators must contend with in their efforts to give employees reasons to remain in their organizations (Gartenstein, n.d.). Hinkin and Tracey (2000) argued that the primary reasons employees quit their employers are poor supervision, dissatisfaction with the work environment, and insufficient compensation.

Employees satisfy a critical service function in the operations of restaurants and managers and operators jeopardize the long-term economic health of their enterprise when they abdicate control of their production capability and capacity. Improving employee retention and developing a capable and competent workforce that is supplemented by customer-managed technology is possibly the best solution to achieving and maintaining customer satisfaction and control of the production capability of the business. Improving managerial practices is the most important step to improve employee retention (Hinkin & Tracey, 2000).

According to Robles (2015), interpersonal relationship skills including, integrity and communication; courtesy, and responsibility are extremely important in leadership perceptions of important workplace soft skills. Hiring managers use three broad categories to assess suitability and organizational best fit during selection processes. The categories of assessment are knowledge, skill, and attitude, (KSA). Knowledge and skill have static measures such as level of education and job-related experience, while attitudes, soft skills, are less defined and measurable, yet possibly the most important in influencing job satisfaction and turnover rates. The discussion about the attitudes and motivations of managers in an interpersonal relationship is the discussion about the importance of emotional intelligence (EI).

EI describes the set of teachable skills that might determine QSR managers' competence in influencing employees' perception of job satisfaction. Therefore, it is important for HR practitioners to understand the quantitative roles of EI in employee turnover rates in QSR. HR practices are the core factors that firms use to define internal skills, attitudes, behaviors, achieve organizational goals (Chen & Huang, 2009); and establish an organizational culture. Organizational culture includes the beliefs and people practices within organizations, and they affect employees' perception of personal well-being (Bolden-Barrett, n.d.) and turnover intention. Some core factors impacting high employee turnover rates in QSR include low salary, poor management, insufficient recognition and reward programs, unsatisfactory advancement opportunities, and dissatisfaction with working conditions (McQuerrey, n.d.).

METHOD

The current study replicates Burke and Latta (2016), a small-scale correlation study of the effect that managers' emotional intelligence (EI) sub-scale factors might have on the turnover rates of employees in quick service restaurants, (QSR). That research posited that soft-skills factors are measurable using Internet-based self-assessment tools like the EQ-i 2.0. A pilot internet survey was done among workers in a franchise company of a national quick-service restaurant chain using the 1-5-15 factor structure to measure EI. The measures of the EQ-i 2.0 produced one universal EI score, five composite scales scores, and 15 subscale scores. The current study replicates using the EQ-I 2.0 but utilizes step-wise regression to identify predictors of high and low turnover rate in an exploratory fashion.

The universal EI score is referred to as Total EI. Total EI is a composite of the subscales Self-perception, Self-expression, Interpersonal, Decision-making, and Stress management. The subscales are in turn composites of subscale factors. The subscales are presented on the left below and the related subscale factors are on the right:

- Self-Perception –self-regard, self-actualization, and emotional self-awareness
- Self-Expression –emotional expression, assertiveness, and independence
- Interpersonal –interpersonal relationships, empathy, social responsibility
- Decision making – problem-solving, reality testing, and impulse control
- Stress management –flexibility, stress tolerance, and optimism

The EI measures used in this research included the validated scales noted above and the definitions provided below that were also used in Burke and Latta (2016).

Turnover and Turnover Rate: Turnover is defined by the U.S. Department of Labor (n.d.), as, "Separation of an employee from an establishment (voluntary, involuntary, or other)" Turnover Rate represents, "The number of total separations during a month divided by the number of employees who worked during or received pay for the pay period that includes the 12th of the month (monthly turnover); the number of total separations for the year divided by average monthly employment for the year (annual turnover)" (U.S. Department of Labor, n.d.).

The current survey involved a self-administered Internet survey to evaluate the EI of 20 QSR of marketing managers at Brand "X" company. Brand "X" in the Southeastern United States. The target population for the current study was QSR managers from brand "X" franchise organization. The senior unit manager from each restaurant participated in the study. The goal of the survey was to identify potential predictors of Turnover Rate. As such, it was an exploratory study with a small sample of unit marketing managers (n=20) and replicates the study by Burke and Latta (2016).

ANALYSIS AND RESULTS

An initial regression analysis was completed using Turnover Rate as the dependent variable, and Total EI as the independent variable. As in the Burke and Latta study, the relationship was not significant. A stepwise multiple regression using Turnover Rate as the dependent variable, and the subscales measuring Emotional Intelligence, Self-Perception, Self-Expression, Interpersonal, Stress Management, Decision Making, and Happiness as independent variables was completed. None of these multiple component scales yielded significant models and resulted in no multiple component scale variables being entered into the regression equation.

To further explore individual measures and their relationship to Turnover Rate, a stepwise multiple regression analysis was completed using 15 individual subscale factors plus the score for Happiness, a measure of overall well-being which is also produced by the EQ-i 2.0 self-assessment instrument as independent variables with Turnover Rate as the dependent variable.

These 15 subscale factors and Happiness are listed below:

1. Self-Regard
2. Self-Actualization
3. Self- Awareness
4. Emotional Expression
5. Assertiveness
6. Independence
7. Interpersonal Relations
8. Empathy
9. Social Responsibility
10. Problem Solving
11. Reality testing
12. Impulse Control
13. Flexibility
14. Stress Tolerance
15. Optimism
16. Happiness

The analysis summary below shows a significant two-predictor model which includes Social Responsibility and Self-Regard measures.

The analysis of variance, coefficients, and the regression equation are below.

ANALYSIS OF VARIANCE

Source	SS	df	MS	F	p
Regression	80813.5	2	40406.8	14.9	.000
Residual	46245.4	17	2720.3		
Total	127059.0	19			

COEFFICIENTS

Coefficient	Unstandardized Beta	Standardized Beta	t	p
Constant	353.28	0.0	3.26	.005
Social Responsibility	-5.54	-1.013	-5.45	.000
Self-Regard	4.30	.661	3.55	.002

REGRESSION EQUATION

The Regression Equation is:
Turnover Rate = [-1.013 * Social Responsibility] + [.661 * Self-Regard] + Error

ANALYTIC LIMICATIONS

The R-Square for the two variable model is .636. When adjusted for the number of independent variables, the Adjusted R-Square is .593, still relatively robust. However, the Standard Error of the Estimate is 52.2 indicating the model is not highly accurate but may be useful.

DISCUSSION

The small sample size is one limitation of this study. Similar to Burke and Latta (2016) the current study included no controls for possible moderating variables such as organizational culture, participants' gender, the level of education, and physical work environments. Also, the use of online self-assessment instruments to collect Self-Perception and other EI data may include participant biases. Finally, the use of a correlational design is ideal for exploring relationships between variables and allows for regression analysis; however, the regression model does not guarantee causation (Singleton & Strait, 2010).

These results indicate that as Social Responsibility increases Turnover Rate decreases and as Self-Regard increases Turnover Rate increases. Fortunately, these variables represent skills that can be taught. Providing training in and emphasizing Social Responsibility throughout an organization while also providing training in how to reduce employees projecting High Self-Regard may reduce turnover in an organization in an industry with very high turnover rates. Finally, Maul (2012) argued that the ability to examine the subscale measures of the EI construct is important because the total EI measure is comprised of composite and subscale skills which are independent skill-sets. Maul also noted that these skill-sets are teachable. Even with the limitations cited above, identifying Social Responsibility and Self-Regard as skills as having significant relationships with turnover rate provides an important insight. Training employees through the QSR organization in these soft-skills may not only improve employee retention, but may also improve customer satisfaction and organizational culture.

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ACADEMIC PSYCHOLOGICAL CAPITAL, GPA, AND RETENTION

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ABSTRACT

Psychological Capital (PsyCap) is defined as "An individual's positive psychological state of development that is characterized by: (1) having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (optimism) about succeeding now and in the future; (3) persevering towards goals and, when necessary, redirecting paths to goals (hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (resiliency) to attain success" (Luthans, Youssef, & Avolio, 2007, p. 3). PsyCap, rooted in positive organizational behavior, is "the study and application of positively oriented human resource strengths and psychological capacities that can be measured, developed, and effectively managed for performance improvement in today's workplace" (Luthans, 2002, p. 59). Academic PsyCap, as referred to in this research study, is the psychological capital of college students and their perception of learning. Given that PsyCap can be developed, this is an important construct for academic institutions and human resource professionals to explore for both student success, institutional success, and for the caliber of students graduating into the external workforce.

This study examines the Academic PsyCap of incoming freshmen college students to a liberal arts college using multiple student characteristics. The long term goal is to better understand the psychological states of freshmen students, how they are related, and how this impacts GPA and retention. The study will aid higher education administration and human resource professionals in recruitment and retention of students. Additionally, it is important to examine Academic PsyCap among college students, as this is a developmental opportunity prior to entry into the workforce.

All incoming freshmen at a small liberal arts institution in the Southeast Region of the United States were invited to complete the 24 question PsyCap Questionnaire (PCQ) and the 10 question Perceived Stress Scale as a scheduled event during freshmen orientation. Two cohorts of students (academic years 2016-2017 and 2017-2018) have completed the survey with a total of 884 surveys completed.

This study explores multiple relationships:

1. Potential relationships between Academic PsyCap and multiple student variables (athlete/non-athlete, residential/non-resident, honors/conditionally admitted, male/female, LGBT affiliation, GPA, P-GPA, in-state/out of state, minority, and student involvement).
2. Potential relationships of multiple student variables (Academic PsyCap, athlete/non-athlete, residential/non-resident, male/female, LGBT affiliation, in-state/out of state, minority, and student involvement) on GPA.
3. Potential relationships of multiple student variables (Academic PsyCap, athlete/non-athlete, residential/non-resident, male/female, LGBT affiliation, GPA, in-state/out of state, minority, and student involvement) on student retention.

Relationships have been identified between student variables, GPA, and retention of college students with Academic PsyCap. Academic PsyCap significantly varies between multiple student variables. Positive significant relationships have also been identified between Academic PsyCap and GPA. Additionally, analysis indicates a positive significant relationship between Academic PsyCap, individual questions on the PCQ, and student retention.

Keywords: academic psychological capital, student retention, GPA, student demographics, hope, self-efficacy, optimism, resilience

Advanced Intelligence: New Academic Insights, Regulation, and Existential Risk – A Discussion

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Webster University

Abstract

This presentation concerns one of the most influential subjects in the current decade, Artificial Intelligence. However, current developments appear to be deja vecu ("the feeling of having already lived through something") all over again. Industry leaders have flatly stated that they thought implementation of artificial intelligence dominated systems would eliminate humanity and the way of life that we all experience. For the record, a definition of artificial intelligence randomly obtained through the Internet defines "artificial intelligence as the theory and development of computer systems able to perform tasks that normally require human intelligence such as visual perception, speech recognition, decision-making and translation between languages." The presentation will begin with a short 10-minute presentation on the dimensions of artificial intelligence and the introduction of two new approaches – namely "random learning" and Biocentrism – to the development of AI systems. We are going to propose the new world should be named *Advanced Intelligence*, since they would appear to be something more than a duplication of human thinking. A collection of interesting topics will be presented and the audience will be engaged in giving their opinion on the various subjects. Most large companies are currently concentrating on basic research in the area of artificial intelligence to aid in the development of products and to make sure that competitors will not get a head start on the technology. The notion of a paper that encourages a discussion by the audience is a relatively new concept and is a technique applicable to small conferences.

An Examination of Blockchain's Utility for Healthcare

Abstract

The underlying technology that powers Bitcoin, the blockchain, has been discussed across a variety of disciplines. The promise of being able to securely and privately store and view every transaction from a system's origin has numerous proof of concept and prototype applications. This research in progress examines the applications of the blockchain and frames the discussion within the context of healthcare information systems.

Keywords (Required)

Blockchain, healthcare, HIT

Introduction

The Healthcare Information Portability and Accountability Act (HIPAA) of 1996 made it so healthcare organizations are accountable for the privacy and security of healthcare data (United States Government, 1996). HIPAA also puts forward requires for unique identifiers for healthcare providers. More specifically, HIPAA's privacy rule sets forward specifications of what constitutes protected health information and how it is to be shared between entities, while HIPAA's security rule sets forward safeguards for protected health information. These regulations that went into effect in 2003 caused a shift in the way that healthcare organizations handled patient data. To build on the regulatory efforts in the healthcare space in the United States, the Patient Protection and Affordable Care Act of 2010 specified that healthcare entities must transition to electronic healthcare records by 2013 (Patient Protection and Affordable Care Act, 2010).

In a separate domain in 2008, the cryptocurrency Bitcoin introduced the technology of blockchain (Nakamoto, 2008). Nakamoto specified the blockchain technology as a sequence of cryptographically secured 'blocks' in which a public ledger of transactions could be stored. Blockchain utilizes a cryptographic public key that lets users in the network write to append-only 'blocks.' Transactions, in the Bitcoin context, are stored by a 'Proof of Work' function that ensures that all users are in consensus of the peer-to-peer distributed blocks. The Bitcoin network can securely transmit these blocks in a chain, while also retaining the privacy of the holder of the public cryptographic key.

This has created an opportunity in the healthcare space: how can the blockchain technology be leveraged to privately and securely store healthcare information? This research examines the current state of the art of blockchain applications in healthcare. Because of nascence nature of the blockchain technology, this research is positioned as ongoing.

Blockchain: An Introduction to the Technology

Blockchain is a decentralized, peer-to-peer data management scheme. Blockchain is effectively a peer-to-peer, distributed database without a central administration. Peers in the network have a public address to which other peers can transmit data. When a transaction is initiated, the network of peers cryptographically validates the block. Included in this transaction is a cryptographic hash to keep track of this transaction in the network. This cryptographic hash is created from the hash of the preceding block, which creates a secure linkage of transactions while preventing malicious changes to the ledger.

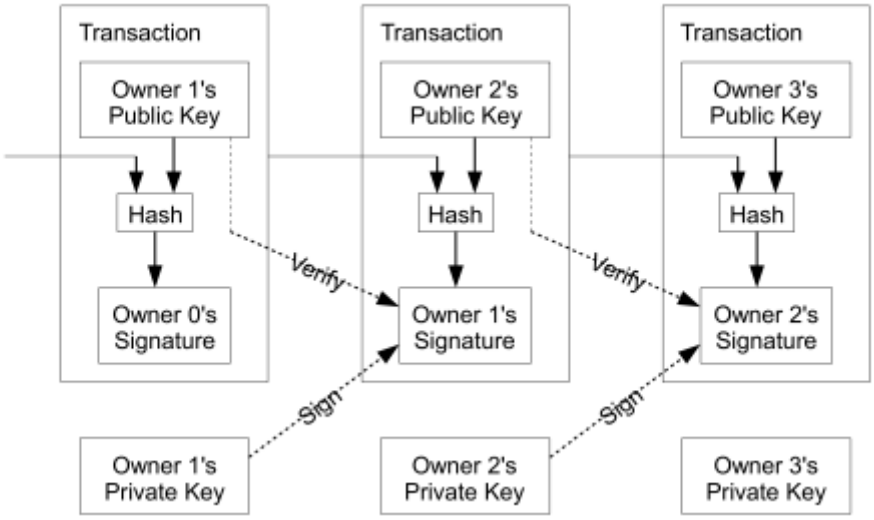

Figure 1. Nakamoto's Graphical Representation of Blockchaining.

(Nakamoto, 2008)

The blockchain solves a problem with traditional payment processors by removing the need of an intermediary payment processor. Where the traditional model requires verification of the user's funds from a third party, the peer-to-peer network of the blockchain network itself verifies the transaction.

Examining Blockchain and Healthcare

While the blockchain technology is still very new, researchers are working to build prototypes and use cases for healthcare (Angraal, Krumholz, & Schulz, 2017). This research examines these efforts and puts together an ongoing review of the literature and uses cases for blockchain in healthcare.

Securing healthcare records is of paramount importance to healthcare providers. One such system that looks to use the blockchain to secure healthcare records is the work of Yue et al on their project called 'Healthcare Data Gateway (Yue, Wang, Jin, Li, & Jiang, 2016).' Healthcare Data Gateway (HDG) provides a prototype example of how the blockchain can be used for patients to create a public key around their records, and then control and share their data securely without violating the HIPAA privacy requirements.

By a similar concept, Ekblaw et al. created a system known as MedRec, that: "gives patients a comprehensive, immutable log and easy access to their medical information across providers and treatment sites (Ekblaw, Azaria, Halamka, & Lippman, 2016)." Ekblaw et al.'s approach adopts the Bitcoin mining model however, by rewarding participants in the network with aggregate and anonymized data. In another prototype paper, Dubovitskaya et al. put forward a framework on managing and sharing electronic medical record data for cancer patient care, while also providing a prototype and demonstrating the prototype in conjunction with a medical school (Dubovitskaya, Xu, Ryu, Schumacher, & Wang, 2017). The overarching theme across each of these prototypes is that the data can remain private, but also accessible for analyses. This kind of access to patient level data can then enable big data analytics for better prediction of chronic, costly, or dangerous conditions (Chen, Chiang, & Storey, 2012; Powers, Meyer, Roebuck, & Vaziri, 2012; Soni, 2011).

Zhanga et al. present an architecture for incorporating the Health Level 7 (HL7) interoperational standards into a blockchain based system and effectively defined a protocol by which blockchain can interoperate across multiple organizations since it conforms to HL7 (Zhanga, Whitea, Schmidta, Lenzb, & Rosenbloomc, 2018). Broderson et al. providers a similar analysis of how the blockchain can improve healthcare record interoperability by showing the efficacy of blockchain at-scale (Brodersen et al., 2016). With this kind of prototype, healthcare organizations can begin to look at cloud solutions as a cost reduction mechanism while also conforming to all of the legal requirements of HIPAA.

Following the need for securely storing records, Peterson et al. present a blockchain-based approach for health information exchange networks that is resistant to cyber attacks while mainlining consistency and fidelity of the data (Peterson, Deeduvanu, Kanjamala, & Boles, 2016). Another challenge with sharing PHI and health records takes the form of the plethora of available cloud solutions, but these solutions violate HIPAA's minimum necessary information requirement; Xia et al. present a prototype cloud environment that allows only network verified users access to the records (Xia, Sifah, Smahi, Amofa, & Zhang, 2017). This cloud prototype goes by the acronym BBDS, for blockchain-based data sharing.

The next domain that is examined in the literature is that of claims processing. Kuo et al. present an argument that the very nature of blockchain lends itself to improving the speed and performance of healthcare claims processing, since the original concept was meant to be a transactional ledger (Kuo, Kim, & Ohno-Machado, 2017).

Hoy points out that the blockchain has the potential to verify pharmaceutical supply chains (Hoy, 2017). Hoy examines the potential of the blockchain across multiple aspects of healthcare including that of medical publications, by positing that the public key generated in a blockchain would let medical researchers track the authorship of new methods of treatment and interventions.

Problem Domain	**Blockchain Application**
Security of EMR/EHR	Healthcare Data Gateway MedRec BBDS Peterson et al, 2016
Privacy of EMR/EHR	MedRec BBDS FHIRChain
Transmission and Interoperability	FHIRChain Dubovitskaya et al., 2017 Brodersen et al. 2016
Claims Processing	Kuo et al, 2017
Pharamcy and Supply Chain Management	Hoy, 2017

Table 1. Applications and related research.

From the efforts conducted so far in examining the literature and prototypes of blockchain, what is revealed is that the plurality effort is focused on security and privacy of electronic medical and health records.

Next Steps

While the blockchain technology for cryptocurrency is nearly a decade old, researchers are discovering new use cases for the file structure every day. This examination is not meant to be a comprehensive literature review of the use cases of the blockchain technology, but rather an abductive approach to show there is an emergent technology that can address the perennial challenge of securing patient data. The next steps of this examination are to extend this research into a comprehensive gap analysis of current security and privacy issues in healthcare and conduct a Cochrane systematic review of medical, healthcare, and business literature of the use cases of blockchain. The result of this research will be a synthesis of the problem domain of privacy and security in healthcare, and blockchain as the solution domain.

Conclusion

This research has examined some of the prototype use cases of the blockchain within healthcare. This research has identified that the blockchain has prototypes existing for improving: electronic medical record sharing, data sharing and interoperations, cloud utilization, security, claims processing and handling, and pharmacy verification.

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An Examination of the Drivers of Future Civic Engagement Behavioral Intention: Proposition Development

Introduction

This study will validate a research stream that used a regional student sample (Nicholls 2012a, 2012b; Nicholls et al, 2016). The research would use behavioral reasoning theory to address the following research questions. Do "reasons" for participation in, and experience with civic engagement or volunteering activities drive future civic behavioral intentions? If so, which "reasons?" This paper is paired with Nicholls and Mezra also at this conference to determine which construct the Satisfaction or the Volunteer Function index will perform as a better predictor of Volunteering.

"Reasons" will be operationalized though measuring satisfaction with prior service experiences. The study also addresses post civic engagement experiences (volunteering or donations). Other research questions include "How does the prior experience influence the feedback loop from the behavior/experience to 'reasons' (satisfaction) in the driver model?" Do reasons drive attitudes toward helping others (AHO)? Additionally, what are the underlying segments describe those who participate in civic engagement. This research contributes to the fields of civic engagement, voluntary action, and nonprofit marketing.

This project will advance a deeper understanding of civic behavioral intentions, volunteering and service outcomes, nonprofit marketing implications, and drivers of voluntary action and behaviors that impact civil society. The results will identify if the motives (reasons) for civic engagement behavioral intentions (CEBIs) are more me- or other-directed and will identify what impact the experience itself has on "reasons" as drivers of CEBIs.

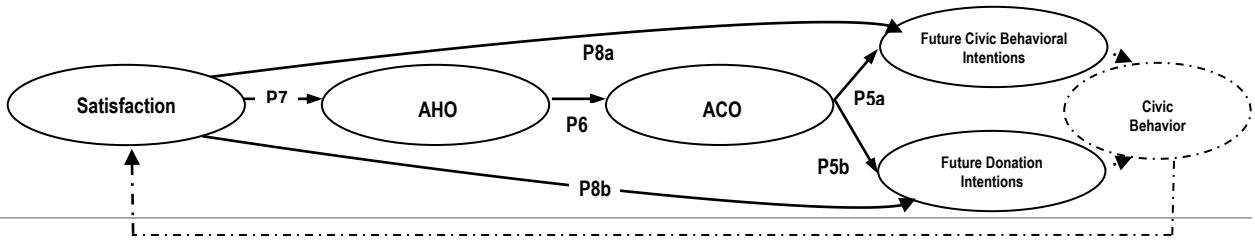
Conceptual Framework

In BRT research, attitudes directly predict behavior and behavioral intentions (Ajzen, 2008; Webb, Green, & Brashear, 2000; Westaby, 2005a, 2005b, 2006). Second, as has been

demonstrated in several studies by Westaby (2005a, 2005b, 2006), attitudes influence the relationship between "reasons" and behavioral intentions. Third, "reasons" has two components; "reasons" for and "reasons" against a behavior (Westaby, 2006) and has been empirically explored by Westaby (2005a, 2005b) and Briggs, et al. (2010) and shown to directly and positively influence attitudes and behaviors directly. Last, "reasons" are examined that directly and positively influence behaviors and behavioral intentions (e.g., Costa-Font, et al., 2008; Lee, et al., 2007; Wagner & Westaby, 2009) so, in Figure 1,

Figure 1 includes the role of post-experience "reasons" (feedback loop) or satisfaction to assess the role this construct has as a driver of civic behavioral intention and future donation intention. Satisfaction as "Reasons"—Consistent with Nicholls (2012a) and Nicholls & Schimmel (2016), reasons will also be operationalized as satisfaction. Satisfaction is a post-experience measure, and fulfills the requirements of the BRT definition of "reasons" (active or passive, context-specific, reasons for or reasons against) and incorporates a feedback loop from behavior→reasons, it is will be used as post-experience "reasons" and because satisfaction is part of the feedback loop and has been shown to influence attitudes and future behavioral intentions (Nicholls 2012a; Nicholls & Schimmel 2016; Oliver, 1980). Behavioral Intentions—Measures will include future civic engagement intentions and include volunteering and future donation intentions, (Stukas, et al., 2009).

Figure 2, Feedback Loop to Satisfaction as Reasons



Research proposition 1a attitudes toward civic organizations will be related to future donation intentions

Research proposition 1b attitudes toward civic organizations will be related to civic behavioral intentions

Research proposition 2 Attitudes toward helping others will be related to attitudes toward civic organizations

Research proposition 3 satisfaction will be related to the mediating variable attitudes toward helping others.

Research proposition 4a satisfaction will be related to the outcome variable civic behavioral intentions

Research proposition 4b satisfaction will be related to the outcome variables of future donation intentions

Analysis—In order to explain the drivers of future civic behavioral intentions, specifically future civic engagement behavioral intentions and future donation intentions, Partial Least Squares-Structural Equation Modeling (PLS-SEM) will be used (Hair, Ringle, & Sarstedt, 2011). The desire of these proposed studies is to simultaneously estimate the factor loadings of the measurement model and path coefficients of the structural model (Hair, Black, Babin, & Anderson, 2010). The key goals of this study are to predict target constructs (civic engagement behavioral intentions) and identify key "driver" constructs (motivations/reasons) for civic engagement behavioral intentions/donations. PLS also allows the modeling of the VFI as a higher order construct. Through the use of PLS, underlying segments based on the constructs will also be identified and profiled.

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AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

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1

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

Software quality can be measured based on two general categories.

How Well the Requirements are Programmed into the Software

- The number of "bugs" in the software.
- Programming defect count.

Customer Satisfaction

- The "look and feel" of the software.
- The "ease of use" of the software.
- Whether all desired requirements were included in the actual requirements.

The focus of this presentation is on "How well the requirements are programmed into the software" based on the methodology of the International Function Point Users Group (IFPUG).

2

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

One way to measure software programming quality is to express it as a metric, computing the ratio of defects found by testers at some (or various) point(s) in the software development life cycle to the amount of software produced. We do not determine the quality of software just by the defect count, per se. For example --

$$\frac{\text{50 defects}}{\text{“large” volume of software delivered}}$$

could represent better quality than

$$\frac{\text{40 defects}}{\text{“small” volume of software}}$$

Depending on how much “large” and “small” are.

3

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

To determine the numerator of the programming quality ratio, software testers "simply" count the number of programming defects found at some point in time in the software development life cycle. Suppose for this presentation we assume the number of defects found are at systems testing.

To determine the value for the denominator, we need a way to measure the size of software so that we can determine how large the software application is.

The size of software can be broken down into two categories.

Amount of Data Processing Capacity

The amount of flow and storage of data in the application.

The amount of "functionality."

Measured by "function points."

Amount of Other Types of Programming

The amount of "non-functionality."

Measured by the Software Non-functional Assessment Process ("SNAP points").

4

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

The size (or amount) of data processing capacity of an application, or the volume of the flow and storage of data in an application, can be defined as the amount of its functionality. One standard unit of functionality is the "function point." It is analogous to a "gallon" of gasoline, a "cord" of wood, or a "meter" of length.

Type of Functionality	FP Range
(External) Inputs	3 - 4 - 6
(External) Outputs	4 - 5 - 7
(External) Inquiries	3 - 4 - 6
Internal Logical Files	7 - 10 - 15
External Interface Files	5 - 7 - 10

5

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

To obtain the functional size of the software application, examine each input, each output, each inquiry, each internal data file, and each interface file. Using the IFPUG Counting Practices Manual rules, determine whether each is either "low," "average," or "high" and then assign its function point count to it. Then sum up all of the function point counts into a cumulative function point count for the application. Weight that by the effect of 15 complexity factors ("General Systems Characteristics") to calculate the final function point count.

RECAP

External Inputs	9
External Outputs	5
External Inquiries	3
Internal Logical Files	7
External Interface Files	5
Subtotal	29
GSCs	18
Value Adjustment Factor	(18* .01) + .65 = .83
Total Function Point Count	= 24

6

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

Further function point sizing information --

Table : Size categories & their equivalent function point size

Relative Size	Size Code	Function Point Size (IFPUG)
Extra-extra-small	XXS	=> 0 and <10
Extra-small	XS	=> 10 and <30
Small	S	=> 30 and <100
Medium1	M1	=> 100 and <300
Medium2	M2	=> 300 and <1000
Large	L	=> 1,000 and < 3,000
Extra-large	XL	=> 3,000 and < 9,000
Extra-extra-large	XXL	=> 9,000 and < 18,000
Extra-extra-extra-large	XXXL	=> 18,000

The vast majority of projects (>93%) fall into the Small to Large size range. That is, in the range =>30 to <3,000 function points).

Projects that produce fewer than 30 function points usually are incremental enhancement projects (note that corrective maintenance, ie. 'bug fixes', to make the product behave as advertised, deliver no change in the size of the functional requirements, of course).

Projects of over 3000 function points represent less than 3% of projects.

Extra-Large category projects that deliver between 3000 and 9000 function points usually take years rather than months and involve teams composed of tens or hundreds of software developers. Telephone billing systems, stock control applications and accounting packages may fall into this XL category.

Reference: copyright
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7

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

In 1992, IFPUG introduced a metric for software quality.* This metric was

$$\frac{\text{Number of Defects}}{\text{Project Function Points}}$$

For example, the first project below is considered of higher programming quality than the second because its defect ratio is lower.

$$\frac{100 \text{ Defects}}{500 \text{ Project Function Points}} = .2$$

$$\frac{50 \text{ Defects}}{100 \text{ Project Function Points}} = .5$$

**Function Points as Assets Reporting to Management*, 1992, IFPUG, 191 Clarksville Road, Princeton Junction, NJ 08550, USA, page 24.

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AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

Here are some defect statistics from Capers Jones © 2011.*

TOTAL SOFTWARE DEFECTS IN RANK ORDER

	Defect Origins	Defects per Function Point
1.	Data defects	2.50 *
2.	Code defects	1.75
3.	Test case defects	1.65 *
4.	Web site defects	1.40 *
5.	Design defects	1.25 **
6.	Requirement Defects	1.00 **
7.	Structural defects	0.70 **
8.	Document defects	0.60 **
9.	Bad-fix defects	0.40 **
10.	Requirement creep defects	0.30 **
11.	Security defects	0.25 **
12.	Architecture Defects	0.20 *
	TOTAL DEFECTS	12.00

* NOTE 1: Usually not measured due to lack of size metrics
** NOTE 2: Often omitted from defect measurements

 SWQUAL08\35

***Software Quality in 2011: A Survey of the State of the Art*, Caper Jones, Capers Jones and Associates, LLC, 2011,** http://semat.org/documents/20181/27952/software_quality_survey_2010.pdf/7cf00a73-c290-47fe-a5ff-4449ba32f65b

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AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

A technology change occurred in 2012 when IFPUG released a second metric, the Software Non-functional Assessment Process (SNAP), which measures the size of an application's non-functionality as its number of SNAP points. SNAP measures the size of 14 subcategories of non-functionality, each of which is given point counts similarly to function point counting.

Data Operations	Technical Environment
Data entry validations	Multiple platforms
Logical and mathematical operations	Database technology
Data formatting	Batch processes
Internal data movement	
Delivering added value to users by data configuration	
Interface Design	**Architecture**
User interface methods	Component based software
Help methods	Multiple input / output interfaces
Multiple input methods	
Multiple output methods	

The final sizing of an application considers both the functional and non-functional sizes – such as "400 function points and 300 SNAP points."

10

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

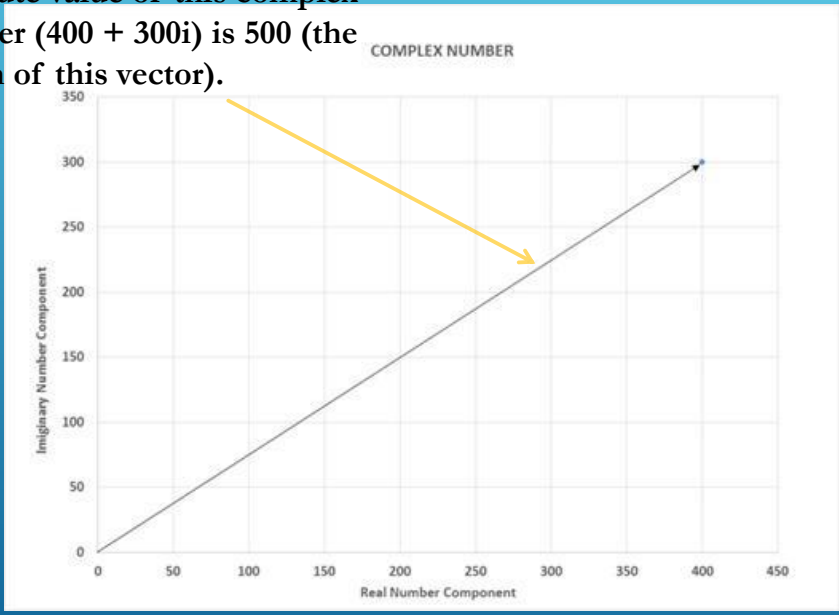
With the introduction of SNAP, an application now has independent size measures for its two components– functional (function points) and non-functional (SNAP points). Although this concept of two size measures introduces a technology improvement in software sizing, it also presents a challenge to software quality metrics – how does one normalize the number of defects when the denominator of the defect ratio metric (the size of software) measures two different things?

This problem turns out to be similar to portraying the absolute value of real and imaginary numbers, so that is the approach taken. Portray the function point count on the x-axis, and the SNAP count on the y-axis. The absolute value of the software size is computed using the Pythagorean Theorem.

11

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

Absolute value of this complex number (400 + 300i) is 500 (the length of this vector).



Similarly, an application of 400 function points and 300 SNAP points has an "absolute size" or "equivalent size" of 500.

The defect ratio now evolves into

$$\text{Quality} = \frac{\#\ of\ defects}{\sqrt{FP^2+SP^2}}$$

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AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

Suppose several applications were each found to have 10 defects at the point of system testing. Their quality can be compared as follows.

a. Application A is sized at 400 function points and 300 SNAP points. The absolute value (or, "equivalent size") of its software size is

Absolute value = $\sqrt{}$ (function points ^{2} + SNAP points^2), or

Absolute value = $\sqrt{}$ ($400^2 + 300^2$) = 500.

Its quality is therefore measured as follows.

$$\frac{\text{10 defects}}{\text{500 equivalent software size points}} = .02$$

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b. Application B is twice the size as Application A. Therefore, its size is 800 function points and 600 SNAP points. Intuitively, since it has the same number of defects as Application A, but is twice the size, its quality should be twice as high; its quality ratio should be half of Application A's ratio.

The absolute value of its software size is

Absolute value = $\sqrt{}$ (function points ^{2} + SNAP points^2), or

Absolute value = $\sqrt{}$ ($800^2 + 600^2$) = 1000.

Its quality ratio is half (twice as good as) that of Application A's --

$$\frac{\text{10 defects}}{\text{1000 equivalent software size points}} = .01$$

which is what we intuitively expected.

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

c. Application C is sized somewhere between that of Applications A and B, at 500 function points and 500 SNAP points. It quality ratio should be measured as being between Applications A and B.

The absolute value of its software size is

Absolute value = $\sqrt{}$ (function points ^{2} + SNAP points^2), or

Absolute value = $\sqrt{}$ ($500^2 + 500^2$) = 707.

Its quality ratio is between that of Applications A and B --

$$\frac{\text{10 defects}}{\text{707 equivalent software size points.}} = .014$$

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AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

d. Application D is sized at 400 function points and 100 SNAP points. It is smaller than Application A. It quality ratio should be measured as higher than (worse than) Application A.

The absolute value of its software size is

Absolute value = √ (function points ^{2} + SNAP points^2), or

Absolute value = √ ($400^2 + 100^2$) = 412.

Its quality ratio is higher than (worse than) that of Application A's --

10 defects / 412 equivalent software size points = .583

16

Conclusion

With the introduction of SNAP in 2012, the original 1992 "defect / function point" ratio can no longer be used to fully measure software programming quality. Accommodations must be made to include the effect of non-functional software development. Function points and SNAP points independently measure two different aspects of software, and these sizes cannot be simply added together; also, one size cannot be simply considered to be a factor of the other. However, function points and SNAP point can be "combined" using vector mathematics and the partial analogy of the complex numbers to generate an "absolute value of software size," or "equivalent software size." This equivalent software size can be used in the denominator of the defect ratio – replacing the function point count approach published in 1992. This represents an evolution of the IFPUG method published in 1992 to reflect non-functional technology metric improvements.

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

BACKUP

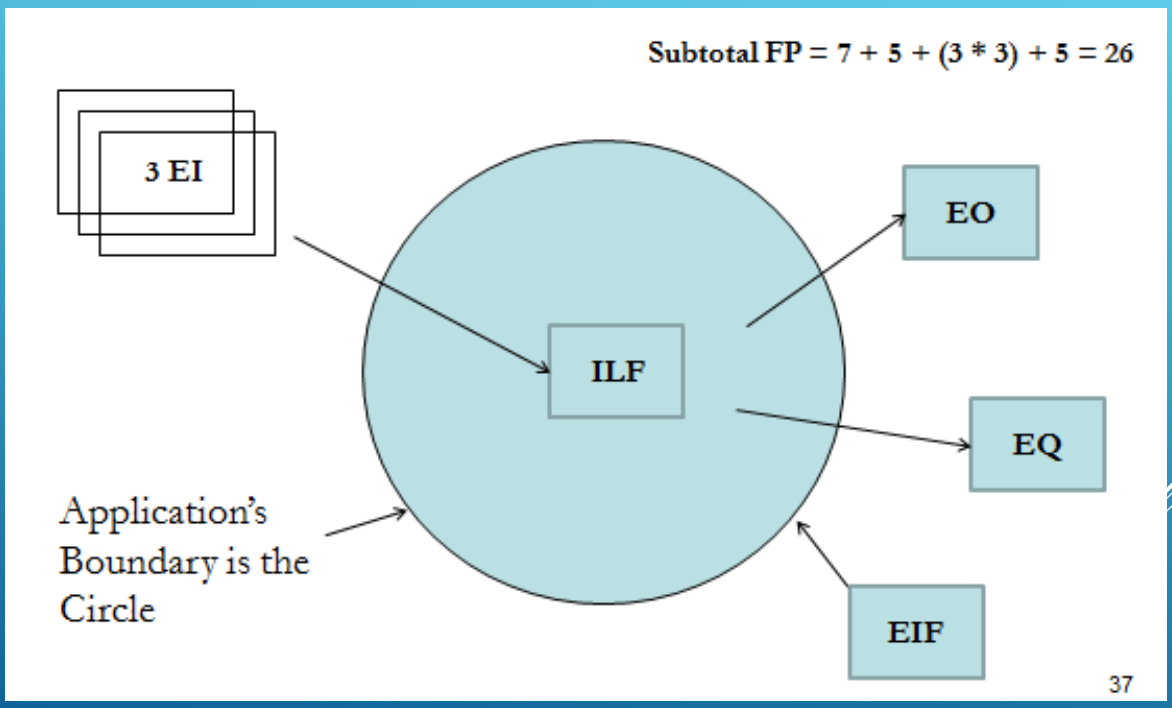
AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

NOTE

Although this quality metric is partly based on the concept of the complex number system as an analogy, there is no intention to portray a SNAP count as being an imaginary number. For example, when comparing the sizes of two applications using a ratio of "$size_1$ / $size_2$," no intention is made to follow the procedure of dividing complex numbers. The vector sizes will be compared instead.

19

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY



20

AN IMPROVED METRIC TO MEASURE SOFTWARE QUALITY

☑ GENERAL SYSTEMS CHARACTERISTICS (CPM)

1.	Data Communications	0
2.	Distributed Data Processing	0
3.	Performance	1
4.	Heavily Used Configuration	0
5.	Transaction Rate	0
6.	Online Data Entry	5
7.	End-User Efficiency	4
8.	Online Update	3
9.	Complex Processing	0
10.	Reusability	0
11.	Installation Ease	0
12.	Operational Ease	3
13.	Multiple Sites	0
14.	Facilitate Change	2

Total is 18.

21

AN INVESTIGATION OF CRYPTOJACKING: MALWARE ANALYSIS AND DEFENSE STRATEGIES

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ABSTRACT

Cybercriminals are capitalizing on the global interest in speculative cryptocurrencies for their own gain. By exploiting vulnerabilities in web browsers and client systems on a large scale, such new operating model named as cryptojacking allows cybercriminals to siphon computational resources from their victims to illicitly generate cryptocurrency. It is important to conduct malware analysis on cryptojacking because this malware has the potential to compromise services running on enterprise servers and operating systems and even critical infrastructure industries. The authors analyze cryptojacking malware samples using both dynamic and static methods and discuss their potential impacts on critical infrastructure. The paper further provides strategies for how to detect and defend against these threats, followed by the conclusions and summary.

Key words: Cryptocurrency, cryptojacking, blockchain, malware analysis, critical infrastructure

Applying peer accountability to the online learning environment via Sponsorship

Abstract

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ABSTRACT

Distance learning has evolved considerably from the days of mail based correspondence courses due to the implementation of coursework into the ubiquitous internet modern society relies so much upon. However, research has shown that the student learning experience online differs from that in the traditional face-to-face environment. Robinson & Hullinger (2008) state "Rather than using research to help replicate what is done in the traditional classroom, researchers should focus on identifying what is done well in the online learning environment. Research should determine whether they (the students) are learning what we intended them to learn—NOT whether they are learning the same as in traditional methods". As feedback is reduced in the online learning environment as demonstrated via Media Richness Theory (Kahai & Cooper, 2003) students rely more on discussion boards and other blog-style posting. Vonderwell, Liang & Alderman (2007) findings suggest that "Asynchronous online discussions facilitate a multidimensional process of assessment demonstrated in the aspects of structure, self-regulatory activities, learner autonomy, learning community and student writing skills. The students valued the discussions as an essential component of their online learning". As such, student engagement becomes more important than ever. In fact, when students help each other out through actively engaging in coursework, Topping (2005) states "Benefits to helpers are now emphasized at least as much as benefits to those helped" though a synergy between peers. This paper focuses on the assignment of a Sponsor and Sponsored Party status to each student in a class. As such, each student will both have a Sponsor and be a Sponsor to another. Predictions include higher grades, more involvement with the discussion board participation in said class, higher course evaluations and a quantifiable increase in an Assurance of Learning matrix based on group-work. This is a timely concept and technique because "Most likely, online learning and teaching opportunities will continue to grow, and this should create new and innovative pedagogy and technology that support online teaching and development. To ensure the relevance and rigor of online learning, it is important that programs develop an effective assessment process (Bowser, Davis, Singleton & Small (2017).

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Barriers to Adoption of Supply Chain Management Practices by the US Construction Industry

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ABSTRACT

Supply chain practices, a standard within the repetitive manufacturing industry, have yet to gain broad adoption within the US construction industry. With the construction industry plagued by time, cost, and schedule overruns, individual companies, trade organizations and some governments have attempted to identify solutions to this industry's resistance at a broad level of change. Several SCM initiatives such as partnering and incentive contracting have been used in conjunction with traditional practices to manage and improve the SC practices with disappointing results. To address this failure, Love et al., (2004) proposes a customer – supplier interface in the project supply chain with the application of Total Quality Management (TQM). Several authors have proposed varied solutions, Love at al., (2004) proposed a holistic approach, Vrijhoef and Koskela (2000) conclude that typical waste and problems actually occur in other stages of the supply process than where the problem is actually detected and identify four roles the supply chain must play to help correct these issues. Daintly et al., (2001) noted serious concerns from the subcontractors perspective centered around mistrust and skepticism.

Reasons for this reluctance are varied but this paper will attempt to present an overall global perspective on this application.

BIOFUEL LOGISTICS NETWORK DESIGN USING TWO-STAGE NETWORK DATA ENVELOPMENT ANALYSIS

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ABSTRACT

This paper proposes an innovative procedure for efficient and robust biofuel logistics network (*BLN*) systems design under the risk of disruptions. Under such a circumstance, the *BLN* design problem should deal with multiple objectives, such as cost minimization, a collection of more biomass, minimizing population exposure to air pollution, and improved productivity for biofuel through the supply chain. We use a goal programming (GP) approach by simultaneously considering several performance metrics in the mathematical formulation. Then, we apply the two-stage network data envelopment analysis (NDEA) to find the efficient supply chain network. Through a case study using the real data, we demonstrate the applicability of the proposed procedure. We observe that the procedure performs well regarding identifying the efficient and robust *BLN* schemes, which would be able to attract potential investors who are interested in investing in the biofuel industry.

INTRODUCTION

The term biofuels, which is used specifically to denote liquid biofuels such as bioethanol and biodiesel, are sometimes used interchangeably with bioenergy. Biofuel, which currently accounts for the majority of renewable energy produced globally, is the fastest –growing source of energy generation (Kaut et al., 2015). Indeed, biofuel has been recognized as an important source of energy that will reduce the nation's dependency on petroleum and has a positive impact on the economy, environment, and society. Many countries around the world have been seeking the opportunity to use biomass feedstocks such as corn, sugarcane, and switchgrass for producing bioethanol and biodiesel. Since biofuel could reduce the dependence on unpredictable world oil supply and also mitigate the environmental impacts (e.g., global climate change, pollution) of using fossil fuels. With the unstable oil price, along with growing environmental concern such as global warming caused by carbon dioxide emissions, biofuels have been regaining popularity. In fact, much of the gasoline in the United States is blended with ethanol. Also, under the Energy Independence and Security Act (EISA) of 2007, the U.S. Environmental Protection Agency (EPA) has developed a Renewable Fuel Standard program (RFS) to ensure that gasoline in the U.S. contains a minimum percentage of renewable fuel. The latest RFS (2011) "w*ill increase the volume of renewable fuel required to be blended into gasoline from 9 billion gallons in 2008 to 36 billion gallons by 2022*."

Some federal agencies in the United States have taken major steps since 2006 to implement the Advanced Energy Initiative rolled out by the US Government. The U.S. Department of Energy announced plans to invest nearly $1 billion in partnership with the private sector and academia to research, develop, and deploy advanced biofuel technologies by 2012. This includes up to $272 million for commercial-scale biorefineries (BRFs), up to $240 million for demonstration scale BRFs working on novel refining processes, and more than $400 million for biofuel centers. The vast expansion in biofuels production and use mandated by EISA will require the development of new methods and equipment to collect, store, and pre-process biomass in a manner acceptable to BRFs. These activities, which constitute as much as 20% of the current cost of finished cellulosic ethanol, are comprised of four main elements:

• Harvesters & collectors that remove feedstocks from cropland and out of forests.

• Storage facilities that provide a steady supply of biomass to the biorefinery, in a manner that prevents material spoilage.
• Preprocessing/grinding equipment that transforms feedstocks to the proper moisture content, bulk density, viscosity, and quality.
• Transportation of feedstocks and biofuels

Biofuel is supposed to be environmentally friendly, but the production of biofuels has been linked to high levels of carbon emissions. Pimentel (2003) maintains that bio-ethanol production increases environmental degradation and that major air and water pollution problems are associated with the production of bio-ethanol in the chemical plant. There is also a report that producing biofuels could also have a detrimental effect on air quality, and there would be a similar impact wherever biofuels were produced in large quantities in areas suffering air pollution, including the United States and China (see http://www.reuters.com/article/us-climate-biofuels-idUSBRE90601A20130107).

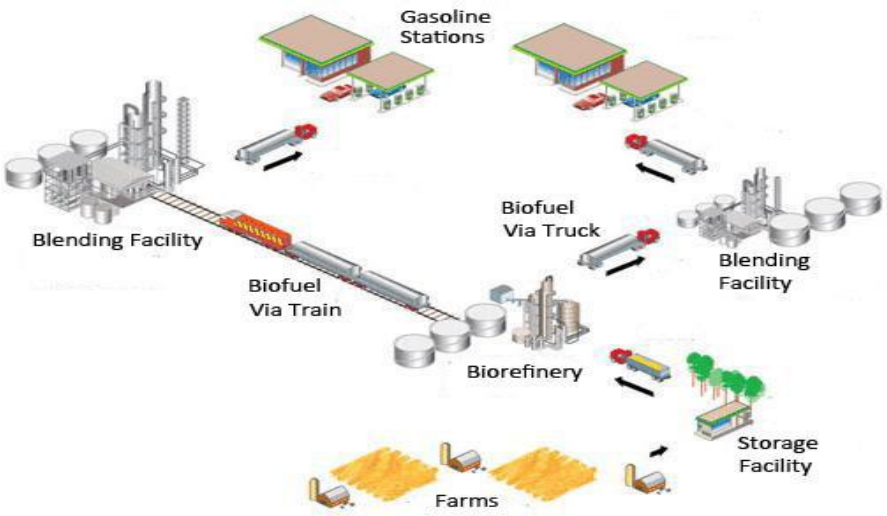
Based upon the issues and challenges of designing and operating biomass chains that secure stable and competitively- priced feedstocks supply for biofuel plants, Gold & Seuring (2011) classify those issues and challenges into the operations, harvesting and collection, storage, transport and pre-treatment techniques as well as into overall supply system design. Hong et al. (2014) consider the effect of the uncertainty in biomass yield and propose a simulation-based robust biofuel facility location model for solving a bio-energy logistics network problem with the objective of minimizing the total logistics cost (TLC). Poudel et al. (2016) present a pre-disaster planning model for designing a reliable biofuel supply chain network considering link failure probabilities.

We investigate the integrated biomass-biofuel supply chain (*BLN*) under the risk of disruptions and present an innovative approach to evaluating a pre-disaster planning model for designing the efficient *BLN* schemes. Following the supply chain of Hong et al. (2014), our *BLN* consists of four different types of facilities: a supply point - farm or harvest site (HS), a storage point – storage facility (SF), and a production point - biorefinery (BRF), and a demand point – blending station (BS). We assume that the locations of HS and BS are fixed, and the demand for each BS is constant throughout the planning period. The biofuel supply chain network structure is depicted in Figure 1.

The inbound flows to BRF in Figure 1 represent the collection, storage, and transportation of biomass, which can be of many types. The biomass collected at each HS is brought by trucks into a local SF. Smaller loads of biomass collected from the HS are temporarily stocked at the SF before they are consolidated and transported to a BRF by large-capacity trucks for processing into biofuel. An SF is a potential site to store and preprocess (e.g., compress) biomass to a more valuable density and/or to pre-treat biomass to make a better-quality biomass feedstock so that they can be transported more cost-effectively. In addition, a direct transportation of biomass from an HS to a BRF is allowed and the resulting transportation cost is usually higher than going through the SF, since the direct shipping of biomass from an HS to the BRF requires more space (due to the low biomass density) and more operations and preparation to be processed into biofuel. Thus, conversion rates to bio-fuel of biomass feedstocks shipped from SF to BRF are usually higher than those for biomass feedstocks directly shipped from HS to BRF.

The outbound flows in Figure 1 show that biofuels are transported from BRFs to BSs to be blended with fossil fuels before being distributed to gas stations. Given the locations of BSs and their demands, the transportation costs mainly depend on the proximity of BRFs to BSs. In this logistics network, determining the locations of BRFs and SFs will be the most important decision. This is because a BRF usually requires several million dollars as the annualized construction and operation cost. Also, the use of SFs would affect the quality of biofuel that primarily depends on upon the moisture content in the biomass (van Dyken et al., 2010), letting alone the total transportation cost between HSs and BSs.

Figure 1. Schematic of Biofuel Supply Chain



We assume that the two facilities in the inbound flows, SF and BRF, are under the risk of disruptions. The risk of disruptions implies that, as Cui et al. (2010) define, some of the constructed facilities may become unavailable due to disruptions caused by major disasters. Thus, we assuming that if a facility is disrupted, biomass would not be used to produce biofuel, we consider five goals as the major performance measures. The first goal is to minimize the total logistics cost (*TLC*). The second goal is to minimize the maximum demand-weighted distance (*MDWCD*), between the demand point and the supply point. The third goal is to maximize the expected amount of biomass feedstocks (*EABF*) flowing into BRFs, whereas the fourth goal is to maximize the expected amount of biofuel produced (*EABP*) by BRFs. The fifth goal is related with the pollution problem and is to minimize population-level exposure to the air pollution. To denote the effect of pollution on the population residing around the biorefineries, the pollution-free score (*PFS*) for the BRFs is used.

This paper aims to apply two-stage network data envelopment analysis (NDEA) approach to evaluate each optimal solution for given weights, generated by GP model formulated for the *BLN* problem, and to identify most efficient option from all options. As far as we know of, applying NDEA to *BLN* design problem has not been tried in the literature. This innovative process would help practitioners as well as researchers to produce a finer evaluation of efficiency and to provide a design and benchmarking framework for designing *BLN* system to improve overall supply chain efficiency.

BACKGROUND

It is assumed that SFs can be located at any HS and that a BRF can only be built at candidate BRF location, since BRF locations must satisfy some realistic requirements. This is a reasonable assumption at the strategic planning stage for the biofuel logistics model. It may be difficult to decide potential SF locations which are not HSs since the assignment of HSs to an SF is not known. We assume that the two facilities, SF and BRF, are under the risk of disruptions. The risk of disruptions implies that, as Cui et al. (2010) define, some of the constructed facilities may become unavailable due to disruptions caused by major disasters. Thus, we assuming that if a facility is disrupted, biomass would not be used to produce biofuel, we consider the five goals as the major performance measures. To accommodate the five goals in one objective function, we use a goal programming (GP) approach as a tool for designing the effective *BLN*. The typical GP model allows the decision maker to assign weights to the deviational variables in the

objective function to better reflect the importance and desirability of deviations from the various goals. See Hong (2018) for detailed equations and goal programming model.

DEA is a performance evaluation technique based on a non-parametric linear programming (LP) approach for frontier analysis. DEA is an approach for identifying best practices of peer decision-making units (DMUs) in the presence of multiple inputs and outputs. Cook and Zhu (2014) state that the network DEA approach is an important area of development in recent years. All the models developed so far on the topic of *BLN* design problem can be of the single-stage model with single or multiple objectives. Monfared and Safi (2013) state that the single-stage DEA model considers a DMU as a 'black box' and neglects intervening processes, i.e., different series or parallel functions. They continue to say that the black box approach provides no insights regarding the inter-relationships among the components' inefficiencies and cannot provide specific process guidance to DMU managers to help them improve the DMU's efficiency. These single-stage models neglect the internal linking activities.

The *BLN* design could be considered as the two-stage network problem, where the total cost and demand-weighted covered distance are the inputs to the first stage which generates the amount of collected biomass feedstocks as an output. Then, the output from the first stage becomes an input to the second stage to produce the two outputs, the amount of biofuel production and a population who are free of air pollution generated by the biorefineries. In other words, the amount of collected biomass feedstocks is measured using *TLC*, *MDWCD*, and the outputs are *EABF*. In the second stage for biofuel production and population free from air pollution, *EABF*, the expected amount of biomass feedstocks delivered to the BRFs are then used as an input, while *EABP* and *PFS* are used as outputs. If we use the single-stage DEA, as Monfared and Safi (2013) state, we could not provide some insights between the amount of biomass and the two outputs, the amount of biofuel production and the effect of pollution to the population around BRFs.

Liang et al. (2006) show that using the concept of cooperative game theory, or centralized control, the two-stage process can be viewed as one where the stages jointly determine a set of optimal weights on the intermediate factors to maximize their efficiency scores. It is called a CRS (Constant Returns-to-Scale) two-stage centralized model. This would be the case in the *BLN* system where we want to jointly determine the amount of collected biomass feedstocks, the locations of SFs and BRFs, and the produced amount of biofuel to achieve the maximum efficiency. See Kao and Hwang (2008) and Liang et al. (2008) for computing the efficiency scores of the CRS two-stage DEA model

CASE STUDY

Using the proposed procedure, we modify and conduct a case study that Hong et al. (2014) study. We follow the scenario illustrated in Figure 2 (EPA Tracked Sites in South Carolina (SC) with Biorefinery Facility Siting Potential (2013)). Sixteen (16) counties, whose biomass resources are classified 'good' or better as shown in Figure 2, are selected as the harvesting sites (HSs). Then, we choose one city from each county using a centroid approach and consider it as a storage facility (SF) location potential. We consider five (5) locations and ten locations (10) throughout SC as candidate sites for BRFs and blending stations (BSs), respectively, as shown in Figure 3. The potential locations for BRFs are selected based upon low population density, easy access to interstate highways, etc.

Although not shown in Figure 3, the actual distances among cities representing HSs, SFs, BRFs, and BRFs, are found. We adopt the same input parameters used by Hong (2018). The risk probability of being disrupted is calculated using major disaster declaration records in SC Carolina from Federal Emergency Management Agency (FEMA) database. See Table 1.

Table 1. Biomass Yield and Risk Probability

No	Harvest Site	Minimum Yield (Thousand Metric Tons)	Average (Thousand Metric Tons)	Maximum Yield (Thousand Metric Tons)	Risk Probability
1	Allendale	100	150	200	0.36
2	Berkeley	150	200	250	0.44
3	Chester	150	225	300	0.28
4	Colleton	100	200	300	0.36
5	Darlington	150	225	300	0.4
6	Dorchester	150	225	300	0.36
7	Florence	150	225	300	0.48
8	Georgetown	250	400	550	0.48
9	Greenwood	150	225	300	0.24
10	Hampton	150	225	300	0.28
11	Horry	100	175	250	0.64
12	Lexington	100	175	250	0.44
13	Newberry	250	400	550	0.36
14	Orangeburg	150	225	300	0.44
15	Richland	250	400	550	0.44
16	York	150	225	300	0.32

Figure 2. EPA Traced Sites in South Carolina with Biorefinery Facility Siting Potential

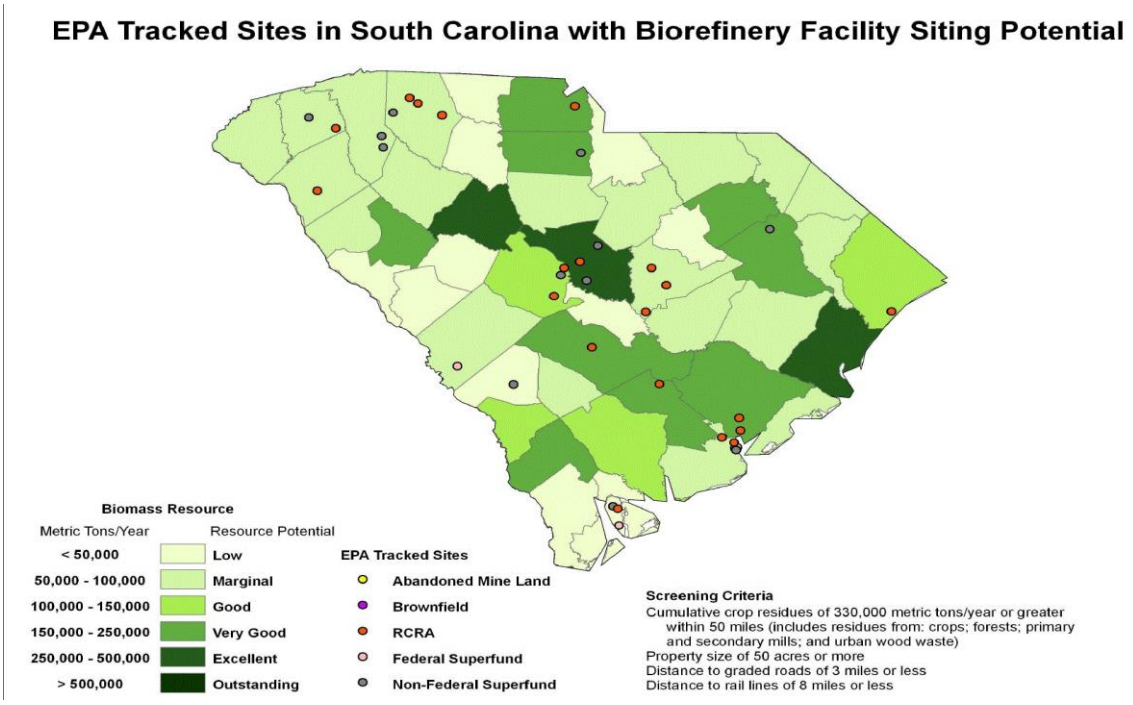
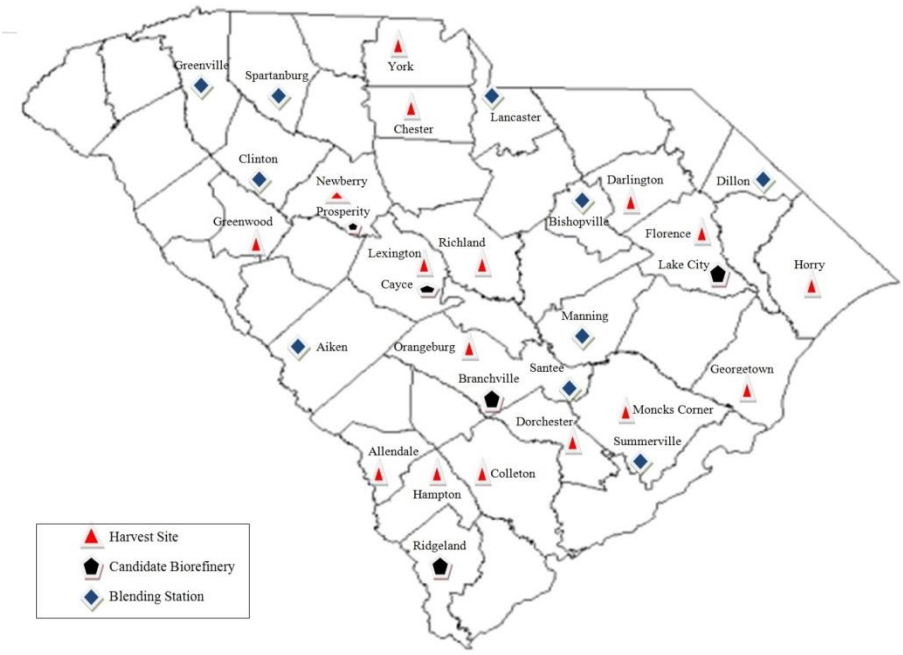


Figure 3. Candidate Sites for Bio-Refineries, Harvesting Sites, and Blending Stations



The GP model is solved for various values of the weight, α_g, where each weight changes between 0 and 1 with an increment of 0.1. There are 1,001 configurations arising out of the combinations of the setting of $\boldsymbol{\alpha}$ under the condition $\sum_{g=1}^{5} \alpha_g = 1$. After we solve the model, we reduce 1,001 configurations into 306 consolidated configurations, based upon the values of the five performance measures. In Table 2, for the most efficient BLN scheme, we present values of the five-performance metrics along with efficiency scores for stage 1 and 2, $\theta_\omega^{1*}$and θ_ω^{2*}, the overall efficiency score, $\theta_{\omega M}^{*}$, normalized overall efficiency score, θ_ω^{Norm}, and rankings for the overall efficiency score. We also present $\theta_{\omega A}^{*}$, the average value of $\theta_\omega^{1*}$and θ_ω^{2*}, and corresponding rankings. We do the same thing for most inefficient BLN schemes in Table 3. From Tables 2 and 3 we see that DMU #302 and DMU #42 are the most efficient and the most inefficient schemes, respectively. We also observe that, most of the cases, α_2^+ and α_1^- turn out to be zeroes for the four most efficient schemes and α_1^+ and α_2^+ turn out to be zeroes for the four most inefficient schemes. From this observation, we may state that MDWCD, related with α_2^+, would not affect the efficiency scores for the extreme cases in terms of the resulting efficiency scores.

In Table 4, we present the optimal locations and allocations of SFs and BRFs and assignments of BRFs to BSs for the most efficient option reported in Table 2. The most efficient option #302 selects {Berkeley, Chester, Greenwood, Richland} and {Prosperity, Lake City} as the optimal locations of SFs and BRFs, respectively. The allocation scheme for the option #302 is as follows: For biomass feedstocks, the harvest sites (HSs), {Chester, York}, ship to SF {Chester}, HSs {Greenwood, Lexington} to SF {Greenwood}, HSs {Berkeley, Colleton, Dorchester} to SF {Berkeley}, and HSs {Allendale, Hampton, Orangeburg, Richland} to SF {Richland}. HS {Newberry} ships to BRF {Prosperity} directly and HSs {Darlington, Florence, Georgetown, Horry} directly ship to BRF {Lake City}. SFs {Chester, Greenwood, Richland} ship the treated biomass feedstock to BRF {Prosperity} and SF {Berkeley} ships to BRF {Lake City}. For the produced biofuel, BRF {Prosperity} ships to BSs {Aiken, Bishopville, Clinton, Greenville, Lancaster, Spartanburg}, whereas BRF {Ridgeland} to BSs {Bishopville, Dillon, Manning, Santee, Summerville}. Note that 26% of demand for BS {Bishopville} are supplied by BR {Prosperity} and 74% are supplied by

BR {Lake City}. Figure 4 shows the BLN corresponding to the configuration in Table 4. A black solid arrow line represents a shipment of biomass from an HS to an SF, a green solid arrow line a direct shipment from an HS to a BRF, and a golden arrow line a shipment from a SF to BRF, whereas a dotted arrow line indicates a shipment of biofuel from a BRF to a BS.

SUMMARY AND CONCLUSIONS

Contrary to the traditional logistics network models focusing primarily on cost-efficiency, this paper considers five (5) performance measures simultaneously to design more balanced biomass-biofuel logistics networks (*BLNs*). Those five performance measures are the total logistics cost (*TLC*), the maximum demand-weighted coverage distance (*MDWCD*), the expected amount of biomass feedstock (*EABF*), the expected amount of biofuel production (*EABP)*, and the pollution-free score (PFS). We propose an innovative procedure of applying goal programming (GP) approach and the two-stage network data envelopment analysis (NDEA) method for designing efficient and robust *BLNs* regarding those five performance measures. Solving GP model would provide various alternatives to the decision maker and application of NDEA to those alternatives will evaluate them and generate the efficient supply chain network schemes. Through a case study, we demonstrate the applicability of our proposed approach. We observe that the proposed procedure performs well and can help the decision-makers identify the robust locations of biorefinery which requires huge investments. Identifying the efficient and robust *BLNs* through the proposed procedure would attract potential investors who might be interested in investing in the biomass and bioenergy industry.

We consider the simple average conversion rates for various types of biomass in this paper. For future research, it would be interesting to consider identifying blends of different types of biomass whose conversion rates will be significantly different. In addition, it would be interesting to consider another goal, such as social impacts by estimating the number of jobs created due to various supply chain network activities. It would be necessary to include the vehicle routing problem in the proposed *BLNs*, the optimal design of routes to be used by a fleet of vehicles to collect biomass feedstocks from the harvest sites.

ACKNOWLEDGMENTS

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Table 2. Efficiency Results for Four Most Efficient Biofuel Supply Chain Schemes

DMU # (ω).	$\boldsymbol{\alpha}=(\alpha_1^+, \alpha_2^+, \alpha_1^-, \alpha_2^-, \alpha_3^-)$	TLC	MDWCD	EABF	EABP	PFS	θ_ω^{1*}	θ_ω^{2*}	$\theta_{\omega M}^*$	θ_ω^{Norm}	Rank	$\theta_{\omega A}^*$	Rank
302	(0.6, 0.0, 0.0, 0.2, 0.2) (0.7, 0.0, 0.0, 0.2, 0.1) (0.8, 0.0, 0.0, 0.2, 0.0)	4,048.83	206309	1731.32	975.22	483.9	0.8850	0.9797	0.8670	1.0000	1	0.9323	1

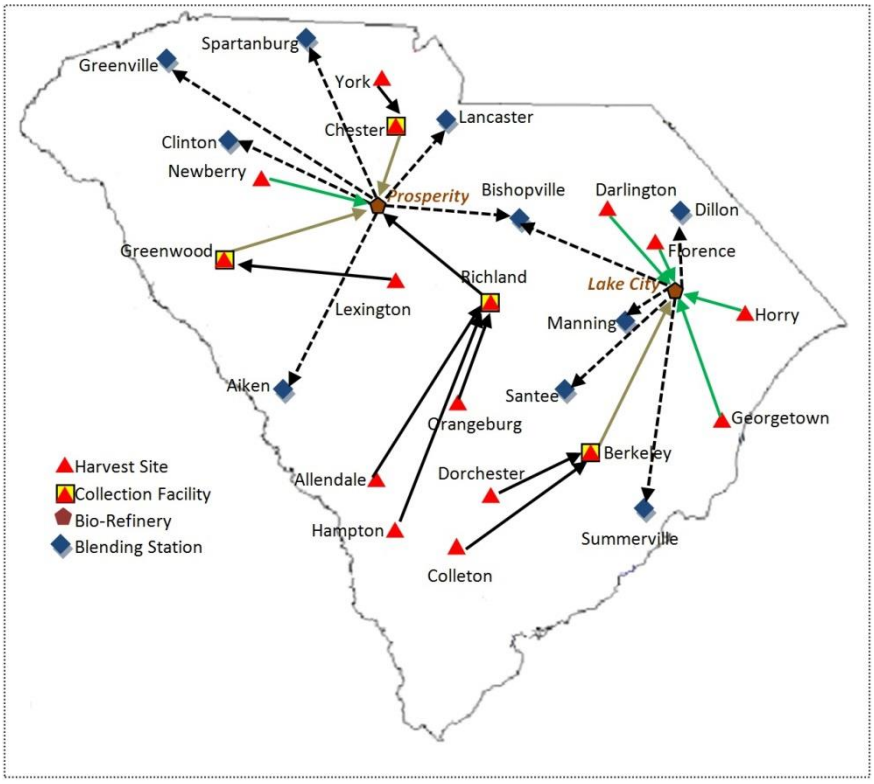
Table 3. Efficiency Results for Four Most Inefficient Biofuel Supply Chain Schemes

DMU No.	$\boldsymbol{\alpha}=(\alpha_1^+, \alpha_2^+, \alpha_1^-, \alpha_2^-, \alpha_3^-)$	TLC	MDWCD	EABF	EABP	PFS	θ_ω^{1*}	θ_ω^{2*}	$\theta_{\omega M}^*$	θ_ω^{Norm}	Rank (Worst)	$\theta_{\omega A}^*$	Rank
42	(0.0, 0.0, 0.4, 0.6, 0.0)	10,315.31	350592	2625.28	1330.09	519.2	0.5267	0.7335	0.3863	0.4456	1	06301	1
30	(0.0, 0.0, 0.3, 0.0, 0.7)	10,117.65	313408	2658.72	1313.06	519.2	0.5450	0.7219	0.3935	0.4538	2	06335	2
35	(0.0, 0.0, 0.3, 0.6, 0.1)	10,037.79	350592	2625.28	1330.09	519.2	0.5413	0.7335	0.3971	0.4579	3	0.6374	4
56	(0.0, 0.0, 0.7, 0.3, 0.0)	9,980.58	313408	2659.48	1314.13	519.2	0.5525	0.7218	0.3988	0.4599	4	0.6371	3

Table 4. Location and Allocation for the Most Efficient Biofuel Supply Chain Scheme

No	Harvest Site	Collection Facility	Bio-Refinery	Blending Station
302	Allendale Hampton Orangeburg Richland	Richland	Prosperity	Aiken Bishopville (0.26) Clinton Greenville Lancaster Spartanburg
	Chester York	Chester		
	Greenwood Lexington	Greenwood		
	Newberry			
	Berkeley Colleton Dorchester	Berkeley	Lake City	Bishopville (0.74) Dillon Manning Santee Summerville
	Darlington Florence Georgetown Horry			

Figure 4. Most Efficient Biofuel Supply Chain Network



Building Successful Marketing Teams with Positive Psychology

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ABSTRACT

This case study assessed the implementation of positive psychology practices within teams at a marketing consulting firm. The process began with individuals recognizing, appreciating and acknowledging each other's strengths. Marketing professionals at all levels of the organization learned to implement new approaches to teamwork across a variety of client projects.

CAN DATA SCIENCE BE A SCIENCE?

AKA BUSINESS ANALYTICS AND BUSINESS INTELLIGENCE

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ABSTRACT

In "What Is this Thing Called Science?" in 1999, A. F. Chalmers says [5]:

> *"Science is highly esteemed. Apparently it is a widely held belief that there is something special about science and its methods. The naming of some claim or line of reasoning or piece of research "scientific" is done in a way that is intended to imply some kind of merit or special kind of reliability. But what, if anything, is so special about science? What is this "scientific method" that allegedly leads to especially meritorious results?"*

Below is an answer to the question: "Is 'Data Science' a science?"

INTRODUTION

Since Aristotle, analytic versions of the definition of 'Science' need accompanying methods that validate the 'Science' designation. Those methods need to follow widely accepted theory and methods underlying the 'Science.' The history of these theories and methods in the Philosophy of Science encompassing Analytics are listed as follows in *The Philosophy Book* [4]:

- Aristotle on the importance of observation and measurement (4th Century Before the Common Era)
- Francis Bacon on inductive methods in science (*Novum Organum*, 1620)
- David Hume's critique of induction (*Enquiry Concerning Human Understanding*, 1748)
- Sir Karl R. Popper and the requirement of falsifiability in scientific discovery (*The Logic of Scientific Discovery*, 1934 and C*onjectures and Refutations: The Growth of Scientific Knowledge*, 1963)
- Tomas Kuhn and professional commitments to shared assumptions producing 'normal science', (*The Structure of Scientific Revolutions*, 1962)
- Paul Feyerabend claims there is no such thing as a scientific method (*Against Method*, 1978)

A relevant question prompted by considering Kuhn's issues of professional commitments and shared assumptions is, where did the term 'data science' originate? The general consensus is that Jeff Hammerbacher of Facebook and DJ Patil, of LinkedIn coined the terms to communicate what their teams do [6]. The seeds of this development involved the founding of the Institute of Mathematical Statistics in 1935 which now publishes the journal "Statistical Science," John Tukey's use of the term "bit" which Claude Shannon used in his 1948 paper "A Mathematical Theory of Communications [20] A second question concerns whether or not the discipline of 'Data Science' which has followed is really scientific. [18]

In an address titled 'Statistics and Statistical Science' delivered by J. Durbin from the London School of Economics and Political Science, UK, as The Address of the President, delivered to the Royal Statistical Society on Wednesday, March 18th, 1987 the distinction between the two designations was put forward, as follows:

> *"The distinction is made between statistics in its original sense of the collection and dissemination of quantitative information for the investigation of economic and social*

problems, and statistical science in the modern sense of the techniques and methodology of statistical analysis. The impact of the development of computing technology on both statistics and statistical science will be considered from a general point of view. Some questions of statistical policy are discussed. A plea is made for the development of a unified philosophy for statistical science in which competing schools of statistical thought can be accommodated in a spirit of tolerance."

In the world at large, the 'science' organizations include the American Association for the Advancement of Science (AAAS) is a non-profit organization dedicated to advancing science worldwide, and Sigma Xi, The Scientific Research Honor Society is the international honor society of science and engineering. AAAS has been in existence since 1848 and claims to have 'marked the emergence of a national scientific community in the United States' (https://www.aaas.org/about/mission-and-history). AAAS publishes the weekly journal Science among others. Sigma Xi (The Scientific Research Honor Society) is a non-profit honor society for scientists and engineers which was founded in 1886 at Cornell University by a junior faculty member and a handful of graduate students. (https://www.sigmaxi.org/). Sigma Xi publishes the journal American Scientist bi-monthly and supports research conferences for students such as the 2018 Annual Meeting and Student Research Conference: Big Data and the Future of Research October 25-28. In January, 2018 AAAS and Sigma Xi created an alliance to promote and advance science and its use in government policy decisions. Together AAAS publishes Science and five other peer-reviewed journals, while Sigma Xi publishes American Scientist and the Chronicle of The New Researcher, an online, open access journal (https://www.aaas.org/news/aaas-and-sigma-xi-forge-alliance-promote-and-advance-science).

The new combined organization leaders describe the alliance as follows:

"While many scientists join professional organizations that match their discipline, increasingly scientists are expected to step into the public arena to support the scientific process and the use of science in policymaking – a reality that underscores the importance of the collaboration. Each scientist in order to be fully engaged in the scientific community should be, not only involved in their professional disciplines, their societies, they also should be in a general organization that has a significant advocacy and outreach component like AAAS and they should be involved in an organization like Sigma Xi that really focuses on honor and ethics in the conduct of excellent research,"

While the author of this paper has been a member of both organizations since 1975, the emphasis on policymaking takes the alliance out of the realm of 'science' and puts it in the realm of 'politics leading to pseudoscience' which brings with it ethical issues and the influence of money in the form of grants.

On the implementation side of current practices, Business Analytics and Business Intelligence [12] are where models come into play in 'Data Science' applications. Analytical models are mathematical models such as the Gompertz curve that are used in such applications as forecasting demand for new products [13], or custom built models used to estimate potential acceptance rates of a new product globally [14]. The present author agrees primarily with Popper [17] that:

'In so far as a scientific statement speaks about reality, it must be falsifiable.'

Science depends completely on experimentation and experience along with definite regularities, patterns, and sequences of nature that can be systematically explored. Popper's notion of falsifiability is crucial to distinguish scientific claims from pseudo-scientific claims.

The present author also agrees with George Box's well known comment that 'all models are wrong, but some are useful' is even more relevant today given political and monetary influences may impact which model is claimed to be scientific .

What Box actually wrote in his first comment on scientific correctness was:

> *"Since all models are wrong the scientist cannot obtain a "correct" one by excessive elaboration. On the contrary following William of Occam he should seek an economical description of natural phenomena. Just as the ability to devise simple but evocative models is the signature of the great scientist so overelaboration and overparameterization is often the mark of mediocrity."* [2]

What Box was talking about was the ideal balance between theory and practice where scientific advancement requires both theory and practice involved with a feedback loop which produces true scientific discovery. But, the ideal practice is typically not in play and the real process shows flaws of imbalance [15].

Box named those flaws of imbalance as follows:

> *"The maladies which result may be called Cookbookery and Mathematistry. The symptoms of the former are a tendency to force all problems into the molds of one or two routine techniques, insufficient thought being given to the real objectives of the investigation or to the relevance of the assumptions implied by the imposed methods."*
>
> *"Mathematistry is characterized by development of theory for theory's sake, which since it seldom touches down with practice, has a tendency to redefine the problem rather than solve it. Typically, there has once been a statistical problem with scientific relevance but this has long since been lost sight of."*

CONCERNS ABOUT EDUCAITON AND SCIENTIFIC UNDERSTANDING

Developments in America

In response to all the discussion about 'science' and 'data science' a team of statisticians was convened in 2001 and published a set of guidelines in the *American Statistician* for undergraduate BS degrees to be awarded in Statistical Science [3]. The motivation for developing this curriculum was provided by concerns about statistics as a discipline surviving the test of time. The concerns centered around the lack of Departments of Statistics offering degree programs in Statistics. The team was charged with finding a solution to be offered to create undergraduate degree programs with recommended curricula.

The core skills of the Statistical Science discipline were identified as comprising the following capabilities:

- Mathematics based skills in statistical science identified as data analysis and interpretation with core topics related to statistical theory, regression, data collection, and analysis of variance.
- Non-mathematics based skills identified as written, oral, and presentation communication skills for technical and non-technical audiences along with team work and collaboration plus project management and problem definition skills
- Computational skills including spreadsheets, analytic software packages (SAS), database management, and graphical displays.
- Mathematical foundations including calculus, linear algebra, and matrix manipulations.
- Substantive area skills including content in a minor or concentration in an areas of substantive application such as business management, engineering, industrial applications, medical applications, government surveys, or communication.

What defines a statistician and a data scientist is still in flux [16].

Developments in England

At University of Durham in England, Jim Ridgeway [19] defined educational implications for statistics created by the 'Data Revolution.' His hope is that students learn about sampling bias, corruption of measurement process, and failures in modeling in attempts to solve problems. He calls this knowledge base "statistical thinking." The purpose in this update of statistics education is:

"Statistics is central to discourses about evidence and policy; discourses about evidence and policy should be central in the statistics curriculum." (pp. 2).

In conclusion, Ridgway states the following:

"Statistics educators need to respond positively to the opportunities provided by the data revolution. The alternative is to see the increasing irrelevance of a static statistics curriculum that offers little help in understanding the data (and the ways that data are used) that affects the life of everyone. Changes need to be quite radical; new ways of approaching evidence should be adopted. However, this radicalism is entirely consistent with the ambitions of the founders of statistics and with current conceptions of statistical thinking and statistical literacy." (pp. 19-20)

Given the mixture of statistics and politics it is not surprising that a government grant number ES/K004328/1 supported the work and that John Wiley & Sons Ltd published the report on behalf of International Statistical Institute.

An example of how government grants can result in 'junk science' and corruption is the case at Harvard University involving a professor of evolutionary biology, Marc D. Hauser. Harvard found professor Hauser guilty of scientific misconduct in 2010. Since government grants were involved, the Office of Research Integrity of the Health and Human Services Department also investigated professor Houser. Ultimately, he resigned in 2011 and Harvard's findings were corroborated by a Federal government investigation in 2012. Ironically, Hauser's book "Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong" was published in 2006 [10].

Science and Scientific Methods

In addition to the mixture of politics, government money, and government think tanks supporting the work, the problems with this approach to educating the next generation of statistical scientists is that they will have a gaping hole in their education concerning what constitutes a science and appropriate scientific methods.

> *An example of what this problem produces is in the June 2018 issue of Science on page 1381 in a short News in Brief report on people's names involving a study published in Proceedings of the National Academy of Sciences. The study included analysis of 4,494 comments made online by students in online reviews of professors in 5 disciplines at 14 universities. The researchers concluded that "College students are 50% more likely to refer to male professors than female professors by their last names alone – and that form of address may confer greater respect." The author of the News Brief then went on to state that there is* ***experimental evidence*** *that 'people regard researchers mentioned by last name alone as more famous and eminent that scientists mentioned by full name.' when referred to on talk shows. That author then went on to note, "They conclude that women may be short-changed on professional benefits such as research funding based on nothing more than how people utter their names."*

In the June issue of ORMS Today, the official journal of the Institute for Operations Research and the Management Sciences (INFORMS), Peer Horner, editor of *ORMS Today* published on an *Inside Story* titled *Thriving in a post-truth era* where he noted that keeping an eye on "the threat of charlatan" 'data scientists' is important. Presumably these 'charlatans' engage in pseudo-data science rather than authentic data science.

Many educators are probably unfamiliar with 'Modus Ponens' *and* 'Modus Tollens' methods of reasoning. Unfamiliar, that is, unless they took a philosophy of science course in undergraduate or graduate school.

Some may know Modus Ponens which is used as follows:

If you are a man, then you are mortal.
You are a man.
Therefore, you are mortal.

Scientific progress no longer proceeds this way, and now depends on the less well known form of Modus Tollens.

Modus Tollens is used in falsification like this:

If you are a god, then you are immortal.
You are not immortal.
Therefore you are not a god.

Using deductive reasoning (Modus Ponens) 'preserves the status quo of accepted truth or facts' This reasoning approach means if you begin with 'true premises,' you can only deduce 'true conclusions.' The premises have to be accepted truths or facts, sometimes called 'conventional wisdom.'

Using the inductive reasoning (Modus Tollens) approach to science results in starting with a theory and deducing predictions. If the theory is true, the prediction will be true. 'Falsification' means we cannot prove a theory to be true, but we can certainly show that a prediction is not true using empirical methods.

There are four ways to test a theory [11].

1. The logical consistency among conclusions among themselves demonstrating 'internal consistency.'
2. Investigating whether or not the empirical support is tautological (meaning a hypothesis is said to be logically irrefutable and obscures the lack of supporting or refuting evidence.).
3. A given theory is compared to other theories to determine if it is actually a scientific advance.
4. Testing the theory using empirical applications that should work and predictions that are shown to be consistent with the theory.

Using Popper's falsification approach only admits theories as 'scientific' if they can be tested using empirical methods. The general approach below:

1. Observe
2. Hypothesize
3. Predict
4. Test predictions with data (preferably experimental)
5. Modify hypotheses until they are consistent with predictions and data

A DEFENSE AGAINST CHARLATANS

It is contended here that the approach above following Box and Popper provides the strongest defense against Data Science charlatans while ensuring that the theory and practice of Data Science are authentic rather than pseudo-data science. This approach requires:

1. Something other than 'blind' Data Mining with conclusions unguided by theory.

2. Willingness to change a theory based on falsifiability using empirical evidence.
3. Scientific experiments and predictions are conducted with valid, reliable measurement systems.
4. The five problems with big data are managed [20].
5. The 5 V's of Big Data are defined and managed.

The five problems with big data identified by Silver are below [21]:

Where to put it

Silver says that even small and medium amounts of data can be difficult to manage. The more data companies have the even more complex the problems of managing it can become.

Big bias

Another issue with having a lot of data is that it can create bias. The presence of meaningful segments may be obscured.

False positives

Daniel Kahneman author of Thinking, Fast and Slow [12], showed that sometimes people rush decisions based on a subset of data (thinking fast). A better practice is to "think slow" and really understand what is in the data. With big data, thinking fast (not analyzing the data fully) can lead to false positives.

Big complexity

Involves extracting the "signal from the noise." Said another way, it's the problem of finding the needle in the haystack. The more data you have, sometimes the harder it can be to find true value from the data.

That's not what I was looking for…

Imagine Google Maps giving you directions and suggesting an alternate, "faster" route. You take it only to find that it's a dirt road under construction. Sometimes big data systems think they have found a shortcut, but in reality, it's not exactly what the user needed.

The 5 V's of Big Data include Volume, Variety, Veracity, Velocity and Value. The presence of each of them is required for using Big Data to assist in business decision making and predicting outcomes. If one of these V's is out of balance, Big Data may not be useful at all.

The Existence of Dark Matter and Modus Tollens

It's well known that Data Science is a fast growing career with many job opportunities [6], 2012). It has even extended into astrophysics which provides an example of Modus Tollens today in upsetting a set of 'scientific facts' first proposed 30 years ago in the 1970's. An article appeared in the August 2018 edition of Scientific American by two astrophysicists [9]. These two astrophysicists, published a summary of evidence indicating that 'dark matter' does not exist and concluded:

"It is time that physicists let go of their prejudices and reexamined this underdog idea."

This statement violates the rules of logic in one or more of the following ways.

1. An absolute assertion is made saying the current state of scientific knowledge is right!
2. Something is believed to be unknowable because we lack the needed technique or technology.
3. Insisting an element of science is inexplicable and unknowable.

4. A claimed law or truth is said to be in its final perfect state.

Business Analytics and Intelligence Using Predictive Models

It's also time for those of us who teach and practice Business Analytics and Data Science to be careful to follow the Modus Tollens approach in our data analytics. We have tools available in the form of Partial Least Squares-Structural Equation Modeling (PLS-SEM). PLS-SEM is causal modeling used to provide a scientific approach to data analytics [7].

When properly applied, theories and purely empirical models can be evaluated for their 'scientific' value. As Hair et. al. note in their statement of value of PLS-SEM reproduced below:

> *"PLS_SEM provides parameter estimates that maximize the explained variance (R^2 values) of the dependent constructs. The method therefore supports prediction-oriented goals (i.e., explaining/predicting the target constructs in the structural model). Its flexibility (i.e., almost no limiting assumptions regarding the model specifications and data) and its comparatively high statistical power make the PLS method particularly adequate for SEM applications that aim at prediction or theory building such as in studies that focus on identifying critical success drivers.*
>
> *Finally, PLS-SEM can also be used for confirmatory theory testing. Recent PLS-SEM research reveals that the method is developing rapidly and has demonstrated numerous technical advancements. These include different approaches to response-based clustering such as FIMIX-PLS, and response-based unit segmentation in PLS (REBUS-PLS). These methods have been constantly advanced, for example, by addressing model selection issues in FIMIX-PLS and comparing several of the approaches by means of computational experiments. The confirmatory tetrad analysis in PLS path modeling (CTA-PLS), allows the empirical testing of the measurement models' mode ex post. More specifically, the method tests the null hypothesis of a reflective measurement model. Furthermore, in case of rejection, the method provides support for using the formative measurement model alternative. Other studies broach the issue of moderating effects, hierarchical component models, and higher order interaction effects in hierarchical component models. All these research efforts expand PLS-SEM's applicability in marketing and management research."*

PLS-SEM and a Conclusion

Business analytics and intelligence have the purpose of driving superior growth for companies utilizing the tools of Data Science [1]. The key is for a company to choose an analytic method that is consistent with the company's strategy and budget.

To make better decisions business analysts and data scientists need to formulate and test their marketing theories using the PLSR-SEM approach outlined by Hair, et. al. [8].

Using this approach generates insights by integrating various analytic techniques and ensuring those adopted can be compared for effectiveness. PLS-SEM allows for this type of integration and model building with theory generated models. Using PLS-SEM requires the following four approaches:

1. Theory guidance to specify the original structural model
2. Clearly specifying the measurement model
3. Dealing with missing data, suspicious response patterns, outliers, and data distributions
4. Evaluating the model's effectiveness using assessments of convergent validity, collinearity, significance and relevance of the formative and reflective model indicators along with bootstrapping.

These four characteristics of PLS-SEM allow falsification of and modification of an original model or abandonment of the original model making the approach 'scientific.'

Finally, companies need both analytic data science specialists and those who can make sense of the analytic output of PLS-SEM modeling and translate it for upper level managers in real time to have maximum impact on strategy formulation, execution and effectiveness in driving superior growth. This approach can follow Modus Tollens allowing falsification and make Data Science scientific.

The answer to the question "Is 'Data Science' a science?" is yes if it follows the falsification approach to data modeling embodied in PLS-SEM.

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COLLEGE TO CAREER TRANSITION: BEST PRACTICES IN BUSINESS EDUCATION

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The job market seems to be back with the growing economy, but are college graduates prepared for the world of work? According to a recent McGraw-Hill Education survey, while for the class of 2018, 44% of employers will increase hiring of new college graduates, only four in 10 college students feel very or extremely prepared for their future careers. A Lumina Foundation study found a significant perception gap between business and academic institution leaders when it comes to assessing the workforce preparedness of today's college graduates. In a recent survey done by Gallup for Inside Higher Ed, 96% of chief academic officers in colleges and universities feel extremely or somewhat confident in their institution's ability to prepare students for success in the workforce. In contrast, the Gallup/Lumina Foundation poll found just 11% of business leaders strongly agree that today's college graduates have the skills and competencies that their business needs.

There are many changes in the job market that may be leading to these gaps and mismatch in perceptions. The future of work, projected to be very different from today, has attracted a lot of attention in the popular press, but the world of higher education seems slow to catch up. What are the high demand career initiatives that address the needs of the future of work? What skill sets do students need to succeed in the emerging workforce? What can companies do to help students better prepare to contribute to their workplace from day one? How can higher education, and business schools in particular, respond to the growing expectations of creating workforce-ready graduates?

This panel of experienced business school leaders and HR practitioners will explore and exchange ideas and best practices on preparing students for college to career transition. Challenges faced by business schools will also be discussed. In AACSB International's 2013 Standards, Standard 4 [STUDENT ADMISSIONS, PROGRESSION, AND CAREER DEVELOPMENT] states that "Policies and procedures for supporting career development should be clear, effective, consistently applied, and aligned with the school's mission, expected outcomes, and strategies." For example, AACSB requires that business schools document processes and demonstrate the effectiveness of career development support that is consistent with degree program expectations and the mission of the school. Examples of evidence may include job acceptance rates for graduates over the most recent five-year period as well as case examples of successful graduates. The panel discussion will help in documenting Standard 4 for AACSB reporting purposes.

Communication as a Key Variable Influencing Workplace Culture for a Nonprofit Organization

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ABSTRACT

This case study examines a nonprofit organization's communication challenges and explains how a lack of effective communication contributes to the overall organizational culture and the level of employee engagement. Field research included a quantitative electronic survey and a qualitative follow-up focus group. Findings revealed employees' perceptions of a lack of free-flowing communication is a significant problem within the organization. Recommendations for improving communication include implementing cross-departmental meetings to break down silos, leveraging more face-to-face interactions, and encouraging executive management to appeal to individual contributors on a personal level.

COMPARING TWO MEASURES OF GENERALIZED SELF EFFICACY, AND THEIR RELATIONSHIP TO ORGANIZATIONAL COMMITMENT: A PRE-TEST POST-TEST COMPARISON

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INTRODUCTION

This paper presents an initial pilot study toward a broader research plan that explores Trust, defined as a willingness to put oneself at risk due to a positive expectation, as it plays a role in motivation as described by the Expectancy Theory of Motivation (Vroom, 1962.) An individual's motivation determines the direction, intensity, and persistence of the individual's behavior. The elements in Expectancy Theory are 1) a quantitative belief (probability) that a certain Effort level will lead to a specific Performance level, 2) the quantitative belief (probability) that a specific Performance level will lead to a specific Outcome, and 3) the value (Valence) placed on that Outcome. Motivational force is determined as the product of the three elements. The two theses explored in this research are: 1) that generalized Organizational Trust (trust of systems and people) is critical in determining Performance to Outcome expectancy, and 2) that Self-Efficacy (trust in self) is critical to determining the Effort to Performance expectancy. These hypotheses stated in the positive are:

H1: Organizational Trust (trust of systems and people) is positively correlated with Motivation.
H2: Self-Efficacy (trust in self) is positively correlated with Motivation.

BACKGROUND

Motivation: Expectancy Theory

For any set of individual effort(E), performance(P), and outcome(O), the Expectancy Theory of Motivation (Vroom, 1964) describes an individual's motivational force as a product of three variables: Valence, Instrumentality and Expectancy where Valence (V) is the perceived value placed on a particular outcome, Instrumentality is the perceived likelihood of a particular level of performance leading to that outcome (P→O), and Expectancy is the perceived likelihood that a particular level of effort will lead to a

particular level of performance (E→P). Thus, motivational force for a particular E,P,O set is calculated as:

$$\text{Motivational force} = (E \rightarrow P) \times (P \rightarrow O) \times V$$

This proposed research seeks to look specifically at the role that Trust plays in both Expectancy (E→P) and Instrumentality (P→O).

Trust

The literature defines trust many ways, but two fairly consistent themes are Rotter's (1980) perspective that trust is "a generalized expectancy held by an individual that the word, promise, or oral or written statement of another individual can be relied on" (Rotter, 1980, p.1), and Zand's (1972) perspective that trust leads to behavior "consisting of actions that (a) increase one's vulnerability, (b) to another whose behavior is not under one's control, (c) in a situation in which the penalty (disutility) one suffers if the other abuses that vulnerability is greater than the benefit (utility) one gains if the other does not abuse that vulnerability" (1972, p. 230). In short, these themes combine to describe trust is a willingness to put oneself at risk because of positive expectations of another.

A central tenet of the proposed research is that trust is critical in an individual's performance to outcome (P→O) expectancy, as the receipt of positively valued outcomes (Valence >0) is dependent on a belief that the system or organization will behave in a way that does not abuse the individual's vulnerability. Hypotheses one is stated as:

H1: Organizational Trust (trust of systems and people) is positively correlated with Motivation.

Potential measures of trust for this study are included in Appendix A: Self Efficacy Scales, and Appendix B: Interpersonal Trust Scale. Additional and updated measures will be explored in the literature review process.

Generalized Self-Efficacy:

Self-Efficacy is a construct related to an individual's belief that they are capable of completing a task or achieving a level of performance. Typically, self-efficacy is described as either generalized or task specific. For the current study, the focus is on comparing two measures of generalized self-efficacy: the General Self-Efficacy (GSE) scale (Schwarzer & Jerusalem, 1995) and the Self-Efficacy Scale (Sherer et.al. 1982). These are presented as potential proxy measures for self-trust which has theoretical similarities to Effort to Performance expectancy (E →P). Previous research by the author and a colleague in the area of Internship Expectations showed a positive correlation between with generalized self-efficacy and expectations of specific task performance (2011.) Hypotheses two is stated as:

H2: Self-Efficacy (trust in self) is positively correlated with Motivation.

METHOD

Student Sample

Student data was collected in conjunction with ongoing joint work on the relative value of single word reinforcers. Undergraduate students (n=115) completed on-line a set of measures including the 17 item General Self-Efficacy scale (Sherer et.al. 1982), the OCQ (Mowday, Steers, & Porter, 1979) and the Rotter Interpersonal Trust Scale (1991). They then had the opportunity (for course extra credit) to complete a laboratory computer exercise where they are given different levels and frequencies of verbal reinforcement through headphones as they work through the exercise. Outcome measures included time on task and accuracy rate. Immediately after the laboratory portion, they were asked to complete the 10 item GSE (Schwarzer & Jerusalem, 1995) as post-test self-efficacy measure. All test data was collected in the late Fall of 2017. All three segments were completed by 77 students. Data analysis methods used were primarily regression analysis with supplemental Factor Analysis using SPSS.

For the purposes of this initial study, Organizational Commitment as measured by the OCQ (Mowday, Steers, & Porter, 1979) is presented as a proxy for motivation. A factor analysis of the Rotter Interpersonal Trust Scale (1991) will guide the use of selected items to serves as a proxy measure for Organizational Trust.

SIGNIFICANCE

Motivation is a key part of a manager's job, and as such is an important part of the Business Management and Organizational Behavior literature. Employee trust in management and in the systems and policies in place is critical to job performance, job satisfaction, and affective organizational commitment. Trust is also difficult to build, and when damaged or lost, harder still to re-establish. Much of the discussion of trust's role in motivation in the literature and in texts used in teaching has been anecdotal. This study, if it supports the anecdotal evidence, will add credence to both the existence and magnitude of trust's impact on motivation. Research related to the Expectancy Theory and Trust theories have typically been separate streams of research. This research, if outcomes are as expected, provides a contribution to the field by strengthening the trust-motivation connection, supporting the thesis that trust is a critical element of the motivation process.

RESULTS

Data analysis began with scale reliability analysis. The 17 item Generalized Self Efficacy Scale (GSES) used in the pre-test data had a calculated Chronbach's Alpha of .832, and the GSE administered post-test's Alpha was .881 indicating that each test is internally reliable. A factor analysis of the items in the scales showed them to be internally consistent and with all items loading on one primary factor both when analyzed separately and when the 27 items were combined into one analysis. Additional eigenvalues above one emerged in the factor analysis, but item loadings were not significant enough to argue that more than one cognitive variable is being measured.

An interesting result was that while both measures of self-efficacy were significantly correlated with each other ($p=.003$), Organizational Commitment as measured by the OCQ was significantly correlated with

the pre-test GSES ($p<.000$) but not the post-test GSE. OCQ was also significantly correlated with the overall Interpersonal Trust Scale ($p=.018$.)

The interpersonal trust scale did not have a significant correlation with either of the self-efficacy measures which argues the two cognitive structures have discriminate validity.

Regression analysis supports that a model including self-efficacy and trust does predict OCQ results, however the post-test self-efficacy measure is not a significant variable, and the pre-test measure is. It is likely that this is related to either the method of the testing. The latter self-efficacy measure was paper& pencil while the earlier measure and the OCQ were both administered on-line.

CONCLUSION

The results of this study are sufficient for the researcher to continue with both further analysis of the data, and with additional data collection. There is preliminary support for the expectancy theory as measured, however more research and analysis is required.

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Appendix A – Self Efficacy Scales

The Generalized Self Efficacy scale (GSE)

Instructions. Indicate for each statement below how true it is for you.

1 = not at all true
2 = hardly true
3 = Moderately true
4 = exactly true

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. I am certain that I can accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I can handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can find several solutions.
9. If I am in trouble, I can think of a good solution.
10. I can handle whatever comes my way.

Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35-37). Windsor, UK: NFER-NELSON.

General Self Efficacy Scale

Instructions. To what extent does each statement describe you? Indicate your level of agreement by marking the appropriate response

1. Strongly Agree
2. Agree
3. Neutral
4. Disagree
5. Strongly Disagree

1	When I make plans, I am certain I can make them work
2	One of my problems is that I cannot get down to work when I should {R}
3	If I can't do a job the first time, I keep trying until I can
4	When I set important goals for myself, I rarely achieve them {R}
5	I give up on things before completing them {R}
6	I avoid facing difficulties {R}
7	If something looks too complicated, I will not even bother to try it {R}
8	When I have something unpleasant to do, I stick to it until I finish it
9	When I decide to do something, I go right to work on it
10	When trying to learn something new, I soon give up if I am not initially successful {R}
11	When unexpected problems occur, I don't handle them well {R}
12	I avoid trying to learn new things when they look too difficult for me {R}
13	Failure just makes me try harder
14	I feel insecure about my ability to do things {R}
15	I am a self-reliant person
16	I give up easily {R}
17	I do not seem capable of dealing with most problems that come up in life {R}

An {R} denotes a negatively phrased and reverse scored item. Results are summed and divided by 17 to arrive at a summary indicator of employee commitment.

M. Sherer, J.E. Maddux, B. Mercandante, S. Prentice-Dunn, B. Jacobs, and R.W. Rodgers, "The Self-Efficacy Scale: Construction and Validation." Psychological Reports, 51 (1982), pp. 663-671.

Appendix B – Interpersonal Trust Scale

Instructions. Indicate the degree to which you agree or disagree with each statement by the following scale:

1 = strongly agree
2 = mildly agree
3 = agree and disagree equally
4 = mildly disagree
5 = strongly disagree

1. Hypocrisy is on the increase in our society.
2. One is better off being cautious when dealing with strangers until they have provided evidence that they are trustworthy.
3. This country has a dark future unless we can attract better people into politics.
4. Fear and social disgrace or punishment rather than conscience prevents most people from breaking the law.
5. An honor system in which teachers would not be present during exams would probably result in increased cheating.
6. Parents usually can be relied on to keep their promises. {R}
7. The United Nations will never be an effective force in keeping world peace.
8. The judiciary is a place where we can all get unbiased treatment. {R}
9. Most people would be horrified if they knew how much of the news that the public hears and sees is distorted.
10. It is safe to believe that in spite of what people say most people are primarily interested in their own welfare.
11. Even though we have reports in newspapers, radio, TV, and the Internet, it is hard to get objective accounts of public events.
12. The future seems very promising. {R}
13. If we really knew what was going on in international politics, the public would have reason to be more frightened than they now seem to be.
14. Most elected officials are really sincere in their campaign promises. {R}
15. Many major national sports contests are fixed in one way or another.
16. Most experts can be relied upon to tell the truth about the limits of their knowledge. {R}
17. Most parents can be relied upon to carry out their threats of punishments. {R}
18. Most people can be counted on to do what they say they will do. {R}
19. In these competitive times one has to be alert or someone is likely to take advantage of you.
20. Most idealists are sincere and usually practice what they preach. {R}
21. Most salesmen are honest in describing their products. {R}
22. Most students in school would not cheat even if they were sure they could get away with it. {R}
23. Most repairmen will not overcharge, even if they think you are ignorant of their specialty. {R}
24. A large share of accident claims filed against insurance companies are phony.
25. Most people answer public opinion polls honestly. {R}

J. B. Rotter Scale: published in: Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). Measures of personality and social psychological attitudes. San Diego: Academic Press.

Appendix C - The Organizational Commitment Questionnaire (OCQ)

Instructions. Listed below are a series of statements that represent possible feelings that individuals might have about the company or organization for which they work. With respect to your own feelings about the particular organization for which you are now working (company name) please indicate the degree of your agreement or disagreement with each statement by checking one of the seven alternatives below each statement

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = moderately agree
7 = strongly agree

1. I am willing to put in a great deal of effort beyond that normally expected in order to help this organization be successful.
2. I talk up this organization to my friends as a great organization to work for.
3. I feel very little loyalty to this organization. {R}
4. I would accept almost any type of job assignment in order to keep working for this organization.
5. I find that my values and the organizations values are very similar.
6. I am proud to tell others that I am part of this organization.
7. I could just as well be working for a different organization as long as the type of work was similar. {R}
8. This organization really inspires the very best in me in the way of job performance.
9. It would take very little change in my present circumstances to cause me to leave this organization. {R}
10. I am extremely glad that I chose this organization to work for over others I was considering at the time I joined.
11. There's not too much to be gained by sticking with this organization indefinitely. {R}
12. Often, I find it difficult to agree with this organization's policies on important matters relating to employees. {R}
13. I really care about the fate of this organization.
14. For me this is the best of all possible organizations for which to work.
15. Deciding to work for this organization was a definite mistake in my part. {R}

Note: An {R} denotes a negatively phrased and reverse scored item. Results are summed and divided by 15 to arrive at a summary indicator of employee commitment.

Mowday, R. T., Steers, R. M., & Porter, L. W. (1979). The measurement of organizational commitment. Journal of Vocational Behavior, 14, 224-247.

COULD A ONE-TIME BASKETBALL TOURNAMENET BECOME AN EVERY YEAR EVENT?

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ABSTRACT

This manuscript examines NCAA exempt basketball tournaments with a particular focus on bringing such an event to the Myrtle Beach Area. Sports tourism is an important part of the Grand Strand Economy, particularly during non-summer months. The region has hosted similar events in the past and is committed to growing its Sports Tourism presence. The addition of an annual NCAA exempt basketball tournament could greatly add to the region's growing sports tourism portfolio of events.

INTRODUCTION

September 2017 was a devastating month for Puerto Rico, a small Caribbean Island and U.S. Territory of 3.4 million residents. During that month, Puerto Rico was badly damaged by two strong and deadly hurricanes (Irma and Maria) over a two-week period [3]. The storm's devastation disrupted all aspects of daily life. While early reports of death to storm-related causes were fewer than 70 people, later research suggested the actual number of storm-related deaths (not simply from the initial landfall of the storm), were closer to 4,000 [6].

College basketball fans are used to watching (and even following) their favorite teams playing in holiday basketball tournaments in places such as Puerto Rico, the Bahamas, U.S. Virgin Island, Hawaii, Alaska, and elsewhere. But, Puerto Rico was in ruins in late September of 2017. ESPN Events, which organizes many of these holiday basketball tournaments, started looking for mainland destinations to host the planned Puerto Rico Tip-Off with 60 days notice. The Myrtle Beach Chamber of Commerce, an active participant in the growing sports tourism category, worked with Coastal Carolina University to host the event at CCU's HTC Center (an on-campus arena) over Nov 16-19, 2017. Participant schools included South Carolina, Appalachian State, Boise State, Illinois State, Iowa State, Tulsa, UTEP, and Western Michigan [2].

Sports Tourism is a growing segment of the overall Myrtle Beach tourism portfolio. In addition to youth sports, the area has been a long-time host of the Beach Ball Classic (high school basketball) and CresCom Bank Holiday Invitational (women's college basketball), with both events played annually in the city's convention center in December. In March 2017, Coastal Carolina University served as a one-time host of the ACC Women's Basketball tournament. In 2017 alone, sports tourism generated an economic impact of $158 million and over 165,000 hotel night stays [10].

The successful hosting of the Puerto Rico Tip-Off and the ACC Women's Basketball Tournament served as demonstration projects as local leaders sought to encourage the development of an annual collegiate holiday basketball tournament along the Grand Strand. The purpose of this manuscript is to provide an overview of collegiate holiday basketball tournaments and to examine the goodness-of-fit of such an annual event in the Myrtle Beach area. First, a look at NCAA regulations governing holiday tournaments is provided. Second, the benefits realized by teams participating in such tournaments are outlined. Third, a review of all 2017 exempted holiday tournaments is presented, including a focus on the critical components to allow such a tournament to be introduced. Finally, an epilogue is provided.

NCAA GUIDELINES ON BASKETBALL SCHEDULING

The National Collegiate Athletic Association (NCAA) provides guidelines for the scheduling of all sports, including the maximum number of allowable contests per team per year. However, new holiday basketball tournaments in Alaska (introduced in 1978) and Hawaii (introduced in 1984) had a significant impact on college basketball scheduling. These events came to be known as MTE's (multi-team exempt tournaments). Early NCAA regulations allowed a team to play in two such tournaments in a four-year period. However, later legal challenges led the NCAA to make more clear provisions on exempt holiday basketball tournaments [4] [5]. Below is the current guidance from the NCAA for Men's Basketball Scheduling [8]:

17.3.5 Number of Contests.

17.3.5.1 Maximum Limitations—Institutional. An institution shall limit its total regular-season playing schedule with outside competition in basketball during the playing season to one of the following (except for those contests excluded under Bylaw 17.3.5.3):

a) 27 contests (games or scrimmages) and one qualifying regular-season multiple-team event per Bylaw 17.3.5.1.1; or
b) 29 contests (games or scrimmages) during a playing season in which the institution does not participate in a qualifying regular-season multiple-team event.

17.3.5.1.1 Qualifying Regular-Season Multiple-Team Event. A qualifying regular-season multiple-team event is one in which:

a) The event is sponsored by the NCAA, an active or affiliated member or a member conference of the Association and must take place in the Commonwealth of The Bahamas, Canada, the Cayman Islands, Jamaica, Northern Ireland, Mexico or the United States or one of its territories;
a) The event includes not more than four contests per institution and concludes not later than 14 days after the first contest of the event;
b) Participation is limited, by conference, to one team per conference and, by institution, to not more than once in the same event in any four-year period; and
c) Each participating institution is using Bylaw 17.3.5.1-(a) as its maximum contest limitation for the playing season in which it participates in the event.
    a. **17.3.5.1.1.1 Hawaii/Alaska/Puerto Rico Exception**. An active Division I institution located in Hawaii, Alaska or Puerto Rico that serves as the sponsor of a qualifying regular-season multiple-team event is not required to count its participation in the event as its one qualifying regular-season multiple-team event pursuant to Bylaw 17.3.5.1-(a), provided the event is conducted in the institution's state or territory and the institution counts all contests of the event in which it is a participant toward its maximum contest limitations. Such an event qualifies as a qualifying regular-season multiple-team event for the other participating institutions, provided all such institutions use Bylaw 17.3.5.1-(a) as the maximum contest limitation for the playing season in which they participate in the event.

There are four key provisions above that impact the scheduling of exempt holiday tournaments:

1. If a basketball team plays in an exempt tournament, that team can schedule 27 non-exempt games and play in up to 4 games in an exempt tournament (thus allowing for a 31 game schedule).

2. If a basketball team does not play in an exempt tournament, that team can schedule a maximum of 29 non-exempt contents (thus allowing for a 29 game schedule).

3. A basketball team can only play in the same exempt tournament once every four years.

4. An exempt tournament may only include one school from each athletic conference.

THE BENEFITS OF EXEMPT TOURNAMENTS FOR A BASKETBALL TEAM

Discussions with Division I basketball coaches, basketball operations personnel, athletic directors, and broadcast teams presenting such games identified the following benefits to a team for playing in an early-season exempt basketball tournament [1]:

1. **More team-time for a team** – many coaches prefer the team-time that participating in an exempt tournament provides. This team-time can enhance team cohesiveness and aid competitiveness by bonding individuals to their teams.

2. **More game preparation before beginning conference play** – many coaches build their non-conference schedules to ensure their teams are ready for conference play (where they can qualify for post-season play). Exempt tournaments can provide strong competition while minimizing the number of separate road trips (and missed class time).

3. **Rewarding players and providing a recruiting advantage** – High-performing teams can be invited to Hawaii, Puerto Rico, the Bahamas, and other destinations. These trips can be viewed as an 'earned reward' for a program and the promise of such trips can offer a recruiting advantage to a team (i.e., we play in nice places in the Fall and Winter).

4. **More opportunity for wins** – playing more games provides a team with more opportunity for wins (a key variable for assessing team success) as well as qualifying for post-season play).

5. **More opportunity for quality wins** – playing better-ranked opponents provides a team with more opportunity for more quality wins. Here, a mid-major may upset a major conference team; or, a major conference team can complete with strong non-conference teams from outside of their conference (since only one team per conference is eligible to compete in an exempt tournament).

6. **A nice trip for our fans** – playing games in desirable destinations can help improve fan connection to a team (i.e., we can follow our team to Puerto Rico).

OVERVIEW OF THE 2017 NCAA EXEMPT MEN'S BASKETBALL TOURNAMENTS

As noted earlier, there is incentive for basketball teams to participate in exempt tournaments. However, there are restrictions on their participation; namely, a tournament can only include one school per conference and a school can only play in the same event once every four years [8]. **Table One** provides an overview of the Exempt Men's Basketball Tournaments played in 2017. Participant teams have been broken down into three clusters:

1. Power 5 Conferences (ACC, Big 10, Big 12, PAC 12, and SEC) and Big East
2. Group of 5 Conferences (American Athletic, Conference USA, MAC, Mountain West, and Sun Belt)
3. All other D1 Conferences (Colonial, Big Sky, Missouri Valley, Ohio Valley, etc.)

TABLE ONE
2017 EXEMPT MEN'S BASKETBALL TOURNAMENTS: PARTICIPATION BY CONFERENCE

Tournament	# of Power 5 Schools + Big East	# of Group of 5 Schools	# of Other Conf. Schools	Total Teams
2K Classic New York, NY	3	0	1	4
Puerto Rico Tip-Off Myrtle Beach, SC**	2	5	1	8
Charleston Classic Charleston, SC	2	3	3	8
Jamaica Classic Montego Bay	1	3	3	7
Bahamas Showcase Nassau, Bahamas	0	2	6	8
Paradise Jam (USVI) Lynchburg, VA**	2	1	5	8
Naismith HOF Tip-Off Uncasville, CT	3	1	4	8
Legends Classic Brooklyn, NY	4	0	0	4
CBE Hall of Fame Kansas City, KS	4	0	0	4
Maui Jim Invitational Maui, HI	5	1	2	8
MGM Main Event Las Vegas, NV	2	3	3	8
Cayman Islands Classic Cayman Islands	1	5	2	8
Gulf Coast Showcase Estero, FL	0	3	5	8
Cancun Challenge Cancun, Mexico	0	2	6	8
Battle 4 Atlantis Paradise Island, Bahamas	5	2	1	8

** = relocated for 2017 due to storm damage in the Islands.

TABLE ONE Continued …

Tournament	# of Power 5 Schools + Big East	# of Group of 5 Schools	# of Other Conf. Schools	Total Teams
Great Alaska Shootout Anchorage, AK	0	1	7	8
NIT Season Tip-Off New York, NY	3	0	1	4
Las Vegas Invitational Las Vegas, NV	3	0	5	8
Advocare Invitational Lake Buena Vista, FL	5	1	2	8
PK 80 Bracket One Portland, OR	5	1	2	8
PK 80 Bracket Two Portland, OR	6	0	2	8
Wooden Legacy Anaheim, CA	2	1	5	8
Emerald Coast Classic Niceville, FL	2	1	5	8
Gotham Classic New York, NY	1	1	3	5
Hawaiian Airlines Classic Honolulu, HI	2	2	4	8

Source: Original.

As illustrated in **Table One**, most exempt tournaments are 8-team events which provides participants with the desired 4 basketball games (to get to the maximum number of 31 contents).

A further analysis of tournament schedules reveals two main tournament models:

1. **All Games at Host Site** – 8 teams playing in quarter-, semi-, and finals games. A team's 4th game may be a consolation game or an on-site game outside of the primary participants. This is the model of the Puerto Rico Tip-Off tournament.

2. **Some Combination of On-Campus and Tournament Host Site Teams** – to reduce travel costs (and time away), some games can be 'mainland' games and under the umbrella of the tournament. For example, the MGM Main Event tournament teams play some games in Las Vegas and others elsewhere (home games, away games, etc.).

Regardless of the format and participant profile, exempt tournaments tend to have the following common elements: (1) Lead Organizer; (2) Lead Sponsor; (3) Attractive Destination; (3) Balanced Competitive Field, and (5) Broadcast Media Partner.

Lead Organizer

There are currently three main organizers of NCAA exempt basketball tournaments.

1. **ESPN Events** (Gildan Charleston Classic, Puerto Rico Tip-Off, AdvoCare Invitational, Wooden Legacy, and other events).
2. **Gazelle Group** (2K Classic, Legends Classic, Gotham Classic).
3. **Bd Global Sports** (MGM Resorts Main Event, Gulf Coast Showcase, Islands of the Bahamas Showcase, and other events).

There are also athletic conferences like Metro Atlantic Conference (New England) that manage the Naismith Hall of Fame Tip-Off (held at Mohegan Sun Casino in Uncasville, CT). And, one NCAA member institution (University of Alaska Anchorage) coordinates (and hosts) the Great Alaska Shootout.

Lead Sponsor

Event sponsorship is an important part of athletics and event promotion. For exempt basketball tournaments, the title sponsor is often included in the event's name (e.g., Gildan Charleston Classic, AdvoCare Invitational, or the Maui Jim Invitational). Other times, the event sponsor is more of a presenter of the event (e.g., Progressive Insurance Presents the Legends Classic; State Farm Presents the Nike PK80 Tournament). Further, regional tourism boards sponsor the events to promote area tourism (e.g., U.S. Virgin Islands; Jamaica Tourism; or the Hawaiian Tourism Authority).

Attractive Destination

In order to increase the appeal of participating in exempt tournaments (and attracting a school's fan base), such tournaments tend to be held in popular vacations destinations. For 2017, exempt tournaments were held in such location as Charleston, SC; The Bahamas; Montego Bay, Jamaica; Hawaii; Las Vegas; New York, NY; and others. As noted earlier, Puerto Rico was a planned host site as was the U.S. Virgin Islands before the devastating effects of hurricane season caused a change in plans. Like the Puerto Rico tournament, the USVI tournament was moved to the mainland to Liberty University (Lynchburg, VA) [9].

Balanced Competitive Field

Table Two provides an overview of the pre-season ranking (as measured by RPI – Ratings Percentage Index). There tends to be 3-tiers of teams in such tournaments: (1) top 100 teams from Power 5 Conferences; (2) Teams ranked 101-200 from Power 5 and G5 Conferences; and (3) teams ranked 200 and over. This diversity in pre-season rankings provides for both the "opportunity for wins" and "opportunity for quality wins" discussed above.

TABLE TWO
2017 EXEMPT MEN'S BASKETBALL TOURNAMENTS: DISTRIBUTINO BY PRE-SEASON RPI

Tournament	Pre-Season RPI of 1-100	Pre-Season RPI of 101-200	Pre-Season RPI of 201-300	Pre-Season RPI of 301 +	Total Teams
2K Classic New York, NY	2	1	1	0	4
Puerto Rico Tip-Off Myrtle Beach, SC**	4	2	2	0	8
Charleston Classic Charleston, SC	3	3	2	0	8
Jamaica Classic Montego Bay	2	1	3	1	7
Bahamas Showcase Nassau, Bahamas	1	4	3	0	8
Paradise Jam (USVI) Lynchburg, VA**	3	2	3	0	8
Naismith HOF Tip-Off Uncasville, CT	2	3	2	3	8
Legends Classic Brooklyn, NY	4	0	0	0	4
CBE Hall of Fame Kansas City, KS	4	0	0	0	4
Maui Jim Invitational Maui, HI	6	1	0	1	8
MGM Main Event Las Vegas, NV	2	3	2	1	8
Cayman Islands Classic Cayman Islands	3	4	1	0	8
Gulf Coast Showcase Estero, FL	0	4	4	0	8
Cancun Challenge Cancun, Mexico	1	3	3	1	8
Battle 4 Atlantis Paradise Island, Bahamas	6	1	1	0	8
Great Alaska Shootout Anchorage, AK	2	1	4	1	8
NIT Season Tip-Off New York, NY	4	0	0	0	4
Las Vegas Invitational Las Vegas, NV	2	3	1	3	8
Advocare Invitational Lake Buena Vista, FL	4	1	2	1	8

** = relocated for 2017 due to storm damage in the Islands.

TABLE TWO Continued …

Tournament	Pre-Season RPI of 1-100	Pre-Season RPI of 101-200	Pre-Season RPI of 201-300	Pre-Season RPI of 301 +	Total Teams
PK 80 Bracket One Portland, OR	5	2	1	0	8
PK 80 Bracket Two Portland, OR	6	1	1	0	8
Wooden Legacy Anaheim, CA	2	4	2	0	8
Emerald Coast Classic Niceville, FL	2	3	1	2	8
Gotham Classic New York, NY	2	2	1	0	5
Hawaiian Airlines Classic Honolulu, HI	6	1	1	0	8

Source: Original.

Broadcast Media Partner

The proliferation of sports media has provided more opportunities for games to be broadcast. And, these broadcasters need content. Consider ESPN Events, a division of ESPN that creates made-for-television events such as Bowl Games and Basketball tournaments (such as the Puerto Rico Tip-Off). In recent years, exempt basketball tournaments have been broadcast by ESPN, CBS Sports, Fox Sports Channel, NBC Sports, as well as online providers such as FloHOOPS and Warfield Media. Further, such events have been broadcast on league-affiliated networks (SEC Network, Big 12 Network, etc.).

A Funny Thing Happened on the Way to a Feasibility Study

During the development work for a feasibility study to bring an exempt men's college basketball tournament to the Myrtle Beach area, ESPN Events announced that, in fact, they were doing just that. The inaugural Myrtle Beach Invitational will be held November 15-18, 2018 at Coastal Carolina University. All games will be broadcast on an ESPN Network. Coastal Carolina University will be the event host and, by NCAA rules, can only play in the event once every four year. CCU will play in the event in 2019. During the announcement of the event, ESPN Events was clear that their past satisfaction with hosting events at CCU (such as the Puerto Rico Tip-Off Classic) as well as the region's array of hotels, venues, restaurants, and attractions made the Grand Strand an appealing location for such an event [10].

Table Three provides an overview of the planned 2018 Myrtle Beach Invitational. **Table Four** provides a profile of planned participants (consistent with early data presentations in this manuscript). **Table Five** provides a profile of the location of each participant school. By and large, the schools are located in the geographic markets from where Myrtle Beach tends to draw the majority of its visitors (e.g., Indiana, Kentucky, New Jersey, North Carolina, Pennsylvania, and West Virginia). The inclusion of West Virginia is noteworthy as many West Virginian's consider Myrtle Beach to be their 'second home.'

TABLE THREE
OVERVIEW OF 2018 MYRTLE BEACH INVITATIONAL

Component	Myrtle Beach Invitational		
Lead Organizer	ESPN Events		
Lead Sponsor	Myrtle Beach Chamber of Commerce (Visit Myrtle Beach)		
Destination	Myrtle Beach, SC		
Competition	**Team**	**Conference**	**Final 2017-18 RPI**
	Cal State Fullerton	Big West	133
	Saint Joseph's	Atlantic 10	142
	Central Florida	American Athletic	96
	Valparaiso	Missouri Valley	212
	Wake Forest	ACC	153
	West Virginia	Big 12	28
	Western Kentucky	Conference USA	61
	Monmouth	Metro Atlantic	191
Broadcast Partner	ESPN Networks		

Source: Original.

TABLE FOUR
COMPETITIVE ANALYSIS OF 2018 MYRTLE BEACH INVITATIONAL

Tournament	Pre-Season RPI of 1-100	Pre-Season RPI of 101-200	Pre-Season RPI of 201-300	Pre-Season RPI of 301 +	Total Teams
Myrtle Beach Invitational	3	4	1		8

Source: Original.

TABLE FIVE
GEOGRAPHIC ANALYSIS OF 2018 MYRTLE BEACH INVITATIONAL TEAMS

School	Location	Distance to Myrtle Beach
Cal State Fullerton	Fullerton, CA	2,533 miles
Saint Joseph's	Philadelphia, PA	579 miles
Central Florida	Orlando, FL	497 miles
Valparaiso	Valparaiso, IN	867 miles
Wake Forest	Winston-Salem, NC	213 miles
West Virginia	Morgantown, WV	540 miles
Western Kentucky	Bowling Green, KY	626 miles
Monmouth	West Long Branch, NJ	637 miles

Source: Mapquest [7].

CONCLUDING REMARKS

Academic researchers are often asked to do feasibility studies for a variety of projects. While background research was being conducted on the possibility of new NCAA exempt basketball tournament for the Myrtle Beach area, ESPN Events announced the development of such a tournament for an initial 3-year contractual period. On the surface, all ingredients for a successful tournament are present. ESPN is the lead organizer and will broadcast all games on their family of networks. Myrtle Beach is a familiar vacation destination which attracts over 16 million visitors per year. And, the Chamber of Commerce is committed to sports sponsorship as a means of destination marketing. Finally, a balanced field has been secured.

Myrtle Beach is primarily a drive-in destination (though passenger air loads continue to set records each year). Looking ahead, there are many Division I conferences (such as the ACC, Atlantic 10, MAC, Colonial Athletic, Southern Conference, and others) with geographic footprints that coincide with the primary origin-markets (i.e., hometowns) for Myrtle Beach visitors. So, while a team can only play in the same event once every four years, relationships with individual conferences can be established to ensure the conference has a team in the event each year. And, their fans will be able to drive to the Grand Strand and enjoy the many attractions, golf courses, and restaurants between games. On the surface, the Myrtle Beach Invitational looks well-positioned to become another important part of the overall Myrtle Beach sports tourism portfolio of events.

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ABSTRACT
Balancing the conveniences of technology with the associated risks is a complex cybersecurity problem. People, especially those who use social media, put personal information online without understanding the consequences of their actions. Understanding an individual's cybersecurity awareness and what actions individuals take to protection themselves online is the focus of this research. These findings suggest that a majority of people are aware in some capacity about cybersecurity and the risks of improper cyber behavior. However, prevention measures to mitigate the risks were seldom taken and only done when made aware.

INTRODUCTION

Not a day goes by that some cybercrime or data breach doesn't happen. As a society, we have become very dependent upon the conveniences technology offers. We are made aware of the potential risks that are involved with utilizing the ever-connected technology that make up our daily lives. The advances in technology are becoming so rapid that even our cities will soon be interconnected through a network of Internet enabled devices (Elmaghraby & Losavio, 2014). We are asked to secure our accounts with passwords, be skeptical of email offers and monitor our important accounts, but do people follow these recommendations. According to a study done out of Michigan State University, people entered passwords into as many as 19 unique websites. They also found that the number of passwords a person has is on average less than the number of websites they visit that require one, leading to a reuse of passwords across multiple websites (Wash, Rader, Berman & Wellmer, 2016). This creates a situation where a hacker would only have to obtain the password for one website that is visited by the user to gain access to other accounts held by them on other websites. With more opportunities being created that a hacker has to gain access to a user's personal information and an increased reliance on the Internet, a question has to be answered in order to better protect user's information. That being question being how much about cybersecurity does an average person know? Research shows that 64% of Americans have been the direct victim of a cybertheft (Pew Research Center, 2017). This cyber theft may include information about their credit cards or bank accounts, but also their personal information as well. As a consequence of having more interconnected devices, there are now many more ways in which an attack can occur. There seems to be a lot of misinformation involving cybersecurity practices amongst the public. As such, about half of Americans today feel that their information is more likely to be stolen than five years ago (Pew Research Center, 2017).

While the possibility of cybertheft on the average person has increased in recent years; a lack of sentiment towards public and private institutions and their ability to protect them has grown as well. About 28% of Americans have no confidence in the federal government to protect them from cybertheft and manage their cybersecurity (Pew Research Center, 2017). This failure by the government to adequately provide cybersecurity to people can be thought of as both due to a lack of general awareness on proper cybersecurity practices and a lack of reporting on cybersecurity issues.

There has also been a rampant lack of awareness on the part of employers. Employees who are evaluated as conducting more risky cybersecurity practices are more likely to be a target of an attack (Hadlington, 2017). People assume that their devices or someone else will take care of their cybersecurity rather than taking the initiative themselves. Frequently used social media technologies like Facebook, Snapchat and Instagram but also online shopping sites like Amazon and eBay present more opportunities for people to be targeted for a cybercrime. By looking at how often people use these sites and the frequency with which they have been targeted, a link between the two can be potentially evaluated.

Project Goals

This paper will discuss a study that was conducted to ask individuals about their cybersecurity behaviors and learn if the recommendations are being put into practice.

1. To determine what types of activities are individuals most concerned regarding cyber hacking and data compromise?
2. To determine what types of behaviors, do individuals take to protect their online data and privacy?
3. To determine what type of activities did individuals report having occurred which compromised their online data and privacy?

BACKGROUND

An array of scholarly research has been done to understand why individuals fail to properly protect their data and personal identity on the internet through the use of sound cybersecurity practices (Lawson, 2011; Hadlington, 2017; McBride et al, 2017). Research indicates that with increased technology use, there is an inherent higher risk of cybercrime occurring to the individual (Hadlington, 2017). To a certain degree, the type of website that is visited by the average person in a day is also a contributing factor to a higher risk of cybercrime. Websites like Facebook and Amazon, while useful in their utility, present more avenues through which a lack of proper cybersecurity practices can be potentially dangerous (Lawson, 2017). For social media sites, in the US 79% of online adults are using either Facebook, Instagram, Pinterest, LinkedIn or Twitter. Users seem to have a lack of concern for personal information that is being presented and stored by these websites. By finding themselves less attached to the responsibility of managing their own cyberinformation, the job of cybersecurity is being inadvertently pushed upon employers and managers of companies and the aforementioned websites.

Attempts to Increase Cyber Awareness

Since the most recognized factor preventing safe cybersecurity practices from be pervasive throughout the general population is lack of knowledge, government awareness campaigns have been attempted to mitigate this factor. The Cyber Security Awareness Act of 2011, introduced by Senators Sheldon Whitehouse (D-RI) and Jon Kyl (R-AZ), was an attempt to bring awareness to the public. This was done in the hopes of giving transparency to the public about the cyber-attacks and threats that could directly affect the average person. It highlighted that there were three main problems that led to the public's unawareness to cybersecurity. Those being: lack of clear definitions of key terms and problems; the inconsistent use and quality of

evidence; the lack of transparency of both government and industry. Even terms that are used daily by those in the cybersecurity field such as "breaches" and "sabotage" were not expressly defined by the government, which no doubt aided in the lack of knowledge about cybersecurity. In 2013, this problem was brought up again in the Cybersecurity Public Awareness Act of 2013, which built upon the previous act but also stated out-right that the level of public awareness of cyber threats is unacceptably low.

This lack of knowledge about cybersecurity by the average person is further affirmed by a study done by Hadlington. This study found that 98% of employees believed that management at their companies should handle cybersecurity. Additionally, 58% that they have no knowledge of how to protect their company and themselves from cybercrime (Hadlington, 2017). The research seems to indicate that people—rather than machines or the devices they use—are characterized as the weakest link in the cybersecurity chain (De Bruijn & Janssen, 2017).

Threat of Social Media and Other Websites

The type of website that a person on the Internet uses can determine how vulnerable they are to a cyberthreat. Email and social media accounts are heavily preyed upon by would be hackers. A review done by Beata Biały, senior expert at the NATO Strategic Communications Centre of Excellence, found that the best way to combat hackers is to make social media users aware of a risk they may face via many different social media platforms (Biały, 2017). It was recommended that social media users or would be social media users should be told basic knowledge about hostile activities and the risks involved with using these sites (Biały, 2017). Password usage for the accounts linked to these sites is also coming under threat due to improper cybersecurity practices. A review by Jim Routh, Chief Security Officer of Aetna and Chairman of the NH-ISAC Board, found that the use of passwords is becoming increasingly less effective due to a user possibly reusing passwords or logging into multiple different accounts with the same credentials. Binary authentication through a password as the primary user access control is becoming slowly obsolete. This has led to Social Security Numbers being stolen and made available on the Dark Web to be sold (Routh, 2017).

Supporting the literature, the following study looks at what factors influence an individual's cyber protection and what impact personal cyber awareness may have in changing an individual's behavior online.

METHODOLOGY

To understand the actions individuals took to secure data and protect themselves against cybercrime, a study was conducted at a diverse mid-Atlantic university. A mixed-methods research design was used in which an online survey tool which was sent to selected respondents via email. A total of 23 questions were asked. Of those questions, 7 questions asked demographic information, 14 asked respondents to rate based upon a 4 point Likert scale and 2 questions asked for both quantitative and qualitative information.

Participants

The participants included undergraduate students and graduate students. A total of 93 students received the survey and of that number, 68% completed the survey. All student participants were enrolled in a business school class and selected based upon instructor willingness to send out the survey. The age of the respondents ranged from less than 20 to over 40 years of age with

26% under 20 years of age; 56 % between 20-29 years of age; 10% between 30-39 years of age; and 8% 40 or more years of age. Forty percent of the respondents were female and 60 percent were male. Fifty-six of the respondents were international students and 44% were American students. Ninety-two percent of the respondents were undergraduate students and 8% were graduate students. 67 percent of respondents had a technical background of which some were IT and Cybersecurity majors.

RESULTS AND IMPLICATION OF THE STUDY

Individuals were presented with scenarios of data protection activities and asked to identify which action they most closely modeled. Table 1 describes the scenario and results:

Table 1 Individual's Actions for Data Security

Cyber Activities	**Percent of individuals selecting this scenario**
Simple Passwords; Online shopping at Starbucks (no VPN)	16%
Complex Passwords Rarely change the passwords Only online shop on secure networks Reuse Passwords	33%
Complex Passwords No duplicate passwords Check credit scores and bank activities sometimes (every few months)	36%
Complex Passwords Passwords changed quarterly Check credit scores and bank activities monthly	15%

Individuals were asked to identify what levels of privacy were applied to various types of content. Table 2 describes what populations of individuals were given access to the following data types. The individuals were also asked if the population who had access to their photos impacted what photos they posted. Sixty percent of the respondents said that their decisions as to what photos to post was dependent upon who was able to see them.

Table 2 Data Content Access

Data Content	Accessible to only close friends and family	Accessible to casual friends	Accessible to the general public
Pictures	48%	41%	11%
Comments	33%	45%	22%
Demographic Information	57%	35%	8%
Blogs	37%	38%	25%

Another question asked respondents whether they had been hacked. Eighty-one percent reported to not have been hacked however several of those that been hacked provided detail about their experience.

- *"I lost some emails address, PS4 accounts and social media accounts. the reason why they hacked me because of very simple questions and same email address foe many accounts!"*
- *"I lost access to a Hotmail email account. So, I moved to Gmail and used 2 factor authentication"*
- *"Email hacked"*
- *"EBay hacked"*
- *"I play video games and this was back in 2013 my PlayStation kept getting hacked which meant the hacker had control over my information and he was able to turn off and turn on the PlayStation whenever he felt like it. Pretty much I got sick of it and learned a way to change my IP address so he can no longer control it."*
- *"I got my Facebook hacked and some other video games."*
- *"A $100 charge from amazon was charged to my account, so I had to change cards."*
- *"Someone attempted to get into my ICloud account but apple stopped it and made me change passwords"*
- *"Hacked by email than it led to hacking all my social media accounts"*

Respondents were given a list of activities and asked to rate on a scale of 1 (lowest) to 5 (highest) their concern for being hacked. Table 3 describes these results. Another question asked respondents what types of cyber intrusions they had experienced. Respondents reported that 68% received a suspicious phone call; 76% had a computer virus; 40% had computer spyware; 33% had a hacked password; and 17% had hacked home network.

Table 3 Hacking Activity Level of Concern by Activity

Activity	Very Small Concern	Small Concern	Neutral	Concerned	Very Concerned
Online Bank Account	21%	8%	27%	16%	28%
Email Account	16%	8%	27%	28%	21%
Email Message	16%	8%	33%	27%	16%
Personal Computer via virus	11%	10%	22%	21%	37%
Personal Computer via spyware	10%	8%	27%	33%	22%
Personal information stored on computer hard-drive	10%	3%	32%	22%	33%
Personal information stored on the cloud	10%	11%	30%	25%	24%
Amazon Account	16%	11%	35%	22%	16%
Other online shopping accounts	16%	6%	33%	25%	19%
Cellphone	10%	13%	25%	21%	32%

Another question asked about receipt of a suspicious email. Seventy-eight percent of respondents reported to have received a suspicious email. Of those receiving a suspicious email 68% reported that they clicked on the embedded link in the email. Table 4 describes what happened after clicking on the link. Respondents reported that multiple events could occur from one click.

Table 4 Results from Clicking on a link in a suspicious email

Result from clicking on the link	Percent reporting the following possible actions
Sent emails to my contact list	30%
Slowed my computer down	41%
I lost data on my computer	32%
I had to reformat my computer	36%
I had to get a new computer	25%
It damaged the network I was on	25%
I couldn't detect any change to my computer or data	68%

Several questions focused on user attentiveness to checking data for breaches. Table 5 describes the frequency of which check various accounts for unaccounted accesses to the data.

Table 5 Data Access Validation

Data Type	Monthly check	Quarterly check	Semi-annual check	Yearly check	Only if alerted by the source	Never
Credit cards	62%	10%	3%	5%	14%	6%
Credit score	30%	9%	5%	13%	24%	19%
Driving record	14%	10%	6%	13%	32%	25%
Library activity	11%	6%	5%	11%	27%	40%
Banking activity	65%	5%	3%	2%	17%	8%

Another topic covered in the research was password usage. Sixty-three percent of respondents reported to use the same password on multiple sites and devices. More than 95 percent of respondents reported to have a password on their cellphone, computer and home network. Eighty-seven percent reported to have a password on a tablet or iPad. When asked the frequency for changing passwords, Table 6 describes this activity for a selected group of activities as defined in the survey.

Table 6 Frequency for Changing Passwords by Activity

Activity	Change every 3 months or less	Change every 3-6 months	Change every 6-9 months	Change annually	Never change
Email	14%	11%	14%	17%	44%
Banking	14%	10%	14%	17%	45%
Amazon	13%	5%	14%	5%	63%
Facebook	8%	6%	11%	8%	67%
Snapchat	11%	5%	19%	6%	59%
Shopping sites (not Amazon)	11%	5%	11%	10%	63%

The final question asked respondents if after taking this survey they were more likely to change their data security habits. Table 7 describes the results for several distinct categories of cyber activity.

Table 7 Post-survey Changes in Cyber Activities

Cyber activity	Unlikely to make any changes in cyber behavior	Minor changes in cyber behavior	Some changes in cyber behavior	Many changes in cyber behavior	Very Many changes in cyber behavior
Passwords	21%	21%	30%	20%	8%
Wireless Access	33%	19%	30%	13%	5%
Data Storage	30%	18%	29%	13%	10%
Data Privacy	27%	15%	29%	16%	13%

SUMMARY OF FINDINGS

Findings from this study revealed that respondents were inclined to change their cyber behaviors when they were made self-aware of their behaviors. Concerns over hacking and suspicious emails remain to be a high priority with individuals and password management such as the use of duplicate passwords and infrequent changing of passwords was high by respondents in the study. Discussions about data privacy and methods to hinder hacking activities continues to concern individuals, however actions to prevent these activities are more reactive than proactive.

The findings identified two main areas where respondents expressed concern for are hacking and data compromise. These included bank account information and personal information. Device hacking was also of concern with more than half of all respondents reporting to be concerned or very concerned about having their computer or cellphone infected with a virus or spyware. These findings suggest that individuals do not believe that their virus protection products will be able to keep them safe from hackers.

Cyber Information Concerns

Results of the study clearly showed that individuals are most concerned with having their financial information compromised or stolen. The study revealed that more than 70% of the respondents monitored credit card and bank activity at least monthly without any prompting by their respective financial institutions. Almost 45% of respondents expressed concern or great concern of having their online bank accounts hacked. Forty percent checked their credit scores at least quarterly however 24% relied on a third party to notify them if an unusual activity occurred with their credit score. One possible explanation for why credit scores were of less concern to the respondents could be due to the demographics being primarily under the age of 30 with less exposure to the importance of credit scores.

Although protecting financial data was a very high concern, hacking of personal data ranked as the number one area of either concern or great concern among respondents. Security of the cloud had the highest concern with almost half of all respondents expressing concern of having their personal information hacked on the cloud. 45 percent reported to be concerned with hacking of their personal computer and more than half of all people said viruses and spyware was a concern or great concern.

Cyber Protection Behaviors

The findings support the literature that it is very difficult for users to identify a phishing attack especially as these phishing attacks become more sophisticated and utilize the user's personal information. Three out of four respondents reported to have received a phishing email and one quarter of those individuals clicked on the embedded link. When asked what happened after clicking on the link, 68 percent of those clicking on the link did not see any negative repercussion from that action. It suggests that people may not have known what to look for after the event. Others reported to lose data, computer slowdown, computer damage, network damage or stolen contacts.

Although overwhelmingly (96%) of respondents reported to use password on personal networks and devices such as computers, tablets and cellphones, the management of the passwords fell short of suggested password management procedures. One third of the respondents reported to have had their password hacked but only about half change their passwords or use complex passwords. Sixty-four percent of individuals reused passwords and more than 60 percent of all respondents reported that they change r their online banking accounts passwords only once a year if at all. Two-thirds of all respondents never changed their Facebook, Amazon or other shopping sites passwords. This is particularly interesting given that respondents were expressed significant concern with hacking of their financial accounts yet were not using complex passwords which were routinely changed.

Lessons Learned

As validated in the literature, continued education is imperative to keep online users current on techniques to keep data and identities safe in this fast-moving cyber world. Hackers rely on uninformed, unprotected online devices and "things" to steal and penetrate networks. It was the author's intent to use this survey served not only as a vehicle to collect data but also to make users aware of potential cyber threats. Two-thirds of all respondents reported that after taking this survey they were likely going to make changes to their password management, wireless

usage; data storage strategies and data privacy. The area of data privacy reflected the largest number of individuals reporting to make changes to their behavior regarding data privacy.

CONCLUSION

Cyber protection continues to grow in importance especially as the number of devices that connect to the network grow in number and complexity. Understanding what types of security is needed to protect users from data theft, privacy invasions and financial losses are real issues that plague users. Password management becomes an unmanageable task with users reporting to have an estimate of visiting 19 different websites that require a password. The number of unique passwords on average is lower than the number of different websites that are visited – thus reusing passwords is necessary for users to reduce cognitive overload (Wash, Rader, Berman & Wellmer, 2016). Multiple devices with simple user interfaces, allows users to have an easier access experience but often leave users with no understanding of when the device is compromised or how it can be fixed. This paper addressed user experience and cyber hygiene behavior. It demonstrated that through education, such as the survey used in the research, users became aware of their cyber behavior and many of them reported that they most likely would make changes to protect their data, privacy and computer devices from cyber-attacks.

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Designing a Composite Measure of Course Load Difficulty Using Machine Learning by Assessing Drop, Withdraw, and Failure Rates

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ABSTRACT

Student attrition is an ongoing issue in higher education, with numerous scholars examining the issue from multiple perspectives. Prior work has been conducted to predict student attrition by using university data to build machine learning models and proactively target students at risk of leaving the university. In a separate area, work has been conducted assessing the influence that drop, withdraw, and failure (DWF) rates of courses has on multiple facets of the enterprise of higher education. Building on these two areas of work, this research designs a new composite measure to be used as a predictive analytic to measure an individual student's course load difficultly, based on historical (DWF) rates. This research contributes in two ways: by providing the composite measure's algorithm from historical data, and by presenting the prediction power of the composite measure for attrition.

Panel Discussion

Developing a Marketable Skills Curriculum for Student Success

Today's higher education curricula are packed with classes that we have deemed necessary in order to prepare students for the workforce of tomorrow. However, in all the various programs do we educate our students to be more marketable by emphasizing "soft skills"? Research has shown that 57% of business leaders value soft skills over hard skills and only 11% of employers feel students are adequately prepared for careers. Soft skills including concepts such as:

- Social skills
- Confidence
- Basic professionalism
- Self-management and initiative
- Collaboration
- Teamwork
- Leadership
- Critical and creative thinking
- Communication
- Networking
- Flexibility

The list is almost endless, but the end result is that students need to be better prepared to function in today's ever- changing environment. The three most employer-valued skills are critical thinking, teamwork/collaboration and professionalism/work ethic. Being proactive with students in examining their skills and how this impacts career planning will result in a workforce-ready, professional graduate.

Career planning is not an activity that should be done once and then left behind as we move forward in our jobs and careers. Rather, career planning is an activity that is best done on a regular basis — especially given the data that the average worker will change careers (not jobs) multiple times over his or her lifetime.
Career planning should be proactive and ongoing yet at the same time a rewarding and positive experience. However, from the higher education perspective, we need to start this process with our students early on and not wait until their senior year to suddenly remind them that they will need to build a career portfolio.

Panelist and Moderator: Sharynn Tomlin, Ph.D.
Angelo State University
Associate Dean, MBA Director
Norris-Vincent College of Business

PATHWAYS TO SUCCESS PROGRAM

The Texas Higher Education Coordinating Board has recently issued its 60x30TX initiative to significantly increase the number of post-secondary students earning certifications and degrees. The expected result is a robust increase in the number of people entering the workforce with greater skills and knowledge and the prospect of better, higher paying jobs leading to increased economic health for the state.

Following this mandate, Angelo State University has initiated a "Career Pathways" program that attempts to provide students with a curriculum that provides an emphasizes on building marketable skills. In the past, the career portfolio building activity was developed in the graduating seniors' capstone class, but now we are re-thinking that process and utilizing new software tools that will start with the freshmen class to initiate this process. Adoption of the Foliotek (Pearson) product in combination with the digital badging (soft skills credentialing) software will follow the students throughout their higher education and culminate with a useable portfolio suitable for the job market. The stages of the Career Pathways Program are as follows:

Class	Foliotek	Digital Badge
BUSI 1301 – Introduction to Business	Getting Started; Self-Discovery; Research Careers and Programs of Study	Basic Professionalism; Communication
BUSI 2301 – Legal and Social Environment	Build an Academic Plan; Develop a Personal Brand	Mindset, Self-Management & Initiative; Social Responsibility
MGMT 3301 – Principles of Management	Build Skills for Any Career; Career Portfolio (Resume and Cover Letter)	Collaboration and Teamwork
MGMT 4303 – Strategic Management (capstone)	Networking (Job Search); Interviewing; Consider Your Opportunities	Critical and Creative Thinking; Leadership

Each activity includes a milestone walkthrough, assignment, practice exercises and a Linkedin activity. By the completion of year four, the student will have built a marketable portfolio that can show their resume, projects, digital badging, website, blogs, projects, etc. Additional career development opportunities include College of Business job fairs, mock interviews, etiquette dinners, career clothing closet to mention only a few. If time permits a demonstration will follow.

Panelist: Brad R. Johnson, Ph.D., J.D., C.P.A.
Francis Marion University

EXPERIENTIAL LEARNING OPPORTUNITY FOR ACCOUNTING MAJORS IN THE SCHOOL OF BUSINESS AT FRANCIS MARION UNIVERSITY WITHIN WHICH STUDENTS LEARN MARKETABLE SKILLS

In the Francis Marion University (FMU) School of Business, Dean Hari K. Rajagopalan encourages and supports proposed initiatives of the school's faculty and staff to reach out and serve the needs of the Pee Dee Region. During the 2017-18 academic year (and for the prior fourteen (14) academic years) the "V.I.T.A. Initiative" has directly affected the accounting curriculum within the FMU School of Business by providing experiential learning for accounting majors, thereby supporting the REAL (**R**eady to **E**xperience **A**pplied **L**earning) Program efforts at FMU. In particular, the V.I.T.A. Initiative provides students with a dynamic learning environment within which they learn marketable skills, both hard and soft.

The V.I.T.A. Initiative

Governmental entities have long recognized the benefits of partnering with non-profit entities to more efficiently and effectively provide needed services to their constituencies. As an example, FMU and the Internal Revenue Service (IRS) became S.P.E.C. (**S**takeholder **P**artnership **E**ducation and **C**ommunication) partners in V.I.T.A. to reach out to the Florence community for the purpose of electronically preparing and filing federal and state individual income tax returns during the 2017 filing season (in 2018). This V.I.T.A. (**V**olunteer **I**ncome **T**ax **A**ssistance) Initiative has been popular for several decades at many universities around the country. At FMU, the initiative is led by Dr. Brad R. Johnson, Associate Professor of Accounting and Accounting Program Coordinator. For the academic year (2017-18), the initiative began by accounting students taking ACTG 328 (Federal Individual Income Taxation) from Professor Johnson in Fall 2017. Subsequently, for those accounting students who decided to take ACTG 428 (Federal Taxation of Corporations and Partnerships) from Professor Johnson in Spring 2018, participation in V.I.T.A. was required. In Spring 2018, Dean Rajagopalan graciously agreed to allow the 18 accounting student volunteers in ACTG 428 to use the FMU School of Business lab once per week (on Wednesdays from 5:00 pm to 9:00 pm) for the purpose of electronically preparing and filing federal and state individual income tax returns for any person from the Florence community who elected to use the services provided by V.I.T.A. One day in January 2018, the IRS came to the FMU School of Business lab, set the defaults for the web-based software (Taxslayer), and trained the accounting student volunteers in the use of said software. Note: Over 450 sets of federal and state income tax returns were electronically processed by the accounting student volunteers during the 2017 filing season (in 2018). It is in this manner that the V.I.T.A. Initiative provides the accounting student volunteers with a dynamic learning environment within which marketable skills, both hard and soft, are taught.

Specifically, during the 2017 filing season (in 2018), students were assigned to groups of two (2) students for the purpose of (1) preparing, (2) reviewing, and electronically filing a taxpayer's 2017 Federal income tax return. Groups were established to allow an extension of the andragogical

learning experience. In this fashion, group work supplemented the pedagogical approach of the conventional classroom and cultivated the positive characteristics of the adult student. Students were assigned to collaborative learning groups under the assumption that students teach each other and learn from each other. This collaborative effort became an important part of a student's learning experience and resulted in the following benefits:

- Group members developed friendships that supported the learning process.
- Collaborative and cooperative learning had a positive effect on student achievement, multi-ethnic relationships, self-esteem, and attitude toward course content. (Cooperative learning occurs when all members of a learning group contribute to each other's learning.)
- Collaborative group outcomes promoted effective utilization of the divergent skill levels of group members.
- Group members were actively engaged in the learning process, which made the learning process more relevant and interesting.

An objective of the V.I.T.A. Initiative was to allow each student to demonstrate his or her development of discipline-specific critical thinking skills and talents. Such skills and talents include the ability to:

- Stop being passive memorizers and become active thinkers concerning central course material.
- Conduct a topical search using an electronic database (e.g., RIA's Checkpoint System).
- Discover issues and create propositions within the content discipline (individual income taxation).
- Weigh, synthesize and reshape information to form logical, cohesive arguments and thereby think from multiple perspectives.
- Become more skilled at focused argumentation.
- Recognize black letter law in a form that describes legal consequences given that certain conditions (propositions) exist.
- Use deductive (or syllogistic) reasoning in applying black letter law to various sets of facts and circumstances, where (1) black letter law represents the major premise, the facts represent the minor premise and (3) the conclusion reflects a combination of the major and minor premises.

Panelist: Michael Latta, Ph.D. & Accredited Professional Statistician
Coastal Carolina University

QUALITY EXPERIENTIAL LEARNING PROGRAM FOR MARKETING AND COMMUNICATION MAJORS IN THE SCHOOL OF BUSINESS AT COASTAL CAROLINA UNIVERSITY WITHIN WHICH STUDENTS LEARN MARKETABLE SKILLS

At Coastal Carolina University, faculty who are looking for ways to enrich student learning, enhance their teaching, and revitalize their curriculum are encouraged to consider creating a new Q course, or adding an active learning component to their existing course. The Q refers to the University's Quality Enhancement Program (QEP), initiated in 2012, and to the Quality

Experiential Learning program that has grown out of the QEP. An example course is Advertising MKTG 450 where marketing and communication students learn marketable skills in creating stories, coding to produce an animated video, and project management.

Purpose of the Course: The chief purpose of Advertising to prepare the student for his or her 'best and highest' Advertising leadership position after graduation by developing critical thinking, problem identification and solving, as well as creative communication skills utilized in Advertising.

An Animated Video Advertisement Project: A major graded course component is a project utilizing the Alice animated video program to create an advertisement to be shared with the class.

Benefits of the Course:

- Involves students in learning opportunities outside the classroom to better prepare them for their future roles as citizens and community leaders.
- Eligible for "Q" course Experiential Learning recognition.
- Courses with an active learning component invigorate teaching pedagogy.
- Provides a departure from a traditional teaching approach.
- Connects the student to the curriculum by focusing attention on soft skills.
- Engages students in a more active learning process.

Teaching Philosophy: Most students already work or will work as part of a business organization. Some of these work experiences are exhilarating, while others are exhausting. Some are cooperative, while others are filled with conflict. Some turn into high performing organizations, while others never become more than clusters of people. In Advertising, the interest is in building those healthy, high-performing business leaders of organizations of tomorrow by providing effective learning opportunities. Here, the emphasis is on more than just knowledge comprehension. The focus is also on skill development because managing projects, working with others, being a leader, solving problems, creating new opportunities, managing ourselves, and communicating constructively all require an integration of knowledge and skill.

Course Impact: This course has enrolled an average of 36 students each semester and they have produced some high quality animated video advertisements since 2013. These animated videos serve as demonstrations of marketable skills in creating stories, coding to produce an animated video, and project management. Many students also use their video as part of a portfolio in interviewing for jobs after graduation.

Panelist: Gail D. Moore, JD, CPA
Lander University
Associate Professor of Accounting
Internship Director
Emphasis Coordinator, Accounting

DEVELOPING A MARKETABLE SKILLS CURRICULUM FOR STUDENT SUCCESS

The Lander University College of Business offered a traditional capstone course named BA 499 for all seniors. In this class, we covered the usual topics of resume writing, job skills,

elevators speeches and etiquette and dress. What the College of Business learned from speaking to our students and our prospective employers was teaching these "soft skills" during a student's senior year was too late. Our students needed the soft skills of networking, presentations, working in teams, and one-on-one communications prior to their senior year. Thus the Lander University College of Business Professional Development Series was developed.

The University now offers BA 299, BA 399, and BA 499 (entitled Professional Development I, Professional Development II, and Professional Development III) for students to take in progression during their sophomore, junior and senior years. These classes begin with teamwork, resume writing, basic interview skills, elevators speeches and practicing presentation skills in BA 299 and continue with networking with the community, one on one communication as well as working in teams and continuing with presentation skills in 399. Interview and meal etiquette, inter-personal skills, job search skills and finalizing interview skills are discussed in 499.

These skills are learned through a combination of class work and in the field activities such as networking nights with the local community, etiquette dinners with speakers and guests at each table, one-on-one conversations with professors as well as mock interviews with professors and business leaders in the area. It has been successful for our students and well received by our local business community.

Panelist: Janice A. Black, Ph.
Coastal Carolina University
Professor, Strategy & Entrepreneurial Management
E. Craig Wall Senior College of Business

PROFESSIONAL DEVELOPMENT ACTIVITIES

In the E. Craig Wall Sr. College of Business, before students may graduate they must complete a set of professional development activities (PDAs) that require a time investment by the students but no tuition or official credits. These are a graduation requirement. Students must choose one from each of 6 areas plus an additional 6 professional development activities. The six areas from which a student is required to choose at least one professional development activity are: Majors and Careers; Experiential learning; Leadership Development; Building a Professional Profile; Interviewing Skills; Transitioning to the Profession.

- Soft skill related PDAs under Majors and Careers include: Connecting with a Faculty Mentor; Knowing your Options for a Business Major; Charting a Professional Direction; Choosing the Right Major for You
- Soft skill related PDAs under Experiential Learning include: Job Shadowing; Finding the Perfect Internship; Dream Careers
- Soft skill related PDAs under Leadership and Development include: WIPL Women's Leadership Conference; Wall Connections Keynote Speakers; CEOs Sharing

- Soft skill related PDAs under Professional Profile include: Crafting your Resume, Resume Do's and Don'ts, Rapid Resume Reviews, LinkedIn 101, Building your Online Portfolio, Building your Brand with Social Media
- Soft skill related PDAs under Interview Skills include: Basic Oral Business Communications; How to Ace a Job Interview; Speed Interviewing; Interview like a Rockstar; Mock Interviews
- Soft skill related PDAs under Transitioning to the Profession include: Utilizing the Business Card; Off-Campus Business Networking Opportunities; The Art of Networking; Salary Negotiation and Career Skills; Using CCU Technology to Find a Position; Job Search Strategies; Career and Internship Fair Attendance
- Soft skill related PDAs under an Other Category include:
  - Vita Program Volunteer
  - Leading a Student Organization
  - Doing a Professional Internship
  - Participating in a Study Abroad Program
  - Attending any of the following workshops
    - Professional Oral Presentations
    - Linked In Intensive Activities
    - Career Fair Intensive Activities
- Other outside event that is petitioned

Panelist: Sara Kiser, Ph.D.
Alabama State University
Faculty Athletic Representative
College of Business Administration

The College of Business Administration at Alabama State University has a course for freshmen/sophomore level students titled MGT 201, Business Orientation. This is a class which has evolved over time since its inception in 2013. It started off as a team-taught class in which the faculty rotated between the sections to cover certain areas – math, communications, and professional development (career ladders, etc.). Students would be tested in this course to determine if they were ready to move forward or needed further remediation. When testing funds dried up in 2016, then the course changed. It became a course with only one instructor covering all the areas. Now it has become more of a professional development course. It focuses on career ladders, professional dress, public speaking, different types of writing styles – briefs, cases, etc. It provides a basic overview of what they should be facing in their 300 and 400-level courses. Professional dress is a part of the curriculum as the College requires business casual two days a week and professional dress two days out of the week.

Does Personalization Matter in the Taxi App Industry? A View from a Modified Technology Acceptance Model

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ABSTRACT

The importance of "Good Service" is widely recognized in the contemporary business world, especially in the service industry. Good service, translated as personalization and determined by the preference of customers, leads to the company survival and development. This study, in view of the mentioned importance of "Good Service", tests the effect of "Good Service" on customer's behavior in a highly competitive industry in a highly competitively industry in China. As China has been the largest market of smartphone users in the world since 2012 with an estimated 663.4 million users in 2017, the operation of several service apps in China has become the classic paradigm when similar apps are introduced into other markets. This study aims at analyzing the taxi apps industry in China and identifying the key factors of app personalization that influence attitude and intention of users. Technology Acceptance Model (TAM) is applied as the major theory to explain user's usage attitude and intention in selecting the app. Then, we use 231 survey data to verify the proposed hypothesis in regression model in SPSS and AMOS. The intended results provide the developers of the taxi app with suggestions of the essential attributes of the app function which are deemed to acquire market share and improve competitiveness. This study contributes to the field in two aspects. In practice, we tested six determinants and concluded that ease of use, usefulness, and popularity positively influence both user intention and attitude while perceived risk negatively affects both depended variables with the user's age, gender, education level, income level, and familiarity with smartphone considered. However, incentive motivation affects usage intention positively but not associated with user attitude. As of the key determinant considered in this study, personalization influences passengers' attitude and their behavioral intention in a non-linear U shape, but only significantly influence the attitude in a linear relationship. In theory, the study demonstrates that TAM model can be applied to test major determinants in the service app industry and, more importantly, we showed that a modified TAM to include the non-linear relationship seems to be a possible application.

Drones: 4DTApplications in US Industry and Public Policy

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ABSTRACT

As technologies emerge, public policy can be a means of ensuring that technology makes sense for a culture. For example, as communication technologies emerged in the 19th and 20th centuries, public policy ensured the technology operated in everyone's interests. Public policy is also the means by which the Internet and the field of nanotechnology were able to develop. Most often public policy is used to make sure that completing interests are fairly served, as evidenced by Intellectual Property laws.

Drones can be used to perform tasks that are dirty, dangerous, require dexterity, are dear (or expensive) and tedious for humans to do. Some examples are drones in the military and firefighting efforts. Despite the benefits of drones, their application is limited due to the legal constraints and a lack of regulations. Public policy regarding drones is trending towards restrictions. This trend poses an interesting question: Will regulatory restrictions will reduce the utility of drones?

ENHANCING INFORMATION SECURITY USING A BIOMETRIC FEATURE

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ABSTRACT

For the last three decades, information security has changed and evolved significantly. Using technology to facilitate information security becomes a growing field and needs to be explored further. Standard forms of security procedures such as firewalls and anti-virus software, do not provide a comprehensive method to protect sensitive information. Advanced security methods such as biometrics are being used to provide more security at the personal and organizational level. This paper explores the applications of biometric features in enhancing information security. The biometrics technologies have affected security in today's society, whether it is information security, network security, application security, or operational security. These technologies can provide a better security procedure by adding another layer of security that reduces the potential threats of the information exposure. This research combines the password security measure with the use of biometric features. Whether it includes fingerprints, DNA, retina, typing rhythm, gestures, or voice recognition, these physiological and behavioral characteristics will assist the authentication procedure. An interactive interface was designed to collect security related information along with a fingerprint submission procedure for enhancing the security. The designed model includes an interface, security operation enhancement, and a supported database. The results of implementation show that maintaining fingerprint characteristics using a database add another layer of security to protect customers and small business information process.

Keywords: Information security, biometrics features, security enhanced operations

I. Introduction

Computers have truly changed the way we as humans operate in everyday life. Today most households have at least one computer. These computers are interconnected to share and process public and private data on a global scale. Although such a large scale network assists us with daily tasks, it also makes us more vulnerable. The interconnection has provided an environment in which new applications were developed and virtual stores are established (Santanya, 2011).

As the field of technology progressed and the Internet became more popular, we experienced new levels of security threats to networks and personal information. There were also many companies who were affected by some security breaches. Companies like Target and Yahoo, have fell victim to major security breaches (Perlroth, 2016). Yahoo also confirmed that the attack involved sensitive user information from user's names, telephone numbers, dates of birth, and encrypted passwords. The attackers are believed to

have stolen Yahoo's source code and used it between 2015 and 2016 to create forged cookies, allowing them to login to users' accounts without their details (McGoogan, 2017).

In today's fast changing environment, technology makes it nearly impossible to prevent every attack. Prevention requires a new approach and technology. The implementation of biometric features may enhances information security. Biometrics is the unique process of recognizing humans based upon their physical or behavioral traits (Rouse, 2015). These features can be used as a source of identity access management and access control. Physiological biometrics include things like fingerprints, face recognition, DNA, and iris recognition. While behavioral biometrics include someone's typing rhythm and voice. These features play a significant role in computer security, cyber security, information security, network security, application security, or operational security.

Statement of the Problem

Safety and security holds such a high level of importance to us all. Whether it is a personal computer or a business computer a plan should be put in place for protecting the information assets. With the growing of the Internet, hackers find new ways of interfering with data and corrupting the personal files of others. Data should be protected, and computer security is the framework for keeping personal data or a company's data sheltered (Looper, 2016). Even the most modern version of antivirus software does not give consumers or enterprises what they need to compete in the hacker's world. Some common techniques that are used by intruders are packet sniffing, denial of service, Trojan horse programs, back door and remote administration programs, and unprotected windows shares (Hacker's Methods, 2016).

Biometrics features make it possible to add another layer of authentication on a system. Biometrics provides security benefits across the spectrum, from IT merchants to end clients, and from security system developers to security system users (Biometric Security Technology, 2016). The explosiveness of biometrics features contribute to development of security applications in identification, security, usability, and accuracy, which are all vital in the way we access information (Le, Sarah, 2015).

Statement of the Objective

Authenticating using biometric verification is definitely becoming more popular in commercial and public security systems. It is a great improvement over passwords as a means of authenticating an individual (Rouse, 2015). Biometrics, a form of network defense and information security, is a more sophisticated and complex form of security. Enhancing a company's skill to protect its sensitive data is a key factor in stopping a breach or cyber-attack. Hierarchical structure of data protection is also a great benefit of the biometrics approach. With this added benefit information is more secure (Biometric Security Technology, 2016).

Of the many methods that biometrics consist of, fingerprint identification would be a wise choice to utilize. It is known that throughout life a person's fingerprint remains the same. In over 100 years of fingerprint research and assessment throughout the world, there have been no two individuals with the same matching fingerprints ever. To compare the pattern of multiple fingerprints and successfully complete fingerprint identification, you must analyze the ridges and furrows that lay on the fingertips also the minutiae points of a specimen print. You then compare it with those of other prints that are on file in the database (Technovelgy, 2016). The objective of this research work to apply the unique fingerprint features to enhance the level of the security and access control to sensitive information.

II. Background

As the technology gradually becomes more sophisticated and integrated into our daily lives, the reason and motivations for hackers to access personal and private information also exponentially increase (Cloudbric, 2015). Most computer hackers hack because of curiosity, to bypass restrictions, or to test their computer abilities (Hope, 2017). Other reasons can include hacking for profit, revenge, and destruction.

If a client's computer is not protected, the personal information of the client can be accessed and stolen by identity thieves and other fraudsters (Becerra, 2013).

Computer security is defined as measures and controls that ensure confidentiality, integrity, and availability of information system assets including hardware, software, firmware, and information being processed, stored, and communicated (Auffret, 2013).

Cyber security is defined as a group of technologies that are intended to provide protection to specific computers, networks, and unauthorized entry through processes and practices (Rouse, 2016). There are multiple fundamentals that fall under cyber security. Those necessary elements include: information security, application security, network security, and operational security

Information security, which is also called infosec, is a set of strategies for digital and non-digital information, and it manages the processes, tools and policies necessary to prevent, detect, document and counter threats. No matter how big or small a company may be there is vital importance in ensuring information security for the client's data. For every company a careful planning, implementation, monitoring and maintenance of strict controls is necessary to protect all assets, especially information which is extremely valuable to any organization (Jenny, 2016). Information security processes and policies usually entail the protection of physical and digital safety measures to secure information from hackers in the form of many attacks (Rouse, 2016). Although information and computer security are much alike, you cannot discuss the two without discussing cyber security.

Application security is the use of software, hardware, and procedural methods to protect applications from a range of external threats such as denial of service attacks, cyber-attacks, and data breaches just to name a few. In today's business landscape, the importance of application security has emerged as a leading factor impacting a company's brand perception and even its bottom line (Montesi, 2015). Applications are vulnerable to a wide range of threats due to them being more frequently accessible over networks. Application security is concerned with both preventing unwanted events (like flaws in the code that an attacker can exploit) as well as ensuring desired events (like making sure confidential data is encrypted) (Moyle, 2007). This type of security is one of the many used levels of security that companies utilize to guard systems.

Network security is another division within cyber security. As the Internet evolves and computer networks become larger, the network security become a major concern for companies to consider (Popescu, 2013). With an established network of computers and servers, the focus is how data departs or enters a device. Its processes include taking physical and software defensive actions to secure the fundamental networking infrastructure from many different attacks. Some of those forms of attacks are illegal entry, misuse, malfunction, alteration, destruction, or inappropriate disclosure (Popescu, 2013). There are experts who make certain that their connections are protected.

Operational security is an investigative process that establishes the controls that are required to protect very important and sensitive assets and classifies information assets. OPSEC initially came from a military origin. It is a term that discussed different approaches to stop possible adversaries from discovering and accessing serious and dangerous operations-related information (Rouse, 2016). Operational security has a five-step iterative process that include:

1. Identity critical information
2. Determine threats
3. Analyze vulnerabilities
4. Assess risks
5. Apply appropriate countermeasures

OPSEC main focuses are on the detection and protection of data that could give enemies clues or capabilities to put one at an inconvenience (Techopedia, 2016). Operational security dares us to be brave

and be two steps ahead of the attacker by looking at ourselves through the pupil of an enemy. This way we can find flaws before the attacker does.

There is one main goal that all of these diverse types of security share and that is to protect sensitive information and data. Because modern society has become dependent on software-based technology, security is not really an option (Programming Research, 2016). All these types of security are designed with intent to make sure clients and users of software are protected from malicious intent and hacking. To add another layer of security on to prevent many cyber-attacks would be a wise choice. This is where biometrics fits into the equation. Biometrics are unique physical characteristics, such as fingerprints, that can be used for automated recognition (Pike, 2016). Many applications today already use some of the many features that biometrics has to offer. Some of them are identification cards, immigration checks, police records, access control, security systems, banking, ATMs, and transaction management. Biometrics is also used in airports, for building access, cars, blood banks, and schools (Trader, 2013). Another application that uses some of these biometric features is PC login security. This allows only a certain person to access an account or its personal settings on the computer. Another one is webpage security, which is why you can only go on certain websites or pages. The voting solution, which is also another application, ensures that no one votes twice. Some of these applications are still being further developed.

There are many organizations associated with biometrics. One of those organizations is the Biometric Consortium. It serves as a focal point for researching, developing, testing and evaluating. The BioAPI Consortium was founded with intentions to provide a program and device freedom to programmers of many applications and to the providers of biometric service. This specific platform grew to be the Application Programming Interface (API). The Consortium consists of many different organizations and companies that have one common concern. These organizations come together to help encourage the growth of the biometrics market (Rouse, 2016). Research studying issues related to the possible use of biometrics is being done at the San Jose State University. The Intellect Association for Biometrics was formed in 2007 to address the influential and growing biometrics sector. The group represents Intellect members and companies from across the globe, seeking to ensure that policymakers and the industry are fully informed and able to address this growing market in a cohesive way. Preserved by the Criminal Justice Information Services (CJIS) Division and the Federal Bureau of Investigation (FBI), the Integrated Automated Fingerprint Identification System or the IAFIS, is a nationwide fingerprint and criminal history system (Pike, 2016). According to FBI.gov, the IAFIS job consists of producing search capabilities of fingerprints that are automated, concealed searching ability, electronic illustration storage, and electronic exchange of fingerprints and responses. The IAFIS provides these services 24 hours-a-day and 365 days-a-year. There is great benefit from submitting fingerprints electronically. Those stated above are some organizations that make biometrics more popular by the day.

III. Methodology

Biometrics is the unique process of recognizing humans based upon their physical or behavioral traits (Rouse, 2015). There are two main characteristics of biometrics with one being physiological and the other being behavioral. Physiological biometrics include things like fingerprints, face recognition, DNA, and iris recognition. While behavioral biometrics include someone's typing rhythm and voice. Biometrics features make it possible to add another layer of authentication on a system. Of the many methods that biometrics consist of, fingerprint identification would be a wise choice to utilize. Throughout life, a person's fingerprint remains the same.

In over 100 years of fingerprint research and assessment throughout the world, there have been no two individuals with the same matching fingerprints ever. To compare the pattern of multiple fingerprints and successfully complete fingerprint identification, you must analyze the ridges and furrows that lay on the fingertips and the minutiae points of a specimen print. You then compare it with those of other prints that are on file in the database (Technovelgy, 2016). This research focuses on implementing another layer of security by applying biometrics features as a foundation of model as describe below. To implement this

model, a system was designed that containing three components, which include the interface, database, and random numbers. The first is the interface.

Interface

The user interface provided allows communication with the client and permits the user login and input his/her data. Once data is submitted it will store into a database. A form was created that allows access and use of the systems. The database which creates a record for each user consists of the following information:

- First Name
- Last Name
- Level
- Login ID
- Password

Located under the password field is a message box that represents the fingerprint. All fields with an asterisk indicate that those fields cannot be left blank. If all fields are left empty and the submit button is pressed, an error message "You have not entered information" will appear. If all required fields are filled, and the submit button is pressed, your information will be stored. Once all information is inputted, the submit button can be pressed and data will be stored in the database. This same method will be used for all new users.

Database

The second system's component includes a database designed to maintain the client features and access right and process maintained features of each person. This database contains the user's first and last name, ID, security level, job description, password, and fingerprint identification. Once a new user has reached the login prompt, all required information, which depends on their security level, must be entered before the user is granted access. The database administrator will generate the random number, which represents the fingerprint of the user.

If a client is a previous user who is returning to the system to gain access, the system will prompt to enter his login ID and password. At this point, the system will check against the database to see if the inputted information is in the database. If the information is available in the database, it will grant access. Otherwise, it will deny the access.

Table 1: Features maintained in the Database

FNAME	LNAME	ID	LEVEL	JOB_DESC	PASSWORD	FINGERPRINT_ID
Betty	Lawson	F301	3	Sales Rep	Golink67$	6 28 51 53 54 64 65 78 82 100
Bianca	Smith	G764	5	CIO	DelBe987@	99 31 21 65 79 67 50 22 35 46
Chris	Brass	F45R	4	Senior Manager	&tv$fdk88	90 72 11 19 58 73 53 51 81 9

The user's security level is very important and has a crucial role in this project. The security levels range from one to five with five being the highest level of security. This security factor tells who is trying to login to the system. For example, the CEO, CIO, and security guard all have the highest level of security due to their job titles. Having this level of security, it is required to provide all the necessary data to login to the system. The required data would be first and last name, Login ID, Password, and Fingerprint-ID. If the security level includes 4 or 5 the user will be compelled to enter in all data including the full generated

random numbers, which represents the Fingerprint-ID. Security levels ranging from 1 to 3 will only have to input the first 5 numbers of their randomly generated numbers.

Table 2: Level and Job Description

LEVEL	JOB_DESC
3	Sales Rep
5	CIO
4	Senior Manager
5	CEO
2	Secretary
1	Cafeteria Worker
4	Manager
1	Janitor

Access Control

The access control is based on user ID, Password and the user fingerprint pattern. Random numbers were generated to represent a unique pattern of each person's fingerprint. Because no two people on the planet have the same identical fingerprint pattern, adding this to the project will definitely enhance security levels. Keeping this project in mind, there are ten points on each user's hand. The random numbers that were generated represents those ten points on each user's finger.

Table 3: Generating the Random Numbers

A1 =RAND()*100

	A	B	C	D	E	F	G	H	I	J
1	45	39	82	51	98	19	59	73	6	64
2	6	28	84	52	31	31	61	76	90	15
3	14	52	32	56	41	1	97	79	87	23
4	31	74	44	45	43	83	27	62	61	71
5	87	43	54	50	91	32	76	25	22	63
6	67	64	6	39	38	34	87	63	70	34
7	30	24	28	44	93	30	93	51	76	47
8	39	5	4	18	12	44	77	18	68	4
9	57	50	52	71	38	50	22	63	82	56
10	43	47	48	29	36	28	41	67	72	46

Table 3 shows the list of generated random numbers. These random numbers represent the points selected on the user's finger. They collectively represent the fingerprint pattern stored in the databased for use of access control.

The following figure shows how the system access initiation process works. The user is prompted by the question: "Are you a new user?" At this point either the user selects 'Yes' or 'No'. If Yes is chosen then the user must provide all the required information as listed below. Once a new user reaches the login screen, they must enter their first and last name, create a login ID and password based on the provided criteria, and input their level of security based on their job description.

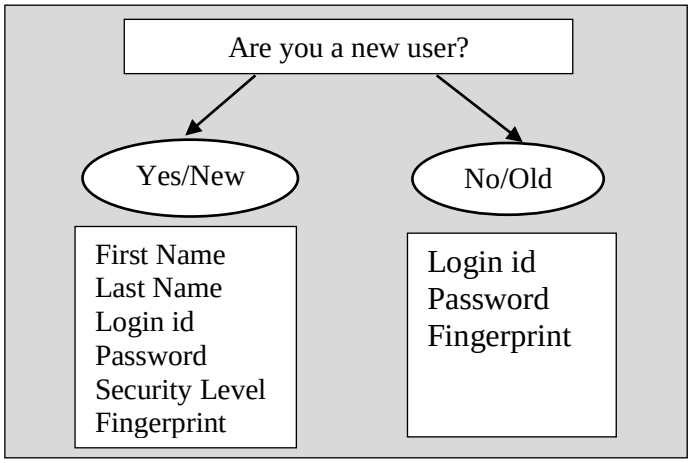

Figure 1: System Structure

If the user selects No assuming this it is an old user then the only information the system would need from the user is the login ID and password. The system then checks the inputted information to make sure that the old user's data is in the database and if so, the user is granted access.

IV. Implementation

The purpose of this project was to show how the biometric features can enhance an information security system. As indicated in the previous section, a model was developed to capture the most fundamental elements of a secure system. The model includes three major components an Interface unit, Access Control, and a Database unit. The following is a brief description of implementation of the model representing the security system.

Interface Unit

This unit was deigned to collect required data and check for valid information. In the following Figure, all the fields that are indicated by an asterisk are the essential information and must not be left blank in order to move forward with the login process.

Figure 2: Interface Unit

The process of providing information includes two major steps. In step-1 the system determines the user type and in step-2 tasks for appropriate data according to the type of user.

Step-1: Determine type of the user and required information accordingly. Figure 3 shows that the system starts by asking the "Are you a new user?" The Figure 4 show the detail if the user selects and submit 'Yes' answer and Figure 5 if the 'No' answer is selected.

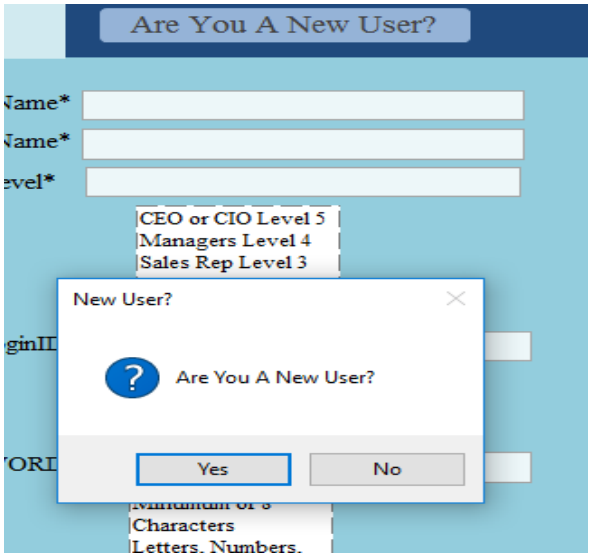

Figure 3: User Information

If the user selects Yes, then a message appears on the screen prompting the new user to input all required data as indicated in the Figure-2.

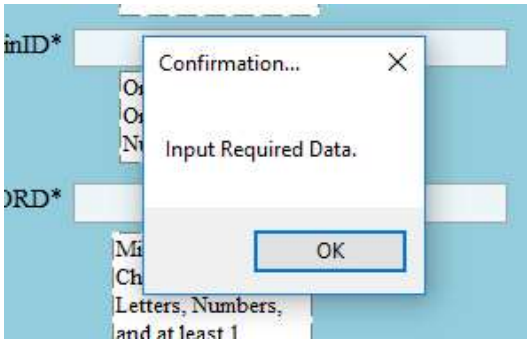

Figure 4: Input Required Data

If the user selects No, which implies that he/she is an old user, then a message appears on the screen prompting the old user to only enter login ID and password.

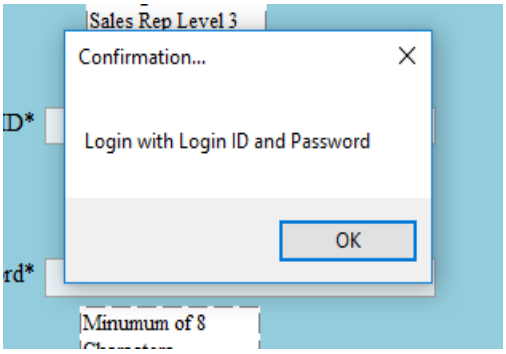

Figure-5: Login ID and Password

Step-2: Providing and determining the access right. At this point, data must be entered into the system before moving forward. Once a new user inputs all the required according to the instructions, the data will be stored into the database unit for validating the access right. The following figure shows an example of a valid data.

Figure 6: Sample User Data

Once the data is submitted for the sample user John Doe, it is added into the database as shown in the following Table. While the storing of the data is taking place, the super user will generate the random numbers in the background to represent the fingerprint of the new user.

Table 4: New Entry

RANDOM

FNAME	LNAME	ID	LEVEL	JOB_DESC	PASSWORD	FINGERPRINT_ID
Betty	Lawson	F301	3	Sales Rep	Golink67$	6 28 51 53 54 64 65 78 82 100
Bianca	Smith	G764	5	CIO	DelBe987@	99 31 21 65 79 67 50 22 35 46
Brandi	Thompson	H87Y	1	Cafeteria Worker	teAynj34$	9 8 82 69 77 10 2 88 60 53
Chris	Brass	F45R	4	Senior Manager	&tv$fdk88	90 72 11 19 58 73 53 51 81 9
Crystal	Bass	N76E	5	CEO	Get$$247	8 1 45 29 2 82 96 32 40 83
Dawanna	Albert	B645	2	Secretary	Pmukin@12	72 69 88 22 24 70 3 83 33 32
Jasmine	Willis	B67P	4	Manager	utdjh65$E	40 73 20 46 17 82 54 12 91 88
Jermaine	Smith	N605	1	Janitor	ooP7t@sw	31 26 63 96 24 30 49 90 60 48
John	Doe	Dj98	4	Manager	D0nTl$2k	43 56 77 89 22 34 10 99 39 86
Monique	West	H98T	2	Secretary	M0$$ns48	57 75 31 7 19 6 13 73 75 78

If the user selects No as the answer to the above question "Are You A New User" then the user needs to login with just their login ID and Password. If the user inputs a valid login ID and password that is already in the system, the system will grant the user access as shown in the following figure.

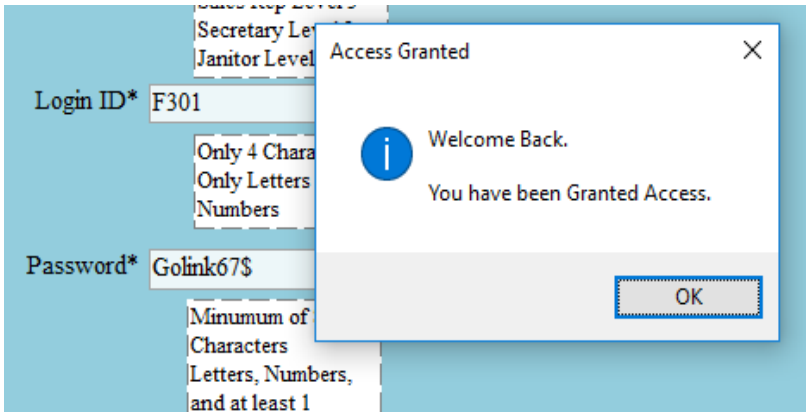

Figure 7: Generated Access

If the old user is trying to login with their login ID and password, the user's information must be available within the system. The system checks the inputted information to make sure that the old user's data is in the database. Otherwise, the user will not be able access the system. The following Figure shows the case that an access was denied because of inaccurate information was provided.

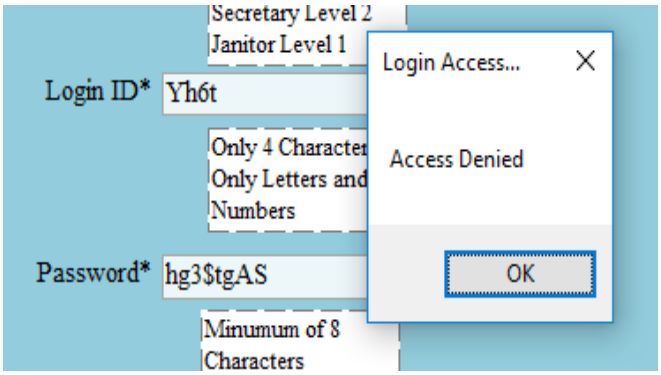

Figure 8: Access Denied

At this point the user will either need to check their login ID and password to make sure to provide correct information or request to create a new account to be granted access.

V. Conclusion

As long as sharing information represents a fundamental element of society's function, security will remain an ongoing issue. Using technology to facilitate information security becomes a growing field and needs to be explored further. Standard forms of security procedures such as firewalls and anti-virus software do not provide a comprehensive method to protect sensitive information. An advanced security method such as use of biometrics features along with a traditional security procedure can provide an enhanced information security applicable to the personal and organizational security levels. This paper explored the applications of biometric features in enhancing information security. It combined password security with fingerprint pattern to enhance information security. A model consisting of an Interface, Control Access, and a Database was designed to capture the essential functions of a security system. The interface unit determines the type of user and collects data. The Control-Access unit is responsible for validating and verifying the access right of each clients based on assigned security levels and the patterns of their fingerprints. The Database unit stores and maintains information on each client. The results of implementation indicate that the system is capable of adding another layer of security to protect sensitive information by applying security level of the clients and fingerprint pattern. Due to the simplicity, flexibility, and scalability of the model, further development can be explored using behavior biometrics features.

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EXPANDING CRITICAL SENSTIVITY THINKING SKILLS OF STEM STUDENTS WITH MARGINALIZED POPULATIONS OF SOCIETY

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A challenge for academic institutions is expanding the discovery learning opportunities for science, technology, engineering and mathematics (STEM) students beyond capitalism and mere technology. To address the challenge, the paper discusses the diversity practices of a course program that is engaging and focusing on the sensitivity of the students to be increasingly thinking of marginalized populations of society, such as people with disabilities, who are often without proper solutions of technology. The program is expanding the non-STEM skills of the students to be inquiring and thinking of projects of technology more personalized to those with disabilities.

The paper discusses a curricula outreach program for inner-city people with disabilities that is engaging STEM students in exciting exploratory projects beyond the curricula of STEM. The students are interacting in ideation one-on-one with an open mind with people with disabilities, at the actual facilities of non-profit organizations, on personalized projects of technology tailored to this population. The methodology of the program is of brain-storming to brain-walking with the people with disabilities, with brain-writing by the students. The people with disabilities are higher-functioning persons in the non-profit organizations. The extra-curricular portion of the program is involving the STEM students in celebratory film festivals, family field projects and gala showcases at the university with the people with disabilities, which are essentially projects expanding the horizons of the students to be advocates for the population instead of bystander mere technologists. The paper discusses the pedagogy of the program, in which the students integrate blogs, critiques and journals of people and project reflections in brain-writing in the semesters, through internal Blackboard Learning, Digital Commons and e-Portfolio systems, which are especially promoting critical thinking. From the program, the STEM students are definitely increasing their critical reflection sensitivity thinking skills to be attuned to community people with disabilities who they would not have met without the program.

The outcomes of the program are especially positive for the STEM students in their growth in learning to be thinking less about capitalist metrics of success and more about those less fortunate without technology than those with technology. The paper will present developing evidence of the meaningful progress of the outreach program, in the perceptions of the students with their partnered persons with disabilities. The findings of the paper will be helpful to faculty interested in an inventive program for inspiring students, in STEM or in non-STEM, to be more proactive and thoughtful about problems of society beyond mere classroom technology topics.

Factors that Influence the Helpfulness of Online Product Reviews: An Empirical Analysis

A vast number of online retailers offer product reviews as a supplemental source of information assisting buyers in their purchase decisions, making reviews an essential part of the online customer experience (Cheung et al., 2012). A number of studies have examined the role of product reviews in e-commerce (e.g. Li and Hitt, 2010; Lui and Karahanna, 2017; Mudambi and Schuff, 2010; Zhang et al. 2016; Xiao and Benbasat, 2007; Zhu and Zhang, 2010) finding that reviews have a significant impact on product sales (e.g. Chevalier and Mayzlin, 2006; Hu et al., 2008) and improve the usefulness of retailers' websites (Kumar and Benbasat, 2006). The importance of product reviews motivates researchers to examine the actual content of the review including the review's sentiment (positive or negative opinion) (Chen et al., 2008; Zhu et al., 2014), perceived credibility (Cheung et al., 2012), and helpfulness (Mudambi and Schuff, 2010; Wan and Nakayam, 2014), all in turn influencing product sales and the success of an online retailer (Chevalier and Mayzlin, 2006; Hu et al., 2008).

Product reviews are used to share recommendations made by previous buyers and to share their experiences, which can be either critical or complimentary. Online product reviews are a type of electronic word-of-mouth (eWOM) broadly defined as "peer generated product evaluations posted on company or third-party websites" (Mudambi & Schuff, 2010, p186). People generate e-WOM offering their personal knowledge of products they purchased (Mudambi & Schuff, 2010) attesting to the credibility of the product (Yin, Mitra, & Zhang, 2016). Some studies have shown that positive reviews can improve customer perception, increase customer visits, and increase the amount of time customers spend on websites

(Mudambi & Schuff, 2010; Verhagen et al., 2013; Yin et al., 2016) while negative reviews can impede the sales of a product (Mudambi & Schuff, 2010).

Albeit unintentionally, ratings and reviews can be affected by a reviewer's emotions resulting in a biased view of the product. Reviewer emotions are frequently expressed in the product review as being either highly satisfied or highly dissatisfied with the product and can skew ratings toward either a 1 or 5, as an extreme evaluation of the product (Ullah, Amblee, Kim, & Lee, 2016). Given the implications of eWOM, factors such as strong reviewer opinions and emotions have a substantial effect on customers' purchase decisions and therefore affects revenues of firms (Ullah et al., 2016).

To empirically investigate the helpfulness of product reviews, some approaches have examined the influence of a reviewer's overall numeric rating (e.g. Mudambi & Schuff, 2010) or the count of positive and negative words in a review (e.g. Hu et al., 2014). These approaches are valuable in that they provide a general sense of the effect of a reviewer's sentiment. However, the content within a review provides a number of additional clues about a reviewer's overall assessment of a product, including their first and last expressed opinions. Potential buyers reading the expressed opinions of the reviewer may not perceive the difference between the first or final expressed opinion, but rely upon certain parts of the review to facilitate their decision making. People maintain an episodic memory of events and process these events differently depending on the task (Tulving, 1993), begging the question as to what part of a product review is most helpful to the customer. In addition to the opinions expressed, other aspects of a product review, such as the number of ideas expressed (sentence count), the most positive and most negative sentence, and the ratio of positive or negative sentences within a review, may also affect what customers perceive as helpful.

Given the influence of product reviews on buyer's decision making, this study investigates the impact of a number of factors on people's perceived helpfulness of a review. We use reviews collected from Amazon.com related to digital cameras, a feature rich product category (Liu & Karahanna, 2017; Ullah et al., 2016). To determine which factors in a product review that affect the helpfulness of a review, we conduct an empirical analysis on a corpus of 7,822 reviews on Digital SLR (DSLR) cameras and 27,973 reviews on Point and Shoot (P&S) cameras. Our investigation makes use of several text analytic and statistical techniques to examine which variables are significant in determining a product review's helpfulness.

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Financial Impact of the Rivers Casino in Pittsburgh

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Abstract

Casinos were introduced to the Pittsburgh area because of the historical positive impact on state economies. Gambling, though common-place, was illegal in Pennsylvania until 1972 when the first lottery was enacted. The success of the lottery lead to increased consideration for expanding gambling in the state, leading Pittsburgh receiving a Category 2 License for a Stand-Alone Casino. The financial impact of a casino operation on the Pittsburgh region is research and evaluated.

On August 9, 2009 the Rivers Casino opened in Pittsburgh on the North Shore. The Rivers his an unbeatable location, constructed amidst Heinz Field, PNC Park, the Carnegie Science Center, and offers a view of the city's skyline and Mt. Washington. Recently, the Rivers Casino just celebrated its eighth anniversary. The projected economic impact after nine months of business was $89,127,037. Additionally, the Rivers Casino created 458 jobs in the Pittsburgh area. Aside from creating jobs, the Rivers Casino added to the Pittsburgh community by contributing over $3,350,000 to non-profit organizations, projects, and events. The primary charitable and philanthropic contributions are made to community development, public health and service, and adult education/workforce development. The Rivers Casino also initiated programs like Rivers Community Champions to do monthly service projects throughout Pittsburgh neighborhoods. In 2016 Pittsburgh's mayor, Bill Peduto struck a deal with Three Rivers Casino allowing a yearly flow of $10 million into city accounts. This means that the city debt would decrease from 16.4% to 9.7%. Along with the decrease in debt, the mayor said this money can help his administration exceed the state-mandated pension fund by $203 million. The deal with Three Rivers Casino

would help the city in its long-term fiscal stability? In addition, table games were introduced to Rivers Casino in July of 2010. Since then, many other programs have been introduced, such as rewards programs. These programs are under the Rush Rewards Player Club, and consist of free food, free slot play, and some free monthly gifts. This has helped to keep loyal members participating in casino functions.

Executive Management and Their Impact

The Rivers Casino was expected to produce enormous things for Pittsburgh. The c-suite and upper level management had a colorful past in the casino and gaming industry, and bring a lot color to the Rivers Casino grand opening in Pittsburgh. It is important to recognize therebackgrounds of the Rivers Casino's executives. The CEO, Greg Carlin, has been an active member in the gaming industry for about eighteen years. He is a founder and the Chief Executive Officer (CEO) of Rush Street Gaming, LLC and is also the CEO of other casinos such as the SugarHouse Casino in Philadelphia and the Rivers Casino in Des Moines (Our Story- Rush Street, n.d). Additionally, the Chief Operating Officer (COO), David Patent, brings over 8 years of experience to the table. Mr. Patent currently oversees operations for Rush Street Gaming, LLC in Pittsburgh, Philadelphia, Mississippi, and Illinois. Previously, he was apart of executive management in the Flamingo Casino and Hotel, Rio All Suite Hotel and Casino, and Harrah's East Chicago Casino. General Manager Todd Moyer, to help the opening of the Rivers Casino as he started his career working with the Trump Taj Mahal in the 1990's (Rivers Casino: Pennsylvania, 2010). From there he successfully operated and oversaw various other casinos before taking on the task of the Rivers Casino in Pittsburgh. the backgrounds of executive management made them perfect candidates to develop the Rivers Casino operation. Since executives and other upper management had this colorful experience, many looked to the Rush Street Gaming, LLC and their previous projects and the success of those projects. One of the most successful casinos they founded was the Riverwalk Casino Hotel in Mississippi. This project happened to finish ahead of schedule, by two months (Rivers

Casino: Pennsylvania, 2010). Additionally, the casino opened on budget which is a key concern for the Rivers Casino project. Another successful project of theirs is the Fallsview Casino Resort in Niagara and it is the highest grossing casino in Ontario (Rivers Casino: Pennsylvania, 2010).
Introduction Gambling in Pittsburgh goes back as far as the recorded history of the city.
The mill workers often gambled to pass time between shifts or earn some extra money (Gambling, 2017). Because of its widespread nature, corruption became rampant in gambling across the city. In attempt to curtail illegal gambling, Pittsburgh created its first lottery in 1972 (Gambling, 2017). However, the city would not see legalized casino gaming until 32 years later. In 2004, the passage of the Pennsylvania Racehorse Development and Gaming Act (HB 2330) allowed "suitable" facilities to obtain slot machine licenses (Ruddock, 2015). In 2010, Pennsylvania further expanded gambling with passage of SB 711 which legalized table games (Ruddock, 2015). Under these bills, Pennsylvania was granted five Category 2 Stand-Alone Casino Licenses, one of which was granted to Pittsburgh which led to the construction of the city's first official casino: The Rivers Casino (Ruddock, 2017).

Construction of the Rivers Casino

After more than 30 years, Pittsburgh constructed its first casino on the city's North Shore.
In 2006, Don Barden's "The Majestic Star Casino, LLC" received the license to open the casino and started construction in late 2007 (Zhuang, 2010). However, construction was halted when Barden "defaulted on a $200 million bridge loan in July [2008] and failed to pay contractors" (Pittsburgh's, 2008). It would take over a half a year to find a new owner for the city's casino. "On July 16, Walton Street Capital, LLC and High Pitt Gaming, LP announced that its joint venture, Holdings Acquisition Co., had reached agreement to purchase 75% of the Pittsburgh Majestic Star Casino from PITG Gaming" (Pittsburgh's, 2008). Finally, the casino project had reached new ownership and was back on track to be completed. This purchase was made official in August 2007 when "the Pennsylvania Gaming Control Board unanimously approved the transfer of the casino license to the new investor group, led by Chicago businessman Neil

Bluhm" (Pittsburgh's, 2008). Debate: Just because Pittsburgh was granted a license to open its own casino by the state legislature, does not mean the venture was met with open arms. Some of the most widely-voiced concerns over the construction of the new casino included "massive traffic jams; rampant crime; the size of the parking garage marred the city's riverfront; and lights from the casino disrupting the science center's observatory" (Belko, 2014). These concerns were legitimate, as downtown Pittsburgh has its own history of traffic problems, and is widely known for having a beautiful view along its riverfront. Anytime a new casino is opened, it does usually lead to an increase in crime, as it consolidates large amounts of money in a centralized location and increase in population, which facilitates attempted crime.

However, it does not seem that the concerns over the construction of the Rivers have come to fruition. As explained by Carnegie Science Center's Co-Director, Ann Metzger, "I have not seen any impact…to [the casino] being next door to us. Our visitors find their way as usual "(Belko, 2014). In fact, the casino has been a plus to the riverfront, as its owners have led construction efforts to build new roads, improve parking facilities, and buy up parking spaces during large events (Belko, 2014). Furthermore, Pittsburgh police have not reported a rise in criminal activity to levels predicted by opponents of the Rivers (Belko, 2014).

the Rivers Casino has been an important development tool in downtown Pittsburgh, and has improve the parts of the city surrounding it..

Projected Games

Table games are an important component of the Rivers Casino. They were looked forward to to by anticipated gamblers in the Pittsburgh area and bring a new detention to the common slot machines and scratch offs that are popular today. The Rivers Casino was expected to include a wide variety of table games including: Blackjack, Poker, Craps, Roulette, Three Card Poker, Texas Hold'em Bonus, Pai Gow Poker, Baccarat, and Big 6. Blackjack was projected to have the most tables with 42 stations followed by Poker tables having 24 stations (Rivers Casino: Pennsylvania, 2010). There were also various considerations in mind when coordinating table

game operations. Forty-two percent of table games were purchased from women, minority, and local businesses totaling to $143 million (Rivers Casino: Pennsylvania, 2010). Additionally, slot machines were also a key component in planning. They were expected to grow the market of gambling in Pittsburgh by attracting younger and older gamblers who are unfamiliar with traditional table games.

Projected Job Creation

The Rivers Casino took big steps in creating various jobs related to the operation of the Rivers Casino. There is much speculation between proponents and opponents of gambling. Proponents suggest that the creation of a casino helps revive depressed economic areas and aids in the creation of jobs. Opponents propose that the addition of casinos leaves the affected areas worse off due to an increase in drugs and crime. Additionally, potential jobs are taken away from the area as many higher levels are transferred in from other areas. The Rivers Casino was projected to createed 458 jobs in the Pittsburgh area (Rivers Casino: Pennsylvania, 2010). Positions include table game managers, security, credit supervisors, and dealers. To fill these positions various job fairs were held, to promote the Rivers Casino. Additionally, 80 new jobs were created in construction of the project (Rivers Casino: Pennsylvania, 2010).

Financial Projections

Historically, projects associated with River Street Gaming, LLC exceeded first year projections. The Rivers Casino projected that in their first year, revenue would total $428 million. The Pennsylvania Gaming Control Board projected revenue of $328 million. Because of this, the annual tax revenue attributed to property tax, economic recovery, and the racehorse industry is around $330 million. Additionally, revenue from the Rivers Casino his contributed to $7.5 million to the new Penguins Hockey arena each year for 30 years (Rivers Casino Revenues Up, n.d). To aid in community development, the Rivers Casino contributes $1.5

million for 3 years to both the Business District development and housing for the Northside Leadership Conference. The Rivers Casino also contributes $3 million for the Hill District (Montari, 2009). Opening, Rivers Casino was not a immediate financial success. In fact, its performance fell well below initial projections. "Rivers was projected to generate $427.8 million in slot machine gross terminal revenue in its first year but has yet to come close to that number. It produced $284.3 million in such revenue in 2013" (Belko, 2014). It is unclear why the casino has not been able to generate projected revenues, but a likely link between the financial recession and the construction of a business solely meant to take people's money. Nonetheless, the Rivers "suffered two bond downgrades in its first year of operation amid concerns that it was not generating enough cash to meet debt obligations, including an annual $7.5 million contribution for the CONSOL Energy Center" (Belko, 2014). It seemed that the Rivers had made promises to the community that it could not keep, and could not accurately forecast its own revenue streams. However, after nearly $108 million in investment revenue and the installment of table games, the casino started faring much more profitably. "The casino now is the third top money maker in the state…[generating] $351.9 million in combined slots and table game revenue…that translated into $161.9 million in tax revenue" (Belko, 2014). The casino turned around its operations, and quickly became one of the most profitable businesses in the area. As such, the Rivers Casino has been able to give back quite generously to its neighborhood. In its first five years, the casino estimated that it paid out $744.7 in state and local taxes and an additional $48.6 million in contributions, including $37.5 million for CONSOL Energy Center, $3 million each to the Hill District and the Northside Leadership Conference, and $531,112 in donations to community groups. It also employs about 1,800 people (Belko, 2014). The casino has generated substantial revenues for both Pittsburgh and the greater Commonwealth of Pennsylvania, and has donated handsomely to its surrounding communities. In turn, these beneficiaries of the Rivers' profits have had little to say against Pittsburgh's top revenue generator, and it seems that any old debate topics have been soundly quenched.

Trend Analysis

When the Rivers Casino first opened its doors, it clearly struggled to live up to the expectations of its owners, the city of Pittsburgh, and the Pennsylvania Gaming Control Board. It fell short in many aspects despite having the maximum number of allowed slot machines upon opening for business (Belko, 2012). Despite these upfront struggles, the Rivers Casino continued operations with the hope of becoming more profitable in the future. In 2012, one of the owners of the Rivers Casino, Ira Schulman, believed the casino was an awful investment because it had lost $200 million in equity since it opened in 2009 (Belko, 2012). However, that all changed with the larger scale installation of table games which lead toward much more prosperity for the Rivers Casino and a general upward trend in revenues in comparison.

As the Rivers Casino grew in popularity, its revenues became dramatically larger and this can be seen in the Pennsylvania Gaming Control Board's annual report. All of the organizations which originally feared the impact of the Rivers Casino quieted their complaints as they began to reap the benefits associated with all of the business that the casino was bringing to area and all of the funds that it in turned donated back to the community (Cato, 2014).

The annual reports created by the Pennsylvania Gaming Control Board accounted for the fiscal year from July until June of the following year. Since 2009, the Pennsylvania Gaming Control Board has been reporting on the Rivers Casino. In its first year of being opened, the Rivers Casino generated almost $176,400,000 worth of taxable revenue (2009-2010 Annual Report). By 2013, the Rivers Casino had approximately $284,300,000 in reported revenue (Belko, 2014). The Rivers Casino used three primary gambling instruments to generate revenue. They used non-banking tables, banking tables, and slot machines. Over the past six years, the slot machines have generated the most revenue for the Rivers Casino. However, since 2012 the revenues generated by slot machines has decreased by almost $20 million. Over the past six years, non-banking table games have relatively consistently generated approximately $6.7 million in gross revenue per fiscal year and banking tables have pretty consistently generated about $63 million in gross revenue per fiscal year. However, even with the relative consistency in gross revenues produced by banking tables, in the 2016-2017 fiscal year, the gross revenues did not breach $60 million.

Rivers Casino

Fiscal Year 2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Non-Banking Tables Gross Revenue					
$7,503,757	$6,730,314	$6,762,943	$6,979,723	$6,739,610	$6,726,743
Banking Tables Gross Revenue					
$61,407,190	$62,550,683	$61,668,191	$63,453,458	$63,955,896	$58,716,004
Average Number of Slot Machines					
2,959	2,939	2,982	2,981	2,877	2,934
Gross Terminal Revenue					
$283,419,178	$283,332,873	$277,076,321	$277,902,931	$272,033,348	$265,345,394
Total Gross Revenue from Gambling Instruments					
$352,330,125	$352,613,870	$345,507,455	$348,336,112	$342,728,854	$330,788,141

In recent years, there have been decreases in the Rivers Casino's gross slot machine revenue and these decreases are out of ordinary compared to other casinos in the state of Pennsylvania. Throughout Pennsylvania there has been an increase in slot machine revenue, especially during the 2015-2016 fiscal year (Lott, 2016). By the time the 2015-2016 fiscal year had ended, there was a 2.3% statewide increase in slot machine revenue (Lott, 2016). However, the Rivers Casino experienced a 2.1% decrease during the 2015-2016 fiscal year and a 2.5% decrease the following year during the 2016-2017 fiscal year. Yet, even with this decreases in slot machine revenue, the Rivers Casino managed to be the third largest revenue generating casino in Pennsylvania (Lott, 2017).

Based on the annual reports from the Pennsylvania Gaming Control Board for the past six fiscal years, the Rivers Casino has been gradually decreasing its gross revenues in both table games and slot machines. Though gross revenues remained above $330 million, it is impossible to realize the steady decrease that has taken place since 2013 when the gross revenues were over $350 million.

Overall, the Rivers Casino has been experiencing a downward trend in gross revenues created by gambling over the past four fiscal years. To combat this trend and hopefully increase future revenues, the casino has been investigating opportunities to enhance its business model and growth.

Tax

As of 2015, Rivers Casino had paid over 1.6 billion dollars in taxes from slot machines and table games combined since opening in 2009 (Cato, 2014). That money has contributed to many different foundations a projects in the Pittsburgh area. 476.4 million dollars of the 1.6 billion was paid in Pennsylvania state tax (Cato, 2014). In February 2016, a new tax was proposed by Governor Wolf on promotional credit marketing programs (Dotty, 2016). This is an important casino tool that incentivizes customers to increase their real-money wagering and broadens the economic environment (Dotty, 2016).

In Pennsylvania, there is a 55% effective tax rate on the gaming industry. This money is frequently used for economic development, tourism, property tax relief, the horse racing industry, and towards the local government (Brainerd, 2015). The breakdown is as follows: state tax, 34%; local share assessment, 4% or $10 million, economic development and tourism fund, 5%; and Pennsylvania Race Horse Development Fund, 12% (Brainerd, 2015).

Rivers Casino has consistently given $10 million per year to the city of Pittsburgh as part of the taxes generated from slot machine revenue (Belko, 2016). Rivers Casino filed a complaint with the state Supreme Court to end the collection of the municipal portion because it “imposes unequal rates of taxation” (Belko, 2016). Mayor Peduto stated that Rivers Casino knew about this funding commitment to the city prior to applying for their licence (Belko, 2016). The city allowed the casino to open strictly because of the projected funding.

In November 2016, officials came together and worked to ensure that $10 million in annual local share payments will flow into city accounts (Bauder, 2016). This was expected to continue uninterrupted through 2017 (Bauder, 2016). Peduto promised to lead the city of

Pittsburgh out of state fiscal oversight by 2019, and in five years debt service would drop to 9.7 percent (Bauder, 2016). Peduto also intends to use the money for pension funding, which was praised by controller Michael Lamb (Bauder, 2016). A long term goal for this funding is to set up a system similar to the UPMC-funded program "Pittsburgh Promise," which provides millions of dollars each year in scholarship money for Pittsburgh Public School students (Bauder, 2016). There has not been any recent information published on whether or not this funding will continue past 2017.

Donations

The Three Rivers Casino donates large sums of its earnings to over thirty-six different charitable organizations every year. Since 2009, table game and slot machines has brought in about $1.6 billion, which part of what was collected was contributed to donations (Cato, 2014). Their yearly contributions have totaled to about $10 million. The most popular contributions made by the Three Rivers Casino includes: Mario Lemieux Foundation, Consol Energy Center, Riverlife, and the Northside Leadership Conference (Rivers Casino License Renewal, 2011).
Mario Lemieux Foundation and Pittsburgh Penguins Foundation:
Each year the Mario Lemieux Foundation and the Pittsburgh Penguins Foundation pairs up with Three Rivers Casino in an annual Pittsburgh Penguins' Alumni Association's Charity
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Poker Tournament. Their efforts are to raise money for the philanthropies of the Mario Lemieux Foundation and the Cystic Fibrosis Foundation. The tournament has a $200 entry fee which then gives the players an unlimited $25 buy of chips. A major draw to join the tournament is that the entire Pittsburgh Penguins' roster takes part in the event. Also, winners of the tournament are given Penguins memorabilia which includes signed jerseys, sticks, pucks, photos, and tickets (Romano, 2014).
The tournament has raised over $115,000 yearly towards the Cystic Fibrosis Foundation which helps the patients affected by this rare disease (Romano, 2014). The foundation helps

patients by working to find a cure for the disease through drug development and giving specialized treatments to patients with different strands of the disease. It continues to make great strides towards finding a cure and increasing the average lifespan of their patients. Since the start of the foundation in 1955, it has increased the average lifespan of patients to which is now more than half its population is eighteen years or older (About Cystic Fibrosis, 2017). With the proceeds raised by the tournament more patients can benefit from better or new treatments.
The Mario Lemieux Foundation raises money in pursuit to find a cure for cancer, specifically for kids. They dedicated this money to cancer research, patient care, and Austin's Playrooms. Austin's Playrooms were created by Mario's wife Nathalie because as they had a son born premature there was not a comfortable place for the family to begin the bonding process with their baby. Since then Nathalie implemented this to the foundation and there are now thirty-three Austin's Playrooms in area hospitals (About the Foundation, 2017). Along with cancer research and Austin's Playrooms the foundation uses the money raised from the tournament to help fund its annual Fantasy Hockey Camp.

Consol Energy Center:

Three Rivers Casino took part in an agreement with the city of Pittsburgh that it will pay $7.5 million each year over the course of thirty years for Consol Energy Center, now known as PPG Paints Arena. By the end of the thirty years the Three Rivers Casino will of saved taxpayers $225 million (Romano, 2014). The casino was able to reach its October, 2014 contribution through a total revenue of $31 million. These funds from August, 2014 came in with $24.8 million from slot machines and $6.2 million from table games. To date the Three Rivers Casino has contributed a total of $67.5 million, which has greatly helped the taxpayers of Pittsburgh with the expenses of the arena (Rivers Casino, 2017).

Riverlife:

Riverlife is known as a group that focuses on Pittsburgh's riverfront development.
Initially this group was worried about having the Three Rivers Casino added to the North Shore. Before the casino opened the group thought it was going to create problems with crime around the riverfront. Instead, the Three Rivers Casino has turned itself to be a model of the riverfront community. The casino was built to include a design that pleased the riverfront with an amphitheater along it, glass-front building and an beautiful landscaping. To help Riverlife keep up with a beautiful riverfront, the Three Rivers Casino holds an annual Party at the Pier (Cato, 2014).

Northside Leadership Conference:

This organization is made up of fourteen different neighborhoods, each with its own characteristics. The Northside Leadership Conference was made up of seven business lines consisting of real estate development and project management, business development, workforce and employer services, public realm, public safety, health and wellness, and communications and advocacy. Each of these business lines are used in a way of addressing concerns within the Northside community. By addressing these concerns, the community promotes the Northside's vitality, quality of life, and image (About Us, 2017). To help with these efforts the Three Rivers Casino contributed $1 million annually for three years (Rivers Casino License Renewal, 2011).

Future Plans

Since 2006 when The Rivers Casino was built, part of the plan was to have a hotel
As part of the casino complex. The Rivers Casino, as of January 2017, planning on building hotel. It will be located on the east side of the North Shore, still attached to the hotel. The exact spot will be the vacant parking lot that is located by the Carnegie Science Center. This hotel would be a $50 million dollar hotel, and has already been approved, even by the Carnegie Science Center. With this hotel plan starting to come to life, more business for the casino should

come about from those who are not in the immediate Pittsburgh area. Along with this, it will look attractive to casino regulars because hotels are becoming more common for casinos to have. The hotel is said to take around a year to build, give or take a few months. Since it is expected to cost around $51.5 million dollars, it will have various luxury hotel features that will be included. Some of these features of the hotel will include a lobby bar, spa, and restaurant that will all be inside of it (Ruddock, S). This will all be attached to the casino, along with the seven-story hotel. The initial plans state that the hotel will include over 200 guest-rooms.. With regards to the specific design of the hotel, glass walls are supposed to be placed on the first few floors so The design of the hotel has been finished since April of 2016, but they have just been waiting to break ground on the project. In the press release, Rush Street Gaming stated, “The contemporary hotel design uses expansive windows on every level to maximize riverfront views and to integrate distinctively, yet seamlessly, into existing North Shore Architecture. Rivers Casino Hotel will also include a fitness center, new restaurant, and lobby bar. A spa will be added to the existing casino facility to accommodate hotel and casino guest” (Ruddock, S). By creating around 1,400 construction jobs during the project, the Pittsburgh job market could be helped by the expansion. Along with this, over 100 jobs will be permanent positions for The Rivers Casino. With regards to the revenue that the new hotel will bring in, $4.7 million is expected in county hotel and sales tax revenue (Belko, M). This number is expected to come in within around five years. For gaming tax revenue, around $29.2 million is expected as well within the first five years that the new hotel will be open (Belko, M). Overall, it is supposed to increase the state and local tax revenue by an average of 6%. This would mean that annually, an additional $10.5 million would be added in tax revenue, just because of a new hotel (Rivers Casino Hotel).

The Rivers

Casino has been continuously planning to add one new game each month. It was not specified if this game was a slot machine or table game, but they have a continuous goal to try to add at least one each month (Rivers Casino Pittsburgh Help). This is in addition to the existing 2,900 slot machines and 100 table games that the casino already offer

Other casinos in the Pittsburgh area, such as The Meadows Casino, have had expansion plans going on as well. The Rivers Casino will have to continue their plans to keep up with the growing market of casinos in the region. Even though the two casinos are just an hour apart, The Meadows is the main competitor for The Rivers Casino. The Meadows already has a hotel and is planning on building an event center.

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HAS BRUNSWICK COUNTY, NC, ITS SHERIFF, AND ITS BOARD OF EDUCATION ESTABLISHED A RECURRING, *SYSTEMATIZED PRACTICE* (RISING TO THE LEVEL OF A *CUSTOM*), WITH RESPECT TO THE RECORDED, IN-CUSTODY INTERROGATION OF MINOR CHILDREN AT SCHOOL, RELATING TO FELONY CRIMES ALLEGEDLY COMMITTED OUTSIDE OF SCHOOL, THAT VIOLATES THE FOURTEENTH AMENDMENT DUE PROCESS CLAUSE?

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ABSTRACT

"It is abiding truth that 'nothing can destroy a government more quickly than its failure to observe its own laws, or worse, its disregard of the charter of its own existence.'"

Oregon v. Hass, 420 U.S. 714, 724-25, 43 L. Ed. 2d 570, 95 S. Ct. 1215 (Brennan, J., dissenting (quoting *Harris v. New York*, 401 U.S. 222, 232, 28 L. Ed. 2d 1, 91 S. Ct. 643 (1971) (Brennan, J., dissenting))).

The primary purpose of this article is to enhance the awareness of students and parents of Brunswick County, North Carolina (NC), in that Brunswick County (BC), NC, its Sheriff, and its Board of Education have established a recurring, *systematized practice* (rising to the level of a *custom*), established through express written policies of the BC Board of Education, and the BC Sheriff (attributable to Brunswick County, NC), with respect to the recorded, in-custody interrogation of minor children at school, relating to felony crimes allegedly committed outside of school, with which said children may have been involved, where the execution of such recurring, *systemized practice* deprives said minor children of their constitutional right to be free from making coerced, involuntary, self-incriminating statements within the context of an in-custody interrogation at school.

In this regard, the instant article has significant public interest.

In a case study approach, the three primary objectives of this article are:
(1) To establish the facts of the case study, including the recurring, *systematized practice*;
(2) To establish the clearly established law at issue; and
(3) To apply the law at issue to the facts of the case study for the purpose of identifying U.S. constitutional implications for the minor-student of Brunswick County.

This article argues that if these objectives are met, the facts of the case study will have revealed that the execution by school officials and law enforcement officers of this recurring, *systematized practice* (rising to the level of a *custom*) violates the Substantive Due process Clause of the Fourteenth Amendment to the U.S. Constitution. In this regard, the instant article has significant public interest not only for minor students of Brunswick County and their parents, but also for any person associated with the legal or educational community.

In a case study approach, this article accomplishes its primary purpose and objectives in a stepwise fashion as follows.

- In Part I, the facts of the case study are presented, which includes the existence of a recurring, *systematized practice* (rising to the level of a *custom*), established through express written policies of

the BC Board of Education, and the BC Sheriff (attributable to Brunswick County, NC), with respect to the recorded, in-custody interrogation of minor children at school, relating to felony crimes allegedly committed outside of school, with which said children may have been involved.

- In Part II, the law at issue is identified.
- In Part III, the law at issue in Part II is applied to the facts of the case study in Part I for the purpose of identifying U.S. constitutional implications for the minor student.
- In Part IV, implications of the findings in Part III for the parents of the minor students are presented.

I.
FACTS OF THE CASE STUDY: THIS ARTICLE PROFFERS THE EXISTENCE OF A RECURRING *SYSTEMITIZED PRACTICE*, RISING TO THE LEVEL OF A *CUSTOM*, WITH RESPECT TO THE RECORDED, IN-CUSTODY INTERROGATION OF CHILDREN AT SCHOOL, RELATING TO FELONY CRIMES ALLEGEDLY COMMITTED OUTSIDE OF SCHOOL

In Part I (Facts of the Case Study), this articles proffers the existence of a *standard operating systematized practice* (rising to the level of a *custom*), established through express written policies of the Brunswick County (BC) Board of Education and decisions of the BC Sheriff, attributable to the County of Brunswick, State of North Carolina (hereinafter, "Brunswick County"), with respect to the recorded, in-custody interrogation of minor children at school, relating to felony crimes allegedly committed outside of school, with which said children may have been involved, where the execution of such *recurring, systemized practice*:
(a) deprives said minor children of their constitutional right to be free from making coerced, involuntary, self-incriminating statements within the context of an in-custody interrogation at school and
(b) deprives the parents of said minor children of their fundamental, constitutional right to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their minor child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school.

In the alternative, within the context of such *recurring, systemized practice* and specifically, the in-custody interrogation of minor children at school, relating to felony crimes allegedly committed outside of school with which said children may have been involved, it is so obvious that the failure by Brunswick County (BC), the BC Sheriff, and the BC Board of Education to provide a volitional, non-coercive environment, within the context of such in-custody interrogation of minor children at school:
(a) would deprive said minor children of their constitutional right to be free from making coerced, involuntary, self-incriminating statements and
(b) would deprive the parents of said minor children of their fundamental, constitutional right to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their minor child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school,
that this article argues that the BC Board of Education, the BC Sheriff, and Brunswick County are each -

(i) *deliberately indifferent* to the constitutionally guaranteed right of said minor children to be free from making coerced, involuntary, self-incriminating statements within the context of an in-custody interrogation at school and
(ii) *deliberately indifferent* to the constitutionally guaranteed right of the parents of said minor children to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their minor child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school.

BRUNSWICK COUNTY SCHOOLS 2017-2018 STUDENT CODE OF CONDUCT

"[From] Leslie K. Tubb, Superintendent[,] August 2017[:]
. . . One of the hallmarks of effective schools is a safe and orderly climate for teaching and learning. This is achieved through a *collaborative effort between students, teachers, parents, and the administration of each school*.
Home and school are partners in developing our children academically and socially. The Student Code of Conduct is an extension of the standards in each home and in our community. . . It is the school's responsibility to communicate behavioral expectations clearly to students, and then to uphold the standards consistently and fairly. *We are also responsible for modeling the behaviors we expect of our students*.
. . . Parents, we ask that you take the time to familiarize yourself with the expectations outlined in this book and reinforce them with your children. *Together, we can minimize interruptions to instruction and create a warm and positive learning environment for our students*.
. . .
Release of Students from School Policy 4210
. . . Except in the most extreme circumstances, *custody of a student shall not be relinquished to any person without the prior approval of the parent or guardian who has physical custody of the student.*
. . .
Behaviors that violate board policy include
. . .
Policy 4340 *Failure/refusal to cooperate with administrative investigations, to include giving false statements or misleading information*." Italics added.

BRUNSWICK COUNTY BOARD POLICIES: SERIES 4000 – STUDENTS

Entity Defendant BOARD Policy Code: 4335 Criminal Behavior [See Exhibit II, incorporated by reference herein, a true and correct copy.]

"Criminal or other illegal behavior is prohibited. Any student who the principal reasonably believes to have engaged in criminal behavior on the school premises or at school activities will be subject to appropriate disciplinary action as stated in applicable Board policies and may be criminally prosecuted as well.

School officials shall cooperate fully with any criminal investigation and prosecution. School officials shall independently investigate any criminal behavior that also violates school rules or Board policy." Italics added.

When detectives in the Criminal Investigative Unit ('CIU') of the Brunswick County ('BC') Sheriff's Office want to forcibly interrogate children at school with respect to felony crimes allegedly committed outside of school with which said children may have been involved, said Sheriff's Office contacts the Principal or Assistant Principal at the school to notify said school of: (1) the arrival time of said CIU detectives, (2) the identity of the students to be forcibly interrogated, and (3) the subject matter of such interrogation.

Under **Policy Code: 4335 Criminal Behavior**, school officials must cooperate fully with any criminal investigation of CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff). The Superintendent of Brunswick County Schools, Leslie K. Tubb, has stated that when the CIU detectives from the BC Sheriff's Office arrive at a school with respect to a criminal matter, they are "totally in-control and in-charge" of said matter. Consequently, school officials following the demands of the BC Sheriff's Office are (a) acting as agents of and (b) being directed by the BC Sheriff's Office. Moreover, when CIU detectives from the BC Sheriff's Office *deliberately and purposefully decide* to come to a BC school for the purpose of forcibly interrogating certain students, with respect to the investigation of a felony allegedly committed outside of school by said students, school officials (i.e., the Principal and/or Assistant Principal) recognize that they each have a critical role to play, on behalf of the CIU detectives, in this *recurring, systematized practice*, herein described, involving a series of two in-custody interrogations in pursuit of a coerced, involuntary confession from said students.

Preparations for the visit to campus by CIU detectives, related to the scheduled, recorded, in-custody interrogation by CIU detectives of minor children at school with respect to felony crimes allegedly committed outside of school with which said children may have been involved, include having the Principal and/or Assistant Principal, on behalf of the CIU detectives, take the students, identified by the BC Sheriff's Office to be interrogated, out of their educational environment, one at a time, where each of said students is then subjected to an in-custody interrogation by the Principal and/or Assistant Principal with respect to felony crimes allegedly committed outside of school with which said student may have been involved. At the end of each in-custody interrogation of a student by the Principal and/or Assistant Principal, the Principal and/or Assistant Principal, on behalf of the CIU detectives, orders said student to make a written statement of said student's involvement with respect to felony crimes allegedly committed outside of school, consistent with the student's in-custody testimony. When finished with the written statement, the Principal and/or Assistant Principal, on behalf of the CIU detectives, takes said statement from the student and orders the student to return to his/her educational environment.

In executing their role in the above described *systematized practice*, rising to the level of a *custom*, established through express written policies of the BC Board of Education and decisions of the BC Sheriff, attributable to Brunswick County, with respect to the recorded, in-custody interrogation of children at school, relating to felony crimes allegedly committed outside of school, with which said children may have been involved, the Principal and/or Assistant Principal *deliberately and purposefully engage* in the concerted actions referenced above, acting on behalf of CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff) and as agents of the CIU detectives, where their concerted actions are consistent with and serve BC [NC] Board of Education policies. In this case, actual deliberation by the Principal and/or Assistant Principal is practical.

During the in-custody interrogation by the Principal and/or Assistant Principal, on behalf of the CIU detectives, the student is not free to leave and return to his/her class, because of the physical force and show of authority demonstrated by the Principal and/or Assistant Principal. Furthermore, with a purpose:

(a) to harm the minor student (i.e., *to deprive the minor student of his/her constitutional right to be free from being coerced into making an involuntary, self-incriminating statement within the context of an in-custody interrogation at school*) and

(b) to harm the student's parents (i.e., *to deprive the student's parents of their fundamental, constitutional right to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school*),

neither the Principal nor the Assistant Principal tells the student that he/she may voluntarily leave or that he/she does not have to answer the questions or that he/she could call his/her parents or that he/she may have someone else present while he/she is being questioned.

Finally, under Policy 4340 *Failure/refusal to cooperate with administrative investigations, to include giving false statements or misleading information* (*see* Brunswick County Schools 2017-2018 Student Code of Conduct), the students each knows that he/she has to answer truthfully and completely, verbally and in writing. Otherwise, the student knows that he/she will be suspended or expelled from school by the Principal. Finally, the student is wholly and indisputably without any advocate to protect his/her U.S. constitutionally guaranteed right *to be free from being coerced into making an involuntary, self-incriminating statement within the context of an in-custody interrogation at school*. The Principal and/or Assistant Principal, acting on behalf of the CIU detectives, each knows that the student is under tremendous pressure to answer their questions and they each expect this intense pressure to cause the student to confess (to make coerced, involuntary, self-incriminating statements within the context of an in-custody interrogation at school). As a result of such psychological intimidation and coercion, the student is induced to truthfully and completely respond verbally and in writing to the questions of the Principal and/or Assistant Principal. Some of the statements are self-incriminating. However, these self-incriminating statements are induced (coerced), they are not voluntarily made.

When the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff) arrive at the school to interrogate certain named students, the Principal and/or Assistant Principal gives the CIU detectives the written statement of each of those students who had been previously identified by the BC Sheriff's Office and subjected to the in-custody interrogation by the Principal and/or Assistant Principal with respect to felony crimes allegedly committed outside of school with which said student may have been involved.

Subsequently, the Principal and/or Assistant Principal, acting on behalf of the CIU detectives, causes each of those students (one at a time) to be taken out of his/her educational environment, where each of those above-named students (one at a time) is led to an interrogation room. Once in the interrogation room, the door is shut behind him/her. Here, the Principal and Assistant Principal have relinquished their custody of the student as *pareens patriae* to the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff), enabling said detectives to forcibly subject said student to a recorded in-custody interrogation in pursuit of a coerced, involuntary confession from said student.

In the interrogation room, CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff) are waiting inside the room, sitting down, where *actual deliberation by the detectives is practical*. The CIU detectives formally introduced themselves. The student does not voluntarily enter into the interrogation room and is NEVER asked if he/she will voluntarily submit to questioning by the CIU detectives (i.e., employees of the BC Sheriff). There is no school official present.

In the interrogation room, the student is forcibly subjected to a recorded, in-custody interrogation by the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff). Specifically, the detectives interrogate the student with respect to alleged felony crimes with which the student may have been involved. More specifically, the detectives interrogate the student concerning his/her formal written statement (of which the detectives have possession). The entire in-custody interrogation is recorded.

During the interrogation by the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff), the student knows that he/she is NOT free to leave and return to his/her class because of the physical force and show of authority demonstrated by the detectives. Furthermore, with a purpose:

(a) to harm the minor student (i.e., *to deprive the minor student of his/her constitutional right to be free from being coerced into making an involuntary, self-incriminating statement within the context of an in-custody interrogation at school*) and
(b) to harm the student's parents (i.e., *to deprive the student's parents of their fundamental, constitutional right to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school*),

the detectives do not tell the student that he/she may voluntarily leave or that he/she does not have to answer their questions or that he/she may call his/her parents or that he/she may have someone else present while he/she is being questioned. Finally, the student knows that he/she has to answer truthfully and completely pursuant to Policy 4340. Otherwise, the student knows that he/she will be suspended or expelled from school by the Principal.

As a result of the psychological intimidation and coercion described above, the student is induced to truthfully and completely respond to the questions of the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff). Some of the statements are self-incriminating. However, these self-incriminating statements are induced (coerced), they are not voluntarily made.

Finally, as part of the above described *recurring, systemized practice*, rising to the level of a *custom*, with respect to the recorded, in-custody interrogation of children at school, relating to felony crimes allegedly committed outside of school, with which said children may have been involved, established by the BC Board of Education and decisions of the BC Sheriff, attributed to Brunswick County, if a citizen complains about the coercive manner with which a student was interrogated by the Principal and/or Assistant Principal and/or the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff), with respect to felony crimes allegedly committed outside of school, with which the student may have been involved, a staff attorney for the BC Sheriff's Office will communicate with the Principal and Assistant Principal and each of the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff) *for the purpose of manufacturing evidence and making false statements*, specifically intended to cover-up their illegal conduct (i.e., (1) the deprivation of a minor student's constitutional right to be free from being coerced into making an involuntary, self-incriminating statement within the context of an in-custody interrogation at school and (2) the deprivation of a parent's fundamental constitutional right to the custody, care and control of his/her minor child and specifically, the freedom to protect their minor student-child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school) by attempting to trivialize and legitimize said conduct.

With a purpose:

(a) to harm the minor student (i.e., *to deprive the minor student of his/her constitutional right to be free from being coerced into making an involuntary, self-incriminating statement within the context of an in-custody interrogation at school*) and
(b) to harm the student's parents (i.e., *to deprive the student's parents of their fundamental, constitutional right to the care, custody, and control of their minor, student-child, and specifically, the freedom to protect their child from making involuntary, self-incriminating statements, within the context of a coercive, in-custody interrogation at school*),

the core of this *recurring systemized practice*, rising to the level of a *custom*, is to hold each minor student incommunicado during a series of two in-custody interrogations, while deliberately ignoring -
(i) the minor student's constitutional right not to be coerced into making an involuntary, self-incriminating statement as well as

(ii) any desire that he/she might have to speak with another person (e.g., a parent or an attorney) in connection therewith.

The point of flouting the requirements under *Miranda* (i.e., that a minor student in custody be permitted to consult with an attorney prior to his/her in-custody interrogation) is to ensure that the student, a minor, will not rely on his/her right to remain silent (i.e., to intentionally undermine the minor student's right to remain silent). With the minor student cut off and isolated from his/her educational environment, which is designed to instill stress, hopelessness and fear, this *recurring, systemized practice*, rising to the level of a *custom*, calls for psychologically dominating a student's will and breaking the student's resistance to confess. Basically, at that point, the minor student will do whatever he/she is told to do. Then, during each interrogation, the Principal and/or Assistant Principal and/or the CIU detectives will use specific interrogation techniques to pressure, intimidate and/or cajole the minor student until he/she finally confesses. Previously, execution of this *recurring, systemized practice* has been very successful in obtaining confessions from minor students. As such, execution of such *systemized practice* occurs at least twice per month.

Even though the Principal and Assistant Principal and the CIU detectives each knows that the above described *recurring, systemized practice* violates the law, in continuing to execute such *systemized practice*, they each make a calculated decision to deliberately violate the law [and trample on the civil rights of the minor student and his/her parents] for its potential outcome (i.e., the student's coerced, involuntary confession). Although the Principal and Assistant Principal and the CIU detectives from the BC Sheriff's Office (i.e., employees of the BC Sheriff) each knows that:
(a) the above described *recurring, systemized practice* is patently unconstitutional [because of its intensely coercive psychological nature, within the context of an in-custody interrogation at school, characterized by an abandonment of all aspects of *Miranda* safeguards] and, as a result,
(b) any confession thus generated would not be admissible in evidence in a prosecutor's case in chief, they each expect that such confession will be admissible for purposes of impeachment, if the student ever goes to trial.
In this case, they each expect that the confession will prevent the minor student from testifying that he/she is innocent.

II.
CLEARLY ESTABLISHED LAW WITH RESPECT TO A MINOR STUDENT'S CONSTITUTIONAL RIGHT TO BE FREE FROM MAKING COERCED, INVOLUNTARY, SELF-INCRIMINATING STATEMENTS, WITHIN THE CONTEXT OF AN IN-CUSTODY INTERROGATION, UNDER THE SUBSTANTIVE DUE PROCESS CLAUSE OF THE 14TH AMENDMENT

The Due Process Clause of the Fourteenth Amendment provides that no State shall "deprive any person of life liberty, or property, without due process of law." U.S. Const. amend. XIV.

The term "self-incriminating" is an adjective defined in 1925 as "[t]ending to put the blame or criminal responsibility on oneself; inculpatory to oneself." Garner, Black's Law Dictionary, Deluxe Tenth Edition (Thomson Reuters 2014), p. 1566.

The term "self-incrimination" is a noun defined in 1853 as "[t]he act of indicating one's own involvement in a crime or exposing oneself to prosecution, esp. by making a statement." Garner, Black's Law Dictionary, Deluxe Tenth Edition (Thomson Reuters 2014), p. 1566.

HISTORICAL BACKGROUND

The Supreme Court, in 1936, clearly established (beyond any law-enforcement officer's misapprehension) the proposition that the U.S. Constitution, as a limit on the conduct of law-enforcement officers, unequivocally prohibits coercion in the pursuit of a self-incriminating statement from a person suspected of a crime. *See Brown v. Mississippi*, 297 U.S. 278, 80 L. Ed. 682, 56 S. Ct. 461 (1936). The Supreme Court in *Brown* based its holding on substantive due process in the execution of the law, which it held was demanded by the Fourteenth Amendment. Specifically, the Supreme Court held that the Fourteenth Amendment, substantive due process violation, caused by the coercive behavior of law-enforcement officers in pursuit of a self-incriminating statement, is complete with the coercive behavior itself. In other words, for a violation to be complete, there is no need for such self-incriminating statement to be introduced at a criminal trial.

Furthermore, coercive behavior does not necessarily involve torture. In other words, torture is not a necessary prerequisite to a judicial holding that coercive conduct by law-enforcement officers in the pursuit of a self-incriminating statement is a Fourteenth Amendment, substantive due process violation. Psychological coercion is sufficient. For example, in *Spano v. New York*, 360 U.S. 315, 3 L. Ed. 2d 1265, 79 S. Ct. 1202 (1959), the facts of the case involved no physical brutality or violence. Notwithstanding the foregoing, the Supreme Court held that a violation of the Due Process Clause of the Fourteenth Amendment had occurred, as follows.

> "The abhorrence of society to the use of involuntary confessions does not turn alone on their inherent untrustworthiness. It also turns on the deep-rooted feeling that the police must obey the law while enforcing the law; that in the end life and liberty can be as much endangered from illegal methods used to convict those thought to be criminals as from the actual criminals themselves. Accordingly, the actions of police in obtaining confessions have come under scrutiny in a long series of cases. Those cases suggest that in recent years law enforcement officials have become increasingly aware of the burden which they share, along with our courts, in protecting fundamental rights of our citizenry, including that portion of our citizenry suspected of crime. The facts of no case recently in this Court have quite approached the brutal beatings in *Brown v. Mississippi,* or the 36 consecutive hours of questioning present in *Ashcraft v. Tennessee*. But as law enforcement officers become more responsible, and the methods used to extract confessions more sophisticated, our duty to enforce federal constitutional protections does not cease. It only

becomes more difficult because of the more delicate judgments to be made." *Spano*, 360 U.S. at 320-21.

More broadly, in *Rochin v. California*, 342 U.S. 165, 172, 72 S. Ct. 205, 96 L. Ed. 183 (1952), the Supreme Court held that the Due Process Clause of the Fourteenth Amendment protects against any government conduct that "shocks the conscience."

More recently, in *Mincey v. Arizona,* 437 U.S. 385, 57 L. Ed. 2d 290, 98 S. Ct. 2408 (1978) the Supreme Court again illuminated the Fourteenth Amendment, substantive due process protections of the Constitution against the coercive conduct by law-enforcement officers in their pursuit of a self-incriminating statement. Similar to the instant case, the claims of *Mincey* dealt with the conduct of law-enforcement officers, where the source of the issue with respect to Mincey's statement was a refusal by a law-enforcement officer to abide by the dictates of *Miranda*. In view of the question presented in the instant case as to whether the law on the subject of coercing confessions was clearly established, the text of the Supreme Court's opinion is revealing, as follows.

> "It is hard to imagine a situation less conducive to the exercise of 'a rational intellect and a free will' than Mincey's . . . He was, in short, 'at the complete mercy' of Detective Hust, unable to escape or resist the thrust of Hust's interrogation. . . . There were not present in this case some of the gross abuses that have led the Court in other cases to find confessions involuntary, such as beatings . . . . But 'the blood of the accused is not the only hallmark of an unconstitutional inquisition.' Determination of whether a statement is involuntary 'requires more than a mere color-matching of cases.' It requires careful evaluation of all the circumstances of the interrogation.
>
> It is apparent from the record in this case that Mincey's statements were not 'the product of his free and rational choice.'" *Id.* at 396-402.

In a judicial determination as to whether specific conduct of law-enforcement officers in the pursuit of a self-incriminating statement is in violation of Fourteenth Amendment, substantive due process, *Haynes v. Washington*, 373 U.S. 503, 10 L. Ed. 2d 513 , 83 S. Ct. 1336 (1963) is often cited. The conduct of law-enforcement officers in *Haynes* did not involve torture or physical violence. However, such conduct did involve psychological pressure specifically designed to illicit self-incriminating statements from the suspect. In *Haynes*, the Supreme Court again confirmed the principle that Fourteenth Amendment, substantive due process requires that statements taken from a suspect by police be the "voluntary product of a free and unconstrained will." *Id.* at 514.

MORE RECENTLY, IN RELATION TO MINORS

In *Miller v. Fenton*, 474 U.S. 104, 109, 106 S. Ct. 445, 88 L. Ed. 2d 405 (1985), the Supreme Court held: "[C]ertain interrogation techniques, either in isolation or as applied to the unique characteristics of a particular suspect, are so offensive to a civilized system of justice that they must be condemned under the Due Process Clause of the Fourteenth Amendment."

In particular, minors are entitled to the same panoply of due process rights as adults, where parents are entitled to be notified of their child's due process rights. *In re Gault*, 387 U.S. 1, 18 L. Ed. 2d 527, 87 S. Ct. 1428 (1967). Furthermore, it has also long been established (i.e., the law is clearly established) that the constitutionality of interrogation techniques is judged by a higher standard when police interrogate a minor. *See In re Gault*, 387 U.S. 1, 55, 87 S. Ct. 1428, 18 L. Ed. 2d 527 (1967) (In an interrogation of a minor**,** "the greatest care must be taken to assure that the admission was voluntary, in the sense not only that it was not coerced or suggested, but also that it was not the product of ignorance of rights or of adolescent fantasy, fright or despair.").

If a citizen is compelled to incriminate himself on pain of penalty, the state cannot use his statements against him in a subsequent criminal prosecution. *See Wiley v. Doory*, 14 F.3d 993, 996 (4th Cir. 1994).

OTHERS MORE RECENTLY

Federal courts have long recognized (i.e., the law is clearly established) that the touchstone of Fourteenth Amendment due process "is protection of the individual against arbitrary action of government." *County of Sacramento v. Lewis*, 523 U.S. 833, 845, 118 S. Ct. 1708, 140 L. Ed. 2d 1043 (1998). Within this standard ("arbitrary action of government"), using "arbitrary" to describe the conduct that triggers constitutional protections means that only the most egregious conduct of law-enforcement officers can be described as arbitrary (in the constitutional sense of the word). *Id*. at 846. The bottom-line test, as articulated by the Supreme Court many decades ago, to determine whether the conduct of law-enforcement officers violates Fourteenth Amendment, substantive due process is: Whether the challenged conduct "shocks the conscience." *Id*. (quoting *Breithaupt v. Abram*, 352 U.S. 432, 77 S. Ct. 408, 1 L. Ed. 2d 448 (1957), where the Supreme Court held that only government conduct, which was so brutal and offensive that it did not comport with the traditional ideas of fair play and decency, would violate substantive due process).

Since the inception of the "shocks the conscience" standard many decades ago to determine whether the conduct of law-enforcement officers violates Fourteenth Amendment substantive due process, such standard has been extensively explored by the Supreme Court. From such exploration, a guiding principle emerges. That is: What shocks the conscience is dependent upon the context of the situation and each case must be judged on its own specific facts. In *County of Sacramento v. Lewis*, the Supreme Court explained as follows.

> "It should not be surprising that the constitutional concept of conscience shocking duplicates no traditional category of common-law fault, but rather points clearly away from liability, or clearly toward it, only at the ends of the tort law's spectrum of culpability. Thus, we have made it clear that the due process guarantee does not entail a body of constitutional law imposing liability whenever someone cloaked with state authority causes harm. We have accordingly rejected the lowest common denominator of customary tort liability as any mark of sufficiently shocking conduct, and have held that the Constitution does not guarantee due care on the part of state officials; liability for negligently inflicted harm is categorically beneath the threshold of constitutional due process. … It is, on the contrary, behavior at the other end of the culpability spectrum that would most probably support a substantive due process claim; conduct intended to injure in some way unjustifiable by any government interest is the sort of official action most likely to rise to the conscience-shocking level. See *Daniels v. Williams*, 474 U.S., at 331, 106 S.Ct., at 665 ('Historically, this guarantee of due process has been applied to *deliberate* decisions of government officials to deprive a person of life, liberty, or property.')" *County of Sacramento v. Lewis*, 523 U.S. 833, 848-849, 118 S. Ct. 1708, 140 L. Ed. 2d 1043 (1998).

However, in certain cases, courts have not applied a traditional "shocks the conscience" standard to determine whether the conduct of law-enforcement officers violates Fourteenth Amendment substantive due process Instead, courts have applied a lower "deliberative indifference" standard to determine whether the conduct of law-enforcement officers violates Fourteenth Amendment substantive due process. In particular, these cases involve the conduct of law-enforcement officers where law-enforcement officers have had time to deliberate before taking action. *See Id.* at 523 U.S. 851. ("As the very term 'deliberate indifference' implies, the standard is sensibly employed only when actual deliberation is practical….")

To determine whether the conduct of law-enforcement officers violates Fourteenth Amendment substantive due process in the course of taking a person's self-incriminating statement, such determination depends upon the voluntariness of the statement. *Colorado v. Connelly*, 479 U.S. 157, 166, 107 S. Ct. 515, 93 L. Ed. 2d 473 (1986).

The Voluntariness of a Self-Incriminating Statement.

In particular, to determine whether a self-incriminating statement was voluntarily made, a court must evaluate the totality of the circumstances surrounding the interrogation to determine whether the defendant's "will [was] overborne and his capacity for self-determination critically impaired." *Schneckloth v. Bustamonte*, 412 U.S. 218, 225-26, 93 S. Ct. 2041, 36 L. Ed. 2d 854 (1973). Within this context, "coercive police activity is a necessary predicate to the finding that a confession [self-incriminating statement] is not 'voluntary.'" *Colorado v. Connelly*, 479 U.S. 157, 167, 107 S. Ct. 515, 93 L. Ed. 2d 473 (1986). Also, within this context, "coercion can be mental as well as physical." *Blackburn v. Alabama*, 361 U.S. 199, 206, 80 S. Ct. 274, 4 L. Ed. 2d 242 (1960). Finally, in addition to "the crucial element of police coercion," courts consider "the length of the interrogation, its location, its continuity, the defendant's maturity, education, physical condition, and mental health" and the failure of police to advise the defendant of his *Miranda* rights. *Withrow v. Williams*, 507 U.S. 680, 693-94, 113 S. Ct. 1745, 123 L. Ed. 2d 407 (1993); *see also Schneckloth*, 412 U.S. at 226 (discussing factors).

In *United States v. Braxton*, 112 F.3d 777, 780 (4th Cir. 1997), the Fourth Circuit Court of Appeals held in determining the voluntariness of a self-incriminating statement, courts should analyze "whether the confession was extracted by any sort of threats or violence, or obtained by any direct or implied promises, however slight, or by the exertion of any improper influence." *Id*. at 780. Courts should further consider "whether the defendant's will has been 'overborne' or his 'capacity for self-determination critically impaired,'" *United States v. Pelton*, 835 F.2d 1067, 1071 (4th Cir. 1987) (quoting *Schneckloth v. Bustamonte*, 412 U.S. 218, 225, 93 S. Ct. 2041, 36 L. Ed. 2d 854 (1973)), because of coercive police conduct. *Colorado v. Spring*, 479 U.S. 564, 574, 107 S. Ct. 851, 93 L. Ed. 2d 954 (1987). The decision is based on the "totality of the circumstances," including the characteristics of the defendant, the setting of the interview, and the details of the interaction. *United States v. Cristobal*, 293 F.3d 134, 140 (4th Cir. 2002). Inherent in this analysis is a focus on the "crucial element of police overreaching" in exerting pressure on the detainee to respond to questions. *Colorado v. Connelly*, 479 U.S. 157, 163, 107 S. Ct. 515, 93 L. Ed. 2d 473 (1986).

Finally, in *Chavez v. Martinez*, 538 U.S. 760, 123 S. Ct. 1994, 155 L. Ed. 2d 984 (2003), *Chavez* addressed whether a former criminal suspect could sue a police officer under § 1983 for coercing a confession. Specifically, the police failed to give the suspect any *Miranda* warnings and interrogated him under circumstances alleged to be extremely coercive. Martinez made several incriminating statements but was never charged with any crime. *Id*. at 764. He subsequently brought suit under § 1983 for violation of his Fourteenth Amendment substantive due process right to be free from coercive questioning. *Id*. at 765. The Supreme Court held that unlawful police interrogation techniques might give rise to a substantive due process claim under the Fourteenth Amendment [*see id*. at 773 (plurality opinion of Thomas, J.); *id*. at 779 (Souter, J.); *id*. at 787 (Stevens, J.); *id*. at 799 (Kennedy, J.)] if the police behavior "shocks the conscience" or was "unusually coercive." See *Chavez*, 538 U.S. at 787 (Souter, J.).

III.
U.S. CONSTITUTIONAL IMPLICATIONS FOR MINOR CHILDREN: CLEARLY ESTABLISHED LAW IN PART II, WITH RESPECT TO A MINOR STUDENT'S CONSTITUTIONAL RIGHT TO BE FREE FROM MAKING COERCED, INVOLUNTARY, SELF-INCRIMINATING STATEMENTS, WITHIN THE CONTEXT OF AN IN-CUSTODY INTERROGATION, IS APPLIED TO THE FACTS OF THE CASE STUDY IN PART I

THE FOURTEENTH AMENDMENT SUBSTANTIVE DUE PROCESS RIGHT TO BE FREE FROM GOVERNMENT CONDUCT THAT "SHOCKS THE CONSCIENCE"

Under the Fourteenth Amendment's "shock the conscience" theory established in *Rochin,* 342 U.S. at 172, any person has a Fourteenth Amendment substantive due process right to be free from government conduct that "shocks the conscience." Because a minor child is entitled to the same panoply of due process rights as adults [*In re Gault,* 387 U.S. 1, 18 L. Ed. 2d 527, 87 S. Ct. 1428 (1967)], a minor child has a Fourteenth Amendment substantive due process right to be free from government conduct that "shocks the conscience" under *Rochin.*

COERCIVE BEHAVIOR BY LAW-ENFORCEMENT OFFICERS THAT "SHOCKS THE CONSCIENCE" UNDER *ROCHIN* VIOLATES THE PROHIBITIONS OF FOURTEENTH AMENDMENT SUBSTANTIVE DUE PROCESS

Moreover, the Supreme Court, in 1936, clearly established (beyond any law-enforcement officer's misapprehension) that Fourteenth Amendment substantive due process prohibits coercion by law-enforcement officers in the pursuit of a self-incriminating statement from a person suspected of a crime, where the substantive due process violation, caused by the coercive behavior of law-enforcement officers in pursuit of a self-incriminating statement, is complete with the coercive behavior itself. *See Brown v. Mississippi,* 297 U.S. 278, 80 L. Ed. 682, 56 S. Ct. 461 (1936). Within this context, psychological coercion is sufficient. *Spano v. New York,* 360 U.S. 315, 3 L. Ed. 2d 1265, 79 S. Ct. 1202 (1959). Such coercive behavior does not necessarily have to involve torture. Accordingly, in the pursuit of a self-incriminating statement from a person suspected of a crime, coercive behavior by law-enforcement officers that "shocks the conscience" under *Rochin* violates the prohibitions of Fourteenth Amendment substantive due process.

THE CONSTITUTIONALITY OF INTERROGATION TECHNIQUES IS JUDGED BY A HIGHER STANDARD WHEN POLICE INTERROGATE A MINOR

In *Miller v. Fenton,* 474 U.S. 104, 109, 106 S. Ct. 445, 88 L. Ed. 2d 405 (1985), the Supreme Court held: "[C]ertain interrogation techniques, either in isolation or as applied to the unique characteristics of a particular suspect, are so offensive to a civilized system of justice that they must be condemned under the Due Process Clause of the Fourteenth Amendment." In particular, the constitutionality of interrogation techniques is judged by a higher standard when police interrogate a minor. *See In re Gault,* 387 U.S. 1, 55, 87 S. Ct. 1428, 18 L. Ed. 2d 527 (1967) (In an interrogation of a minor**,** "the greatest care must be taken to assure that the admission was voluntary, in the sense not only that it was not coerced or suggested, but also that it was not the product of ignorance of rights or of adolescent fantasy, fright or despair.").

EXECUTION OF THE RECURRING, *SYSTEMIZED PRACTICE*
BY LAW-ENFORCEMENT OFFICERS
DEPRIVES MINOR CHILDREN OF THEIR CONSTITUTIONAL RIGHT
TO BE FREE FROM MAKING COERCED, INVOLUNTARY,
SELF-INCRIMINATING STATEMENTS

Under the facts of the case study, execution of the recurring, *systemized practice* by law-enforcement officers deprives minor children of their constitutional right to be free from making coerced, involuntary, self-incriminating statements, within the context of an in-custody interrogation at school, in that the interrogation techniques employed by such law enforcement officers, either in isolation or as applied to the unique characteristics of minor children, are so offensive to a civilized system of justice that they must be condemned under the Due Process Clause of the Fourteenth Amendment. *Miller v. Fenton*, 474 U.S. 104, 109, 106 S. Ct. 445, 88 L. Ed. 2d 405 (1985). Such a claim is based upon the conduct of law enforcement officers violating the Fourteenth Amendment substantive due process right of minor children to be free from making coerced, involuntary, self-incriminating statements, within the context of a series of two (2) in-custody interrogations. Specifically, in executing the recurring, *systemized practice*, the conduct of law enforcement officers "shocks the conscience" within the meaning of *Rochin* as a result of the coercive methods employed and the attempts at covering-up their illegal conduct by *manufacturing evidence and making false statements* about said minor children.

In the alternative, in determining whether the conduct of law enforcement officers "shocks the conscience" within the meaning of *Rochin*, a "deliberative indifference" standard should be applied, because the conduct of the law enforcement officers was premeditated, where said officers had time to deliberate before taking action, which means that actual deliberation was practical). *County of Sacramento v. Lewis*, 523 U.S. 833, 851, 118 S. Ct. 1708, 140 L. Ed. 2d 1043 (1998) ("As the very term 'deliberate indifference' implies, the standard is sensibly employed only when actual deliberation is practical….").

IV.
U.S. CONSTITUTIONAL IMPLICATIONS FOR THE PARENTS: CLEARLY ESTABLISHED LAW IN PART II, WITH RESPECT TO A PARENT'S FOURTEENTH AMENDMENT (SUBSTANTIVE DUE PROCESS), FUNDAMENTAL, LIBERTY INTEREST AND PRIVACY GUARANTEE TO THE CARE, CUSTODY, MANAGEMENT AND CONTROL OF THEIR MINOR CHILDREN, IS APPLIED TO THE FACTS OF THE CASE STUDY IN PART I

UNDER NORTH CAROLINA LAW

In *Partick v. Bruan*, 202 N.C. 62, 162 S.E. 207 (N.C. 1932), the North Carolina Supreme Court held that "The father has at common law an unquestioned right of custody and control over a minor child as against the mother, and still more clearly as against any third person."

Moreover, in *Littleton v. Haar*, 158 N.C. 566, 74 S.E. 12 (N.C. 1912), the North Carolina Supreme Court held that "the father has the paramount right to the control and custody of a minor child, as against the world . . ."

UNDER FEDERAL LAW

A parent is entitled to be notified of SMJ's due process rights. *In re Gault,* 387 U.S. 1, 18 L. Ed. 2d 527 , 87 S. Ct. 1428 (1967).

In addition, the Supreme Court has recognized a "fundamental liberty interest of natural parents in the care, custody, and management of their child." Santosky v. Kramer, 455 U.S. 745, 753, 102 S. Ct. 1388, 71 L. Ed. 2d 599 (1982). Jordan v. Jackson, 15 F.3d 333, 342 (4th Cir. 1994) ("The state's removal of a child from his parents indisputably constitutes an interference with a liberty interest of the parents and thus triggers the procedural protections of the Fourteenth Amendment."). Also, *see, e.g., Meyer v. Nebraska*, 262 U.S. 390, 400, 43 S. Ct. 625, 67 L. Ed. 1042 (1923) (Parents have a fundamental constitutional right to direct the upbringing of one's children).

Specifically, in *D.B. v. Cardall*, 826 F.3d 721, 2016 U.S. App. LEXIS 11091 (4th Cir. Va. June 20, 2016), the Fourth Circuit Court of Appeals held as follows.

> "The identification of those rights that implicate substantive due process 'has not been reduced to any formula.' *See Obergefell v. Hodges*, 135 S. Ct. 2584, 2598, 192 L. Ed. 2d 609 (2015) (internal quotation marks omitted). At minimum, however, they include those 'deeply rooted in this Nation's history and tradition.' *See Washington v. Glucksberg*, 521 U.S. 702, 721, 117 S. Ct. 2258, 117 S. Ct. 2302, 138 L. Ed. 2d 772 (1997) (internal quotation marks omitted). This proceeding involves 'perhaps the oldest of the fundamental liberty interests recognized by' the Supreme Court — 'the interest of parents in the care, custody, and control of their children.' *See Troxel v. Granville*, 530 U.S. 57, 65, 120 S. Ct. 2054, 147 L. Ed. 2d 49 (2000) (plurality opinion). We have agreed that 'few rights' are "more fundamental in and to our society than those of parents to retain custody over and care for their children, and to rear their children as they deem appropriate.' *See Jordan ex rel. Jordan v. Jackson*, 15 F.3d 333, 342 (4th Cir. 1994).

Based upon the analysis of the Fourth Circuit Court of Appeals in *D.B. v. Cardall*, it is well established that parents a fundamental liberty interest in the companionship and society of their minor children and that, based upon the facts presented in Part I – Facts of the Case Study, the conduct of the law enforcement officers interfered with that liberty interest without due process of law, where such interference is remediable under 42 U.S.C. § 1983.

Specifically, based upon the facts presented in Part I – Facts of the Case Study, there is no doubt that the parents of the minor children had a liberty interest in retaining custody over, caring for, and rearing said minor children as they deemed appropriate, when school officials, under the direction and control of law enforcement officers, caused said minor children to be involuntarily taken from their educational environment, where said school officials relinquished custody of said minor children to said law enforcement officers (i.e., employees of the BC Sheriff). Furthermore, there is no doubt that such law enforcement officers interfered with that liberty interest. Moreover, there is no doubt that the parents had a liberty interest in notification of their minor children's due process rights under North Carolina common law, and the right of custody and control over their minor children. *In re Gault,* 387 U.S. 1, 18 L. Ed. 2d 527 , 87 S. Ct. 1428 (1967); *Partick v. Bruan*, 202 N.C. 62, 162 S.E. 207 (N.C. 1932); *Littleton v. Haar*, 158 N.C. 566, 74 S.E. 12 (N.C. 1912). Finally, there is no doubt that the law enforcement officers interfered with those liberty interests.

HEDGING AGAINST U.S. CHINESE CURRENCY FLUCTUATION

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ABSTRACT

Distribution companies constantly search for opportunities to hedge their financial interests. Many distribution companies import goods from China. This means they are constantly impacted by the fluctuation of currency. Fluctuation in currency poses a risk because it affects the price of the goods being imported; this has the potential to affect a company's bottom line. Hedging currency is in the best interest of distributors because it helps protect their financial assets and stock price by reducing the potential volatility of foreign exchange rates. A multiple regression analysis is used to assist in explaining some of the relative valuation of U.S. Chinese currency. This analysis uses the U.S. interest rate, U.S. 10-year Treasury Bond, Chinese CPI, U.S. CPI, Chinese Government 10-year Bond, and the Chinese Import Price as independent variables to predict the U.S. Chinese exchange rate. After conducting the analysis, the model was determined to be statistically significant. Two predictor variables: the U.S. CPI and Import Price Index were also statistically significant.

Keywords: Hedging, currency, exchange rate, China, regression analysis, U.S. dollar, Chinese Yuan

INTRODUCTION

America's economy is flourishing. Unemployment is low, and GDP is high. The U.S. dollar is appreciating against all foreign currencies. While the United States is currently experiencing a period of growth, organizations are still tasked with hedging their financial assets and protecting their financial interests. Due to the fluctuation in value of U.S. and foreign currencies over time, organizations are constantly searching for best practices to predict future exchange rates and protect their corporations and finances. By anticipating potential losses caused by the exchange rate, organizations can hedge accordingly (Brown, 2002).

The U.S. dollar is the world's main currency. Any changes in the value of the dollar affect the rest of the world. This growth is affecting investments throughout the world and attracting overseas money to the United States. Many investors believed the U.S. dollar's growth would be short-lived, but as it continues to grow to the highest level since July 2017, investors are beginning to bet on the U.S. dollar against foreign currencies. The growth of the Chinese Yuan is slowing down, but the growth of the U.S. dollar is steadily increasing. While a strong dollar is beneficial to importers, it is concerning to U.S. exporters, because a strong U.S. dollar results in a price increased international prices for U.S. goods. The U.S. dollar is projected to continue increasing in value as the U.S. economy grows. However, this fluctuation of U.S. currency still poses a risk of loss to organizations. Some organizations can choose to utilize the fluctuation of currency to their advantage. However, it is unwise to be speculative and bank on the fluctuation of exchange rates to increase cash flow. Trade tensions with China have also been cited as a U.S. dollar booster because if a "trade war" erupts, the U.S. is projected to have the upper-hand against China (Iosebashvili, 2018). With the continued growth of the U.S. dollar, this projection means the U.S. dollar will be able to purchase more of a foreign currency than it did in the past. If the dollar continues to grow, distributors can purchase more goods from China at a lower price. However, there is no guarantee that the dollar will continue to grow and for this reason, organizations must hedge themselves against foreign currency. If the U.S. dollar weakens, it would result in an increase in the net cost of goods purchased from foreign countries and a decrease in the net cost of U.S. made goods purchased by other countries. A weaker U.S. dollar would create a fall in the U.S. Treasury Bond yield, which in turn affects mortgage rates. Lastly, a weakened U.S. dollar means the U.S. dollar is not in high demand, which in turn could increase the demand for the Chinese Yuan (Amadeo, 2018).

With new policies set in place by President Trump, some argue that a "trade war" is imminent between the U.S. and China. Trump has levied tariffs on $50 billion of goods imported from China (Swanson, 2018). With tariffs being placed on Chinese goods, China is retaliating with tariffs for imported American goods. The fear is that consumer prices will skyrocket in response to the newly imposed tariffs. President Trump's goal is to levy taxes on over 1,000 Chinese products and bring jobs back to the United States by increasing the cost of imported goods. With tensions escalating, distribution companies must determine an effective process to hedge their finances when purchasing goods from China. The Trump Administration suggests a 25% tariff on $50 billion of Chinese tech imports (Bremmer, 2018). For technology distributors in the U.S., this raises questions as to how China will react to these actions. China is threatening to levy heavy additional tariffs on U.S. imports in response. China's Central Bank has been known to manipulate the exchange rate. Recently, the Central Bank Chief vowed to maintain the stability of the Yuan and protect their economy. With the value of the Yuan rising and falling in a matter of days, investors are constantly searching for the best means to hedge themselves and their companies from the volatility of the Yuan (Vaishampayan, 2018).

When looking at the volatility of the Yuan, organizations are constantly searching for ways to protect their financial interests. One way to protect financial interests is through hedging currency. To effectively hedge currency, an organization must determine which variables impact an exchange rate forecast with the highest accuracy. Determining which factors are the strongest predictors of the exchange rate is difficult. There are many qualitative and quantitative variables to consider. This study attempts to determine which factors are the strongest exchange rate predictors between the United States and China. It looks at exchange rate risk from a distributor's perspective, since distributors constantly purchase products internationally. This paper will determine if the variables chosen are able to consistently be used to forecast the exchange rate between the United States and China.

If a distributor can accurately predict the exchange rate between the United States and China, they can purchase products when the exchange rate is higher, and the U.S. dollar is stronger than the Chinese Yuan. They can also enter into financial agreements to protect themselves from negative fluctuations in the exchange rate. This would create an opportunity where the distributor's U.S. dollar buys more Chinese product. Determining the exchange rate between countries helps a distributor decide the most cost-effective way to purchase product. If they can accurately predict the fall of the exchange rate it might be in the best interest of organizations to purchase next month's product inventory from a different country with a greater value of the U.S. dollar versus the foreign currency. Purchasing product from a country with the lowest exchange rate will save the organization money, thus hedging it from exchange rate fluctuations and the volatility of foreign currency. An example of hedging would be entering into a financial agreement to protect against the fluctuation in the exchange rate. This would be done through the financial futures market. Hedging is in the best interest of distributors because it protects their financial assets and stock price. Predicting the exchange rate could help distributors turn a profit from the fluctuation of exchange rates. The key is to reduce the volatility of foreign exchange rates by analyzing various predictors of the exchange rate, then making decisions based on the forecast.

REVIEW OF RELATED LITERATURE

Gardner, Ritschel, White and Wallen discuss how the United States Department of Defense uses forecasting to determine future foreign currency exchange rates (2017). This article analyzes and compares the accuracy of various forecasting methods such as center-weighted average, ARIMA (auto regressive, integrated,

moving average), random walk method, forward rates, futures, and uses a private company's forecasting. The best forecasting method was determined by finding the sum of squared errors or the forecast errors.

Frazier (2014) defines risk management and best practices to effectively minimize risk in a business environment. Through his research he discusses the utilization of hedges to protect companies from an increase in price, forecasting inventory needs to ensure that a company does not have too many or too few materials in inventory, and the effectiveness of hedging. Companies must create and maintain a competitive edge by anticipating future risks and taking preventative measures by hedging in the financial futures market. Frazier uses regression to analyze the effectiveness of an automobile manufacturer's hedging strategy regarding the Canadian dollar exchange rate. It was determined that the U.S Consumer Price Index (USCPI), the Canadian 10 Year Bond (CATYTB), and the U.S. 10 Year Treasury Bond (USTYTB) were the largest influencers of the Canadian U.S. exchange rate (EXRATE).

Schwartz and Ganatti (2014) describe the situations where companies will begin to hedge their funds against foreign currencies. With central banks across the world changing their policies, it is believed that the value of the U.S. dollar and exchange rate will also change. If the U.S. has higher exchange rates than other foreign countries, then companies are more likely to hedge their funds. Schwarz and Ganatti used the Consumer Price Index (CPI) as another good indicator in determining the power of a country's currency. Through an analysis of data over four decades, they discovered a trend in the value of the U.S. dollar, stating that its value would cycle between weak and strong every six to ten years. They also determined that foreign currency provided a diversification in investments that the U.S. dollar could not offer. If organizations are not confident in their knowledge of foreign currency and forecasting the fluctuation of foreign currency, it is recommended that they hedge their financial assets.

Dow and Kunz (2015) looked at St. Louis Chemical (SLC), a chemical distributor, and their decision to purchase RMO International, a company similar to St. Louis Chemical but headquartered in Germany. Don Williams had to decide whether to acquire RMO International or continue with the current joint venture with him owning fifty-one percent of RMO International. If acquired, all future euro cash flows from RMO International would be converted from euros to U.S dollars at unknown exchange rates. The fluctuation of the euro's strength would determine if SLC's return on investment would increase or decrease. A strong euro would mean more USD per euro and a higher return on investment, but a weak euro would mean less USD per euro and a lower return on investment. They decided to swap currencies to reduce borrowing costs and exchange rate risk to make the deal profitable and less risky for SLC. Williams ran a report to analyze exchange rate risk based off a neutral exchange rate of euros to USD to determine if it would result in a positive or negative net present value. A moderately neutral exchange rate would result in a positive net present value with 85% confidence level. A moderately weak neutral exchange rate would result in a positive net present value with only 65% confidence level, and if there was a weak exchange rate, it would result in a positive net present value 35% of the time. To hedge his company Williams decided to swap currencies by borrowing $135 million, exchanging it for €100 million and repaying €5.8 million each year. This would hedge his company from the fluctuating value of the euro.

Chang and Lee (2017) utilized an econometric model to determine the factors that influenced governments' exchange rate regime. Events that affect the entire world, the volume of international trade, the economy of each country, and globalization influence a government's decision on exchange rate. They determined the likelihood that a government would choose a flexible or fixed exchange rate regime by MNL and MNP models. They discovered that democratic and left-wing countries with a central bank are more likely to implement a flexible regime, which allows the exchange rate to be determined by supply and demand.

China is considered one of these left-wing countries because they have a high output and their central bank created a flexible exchange rate regime. A flexible exchange rate also allows the Chinese government to manipulate their exchange rate to increase or decrease the value of their currency. China's central bank intentionally devalues their currency to make it a more cost-effective choice for other countries. Politics and a country's economy play a large role in determining what is a preferable exchange rate.

Reed (2016) discusses how the strengthening of the U.S. dollar impacts other international currencies like the euro, Japanese Yen, Chinese Yuan, and Canadian dollar. As the U.S. dollar strengthens against other dollars, it can purchase more goods from other countries, making imports cost less. When analyzing the results of the study regarding China, Reed discovered China's economy was struggling in 2015. It experienced low growth, a volatile stock market, and a weak export sector. The People's Bank of China can manipulate the exchange rate by creating policies to devalue the Yuan by basing the price of Yuan on the midpoint of the previous day's closing price. This policy devalued the Yuan by 1.9%. The devaluation of the Yuan helps China compete with other countries by making their exports cheaper than competitors thus creating an appeal to American companies. The combination of a strong U.S. dollar and a weaker Yuan means U.S. companies can import goods at lower prices than before.

Wen-Chih and Chen-Yuan (2013) collected quantitative data on international political power in relation to China to determine whether international political pressure had an impact on China's international exchange rates while using China and the United States' relationship as the foundation for the study. Politicians manipulate the exchange rate policy to promote economic growth. This paper used qualitative data on Chinese explanations of their exchange rate policy, variations of the policy, international political interaction, and comments of foreign governments to create the study. In 2003, the U.S. had a trade deficit with China which gave China a competitive edge. The Secretary of State urged China to implement a more flexible regime, arguing that the Chinese government had undervalued the Chinese Yuan. After constant pressure from the U.S. government, in 2005 the Chinese government increased the exchange rate of the Yuan. Their analysis showed that international political pressure impacted China's decision to increase the Yuan exchange rate from the years 2002-2008. Analyzing the fluctuation of exchange rate, Wen-Chih and Chen-Yuan determined that international political pressure, inflation, and economic factors significantly influenced the Chinese exchange rate. This shows that the Chinese government will change their exchange rate in response to pressure from other governments. Exchange rate is influenced by quantifiable factors like CPI, but also qualitative factors like international political pressure.

Wei (2015) investigates utilizing the VAR model to describe China's economy. They pulled monthly data from 1994 through 2010 and analyzed the effect of the price of oil, U.S. and Chinese industrial production, U.S. and Chinese consumer price index, and the U.S.-Chinese bilateral exchange rate. It was determined that China's aggregate supply shock and exchange rate shock had the greatest impact on U.S.-Chinese exchange rates, and that the U.S. supply and demand, oil prices, and production did not affect the exchange rate. Instead, the Chinese supply and demand had the highest impact of exchange rate. In the conclusion of their findings, Wei stated that manipulating the exchange rate is not an effective way to correct trade imbalances.

BUSINESS ENVIRONMENT

Distribution companies are becoming more widespread in the United States. However, distributors do not manufacture the products they sell. Instead, they buy products from a manufacturer and sell for a mark-up. This means distributors operate on minimal profit margins, which creates the need for efficiency in every

area of the business. Successful distributors will possess a solid customer base, supplier contracts, and contracts that ensure that the needs of customers are being met while offering competitive prices (Dow & Kunz, 2015). Since margins are low, a small fluctuation in the exchange rate could affect the margin in a large way. To encourage purchasing product from the distributors rather than the manufacturer, distribution companies add value. Some distributors offer marketing services, reseller financial services, the ability to store goods in their own warehouse, education and sales training, or access to IT support. Distribution companies must anticipate future losses and hedge themselves accordingly. Many organizations will conduct a financial analysis of their suppliers and end users to determine the likelihood of receiving payment.

Whether products are exported to China or imported from China, there is a foreign exchange risk every time U.S. dollars are converted to Chinese Yuan or vice-versa. Distributors are tasked with hedging their financial assets and protecting their margins. Publicly-traded distribution companies are required to keep shareholders informed on the financial standing of the company. For this reason, distributors must hedge against translation exposure. Translation exposure is the risk that the value of assets and liabilities will change when converted from one currency to another. This would affect the annual 10k report stockholders receive summarizing the company's performance over the past year. Exchange rates could affect the report thus creating an image that the company's financial performance was weaker or stronger than in reality.

The 10k publication on the United States Security and Exchange Commission of various distributors stated actual results could differ from those suggested due to changes in exchange rate. One example, Distributor X, utilizes foreign currency derivatives to reduce foreign currency exposure to zero. When hedging the goals are to manage foreign risk without speculation, reduce the volatility of cash flows, and protect earnings. They used foreign exchange future contracts to hedge against foreign exchange risk. Currently, Distributor X does not analyze predictors of exchange rate. Instead, they focus on hedging against balance sheet exposure so there is no net change from the fluctuation of exchange rates. Distributor X could increase their hedging potential by analyzing predictors of exchange rate and adding yet another hedge to their organization.

METHODOLOGY

Multiple regression analysis is used to analyze the data for this study. A regression analysis is useful in determining the relationship between exchange rate and the U.S. interest rate, U.S. Treasury Bond, Chinese Government Bond, U.S. CPI, Chinese CPI, and the Chinese Import Price Index. Table 1 outlines the dependent and predictor variables. It also provides additional details for each variable. The exchange rate formula used is as follows:

$$EXCHANGE = \alpha + \beta_1\, USINTRATE + \beta_2\, USTBOND + \beta_3\, CHINACPI + \beta_4\, USCPI + \beta_5\, CHINAGBOND + \beta_6\, PRICEINDEX + \mu.$$

Where α is a constant and β_1, β_2, β_3, β_4, β_5, and β_6 are coefficients of the USINTRATE, USTBOND, CHINACPI, USCPI, CHINAGBOND, and PRICEINDEX. Each of these factors potentially affect the relative demand for one country's currency versus another. Table 2 details the variables that were entered into the regression analysis. Table 3 details the r^2 and adjusted r^2 value for the analysis. Table 4 is the ANOVA table that details the statistical significance of the model. Table 5 shows the statistical significance of the variables used in the model. It also shows the statistical significance for each variable.

TABLE 1

Abbreviation	Variable	Definition	Location of Data
EXCHANGE	China U.S. Exchange Rate	Price of China's currency in terms of U.S. dollar	U.S. Federal Reserve
USINTRATE	U.S. Interest Rate	Rate which U.S. banks and credit unions lend to other institutions	Fed Prime Rate
USTBOND	U.S. Treasury Bond	10-year risk-free bond issued by the U.S. Treasury to finance government spending, yield includes full range of investments offered by the U.S. government	U.S. Treasury
CHINACPI	China CPI	Percent change in prices year-to-year, or inflation, of goods purchased by consumers	Inflation.eu
USCPI	U.S. CPI	Percent change of prices year-to-year for all urban consumer prices	Bureau of Labor and Statistics
CHINAGBOND	China Government Bond	10-year bond issued by the Chinese government to finance government spending	Investing.com
PRICEINDEX	Chinese Import Price Index	Measures average change in prices of goods imported into the U.S. from China	Bureau of Labor and Statistics

Hypothesis Formulation

It is hypothesized that the Chinese U.S. exchange rate is a function of the U.S. interest rate, U.S. 10-year Treasury Bond, Chinese CPI, U.S. CPI, Chinese Government Bond, and Chinese Import Price Index. The regression analysis would determine if the variables chosen were strong predictors of the China U.S. exchange rate. This hypothesis is based on quantifiable factors that could potentially affect the exchange rate with a focus on variables that influence distributors. The purpose was to determine if the variables chosen could predict Chinese U.S. exchange rates and be used by distribution companies to effectively hedge against fluctuations in the exchange rate. The null hypothesis is that there is no correlation between U.S. interest rate, U.S. 10-year Treasury Bond yield, Chinese CPI, U.S. CPI, Chinese 10-year Government Bond, and the Chinese Import Price Index and the exchange rate. If the p-value is less than .05, the null hypothesis will be rejected.

Dependent Variable

EXCHANGE: The foreign exchange rate between China and the U.S. was available through the U.S. Federal Reserve. It lists the units of Yuan per U.S. dollar.

Independent Variable

USINTRATE: The U.S. Interest Rate was found by gathering data from the Fed Prime Rate. The data used was the monthly prime rate.

USTBOND: The U.S. 10-year Treasury Bond yield was available through the U.S. Treasury. The daily treasury curve yield rate was used with data from the first day of each month over a five-year period.

CHINACPI: The Chinese Consumer Price Index was available through Inflation.eu – Worldwide Inflation Data. The Chinese CPI can be used to determine if inflation correlates with exchange rate and can be used as a predictor of future exchange rates.

USCPI: The U.S. Consumer Price Index was available on the Bureau of Labor and Statistics. The data included all items for all urban consumers (CPI-U) for all items. This was based on the percent change in CPI from 12 months prior. The base period of the data was 1967 = 100. The U.S. CPI can be used to determine if inflation correlates with exchange rate and can be used as a predictor of future exchange rates.

CHINAGBOND: The monthly yield rate of a 10-year Chinese Government Bond was found on Investing.com. The monthly yield was based on the first day of each month.

PRICEINDEX: The Chinese Import Price Index was available through the Bureau of Labor and Statistics. The data used included the index value listing for all industries across China. The base period of the data was December 2003 = 100. The Import Price Index shows the average price movement for goods imported from China each month.

The data used is this study are statistics from January 2013 through December 2017.

TABLE 2

Variables Entered / Removed

Model	Variables Entered	Variables Removed	Method
1	USINTRATE, USTBOND, CHINACPI, USCPI, CHINAGBOND, PRICEINDEX[b]	.	Enter

a. Dependent Variable: EXCHANGE

b. All requested variables entered.

TABLE 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.957[a]	.916	.906	.0830716

a. Predictors: (Constant), USINTRATE, USTBOND, CHINACPI, USCPI, CHINAGBOND, PRICEINDEX

TABLE 4

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.986	6	.664	96.273	.000[b]
	Residual	.366	53	.007		
	Total	4.352	59			

a. Dependent Variable: EXCHANGE

b. Predictors: (Constant), USINTRATE, USTBOND, CHINACPI, USCPI, CHINAGBOND, PRICEINDEX

TABLE 5

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	21.012	2.394		8.776	.000
	USCPI	.093	.020	.256	4.681	.000
	CHINACPI	-.035	.022	-.072	-1.552	.127
	USTBOND	-.015	.057	-.020	-.263	.794
	CHINAGBOND	-.082	.055	-.152	-1.489	.143
	PRICEINDEX	-.138	.022	-.811	-6.395	.000
	USINTRATE	-.052	.088	-.066	-.597	.553

a. Dependent Variable: EXCHANGE

LIMITATIONS

This study had several limitations. This study did not analyze the role qualitative factors had in influencing the exchange rate. There are other variables that could potentially affect the exchange rate between countries such as oil prices, Gross Domestic Product, international political pressure, and a government's political agenda. There are an innumerable multitude of variables that defy prediction, including "black swan events" like war, political turmoil, natural disasters, a worldwide pandemic, or an unexpected upheaval in the stability of governments (Taleb, 2007). This data is incredibly difficult to quantify and analyze. These unforeseen events cannot be forecasted, thus increasing the difficulty of accurately predicting exchange rate fluctuations over long periods of time.

RECOMMENDATIONS FOR FUTURE RESEARCH

Given the limitations of this research, there is an opportunity to conduct future research to analyze monthly data over a ten-year and then twenty-year period to determine if the exchange rate predictors listed above are the best factors to predict the exchange rate between China and the U.S. over an extended period, which could enhance the credibility of those variables being strong predictors of the exchange rate. Another opportunity would be to consider lagging the exchange rate by a month. This means one would use last month's independent variables to predict the upcoming month's exchange rate. Another suggestion is to analyze different time constraints by utilizing comparative methodology in the timing. This method would take the predictor variable and dependent variable in different months, then, it would analyze how the exchange rate prediction compares to the current month to determine the accuracy of the prediction. Additionally, it would be interesting to study the effects of qualitative events such as war, natural disasters, and political instability and how each impacted the exchange rates. A further recommendation would be to apply the exchange rate predictor formula to other currencies like the euro to determine if the variables chosen were the most effective predictors, or if there are better predictor variables that apply universally to all currency. Finally, one could analyze other factors like Gross Domestic Product, the price of gold, and

oil prices as predictors of exchange rates to determine which factors are the strongest predictors of the exchange rate.

CONCLUSION

After running the regression analysis, the r^2 value was 0.916 suggesting that the variables can predict 91.6% of the variability in the Chinese U.S. exchange rate. The model was statistically significant at the $\alpha = .05$ level. For this reason, the null hypothesis would be rejected. After analyzing the results from the regression analysis, it can be determined that the predictor variables' Import Price Index and the US CPI were statistically significant at the .05 level. A 1 percentage point increase in the US CPI would lead to a .093 increase in the Yuan to USD ratio. Additionally, as the Chinese Import Price Index increases, one would expect movement in the Chinese Yuan to USD exchange rate. A 1 percentage point increase in the average price of imported Chinese goods would lead to a .138 decline in the Yuan to USD rate.

This formula may benefit distributors as they continue to purchase products from China. By using this formula to predict the exchange rate, distributors may benefit by hedging their currency according to the forecasted exchange rate. In daily use, predicting exchange rate fluctuations can be utilized as a risk management strategy. This will allow them to be better prepared to prevent and mitigate the risk of exchange rate fluctuation. The knowledge of future exchange rates can better prepare management to determine if they will source their product externally or domestically. Depending on the exchange rate volatility, it may be wise to practice near-sourcing and purchase products from a country closer to their organization. Management could also invest in multi-sourcing and have a backup supplier if the forecasted foreign exchange rate is unfavorable. Predicting the foreign exchange rate will help CEO's and their executive team to make more informed decisions regarding their organization. The ability to accurately predict the foreign exchange rate will decrease the risk associated with exchange rate fluctuation and help to hedge an organization against uncertainty. By doing this, organizations may be able to present a more accurate financial summary to company stockholders.

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Homework is the New Classwork with the Help of Online Platforms

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Abstract

Each person in academia has their own style of teaching. What makes us think that our way of teaching is the correct way? Maybe it's time to try a new way of facilitating a classroom and see if it is something that students enjoy and actually benefit from. Most of us lecture during class time and then assign homework but is this really the most efficient use of class time? Students in classes with traditional lecturing were 1.5 times more likely to fail than students in classes with active learning [1]. What if we reversed the roles of homework and classwork, would student's success rates increase? Today most University's use some type of online platform to place recorded lectures and also require students post and turn in work. By using online platforms educators are able to record and post lectures requiring students to review the material before attending class, this in return frees up the valuable classroom time that would otherwise be used to lecture. A way to insure that students have reviewed the online lectures, is by requiring each student to post material about the recorded lecture. In my courses it is required that each student post an article that is no older than six months that relates to the viewed lecture. Students are also required to write a brief paragraph synopsis of their thoughts on the related information. Students are also required to write a brief synopsis on another classmates post, this also insures dialogue between students while using an online platform. When students arrive to class the educator is able to give a brief fifteen minute apercu that corresponds to the previous posted lecture and answer any questions that the students may have. After the brief apercu, new information is also expounded upon which covers new information that was not previously recorded and posted in the online platform. Covering new information in class insures that students are familiar with the lectured information and also insures that students attend class for new information which they otherwise would not be prevue too. Class time is now used more efficiently with hands on work while collaborating with other classmates. The recovered lecture gives students the background information that is need to perform a task during the actual class time. When students arrive to class a hands on tutorial is demonstrated along with new information about the topic at hand. Students are able to create, demonstrate and apply skill sets that have been previously expounded upon while the educator works with each student or student teams during class time. In this paper homework during class time will be expounded upon, and how online platforms free up lecturing time so that students and educator make the most efficient use of classroom time.

Introduction

Changing roles of homework in the classroom and classwork at home is a change that was made to one of my courses last year. Seventeen students flipped their way of thinking about the traditional platform of learning. Students ask more questions in class than when away doing homework, the reason why is having the Professor in front of them allows the questions to flow freely. Why is it that students are expected to understand all material when leaving class rather than when entering the class? The above question is one that has rattled the brain of many before. Determined to come up with a solution to make time more efficient I decided to flip classwork and homework.

Switching traditional learning platforms were made easier by the help of an online software platform that Professors are able to use to make learning more beneficial for students. D2L brightspace is used along with another software that has more recording capabilities known as Echo360. Echo360 allows videos to be recorded by Professors and accessible by students that are enrolled in the course are able to view and listen to the recordings as many times as possible. Echo360 allows Professor to incorporate recorder lectures using power point, excel and any other software that may be taught in the course. Professors are able to create in depth recordings that cover a wide variety of material. How does creating recordings ensure student learning you may ask? Professor can create randomized quizzes after each recording that ask randomize questions to ensure that the student has the knowledge before being able to move forward with any course work. Professors can also assign different reading materials that pertain to the online lectures with the same format of quizzes if needed. The recordings used by Echo360bare able to be downloaded into podcast and other different formats to make learning more accessible, really who doesn't love a good informational lecture while being stuck in traffic? There are also various ways that Echo360 can be used for students with disabilities so this not a worry for Professors or students, all material is able to be delivered in the format a student needs just by the students selecting the correct link. At this moment you are probably thinking to yourself, this sure does seems like an awful lot of more work on my end as Professor, am I correct? Well, in some ways that thought is wrong and in some ways the thought of more work is correct. More work will not be added by simple creating a recording because you are simple speaking of the subject matter you love so much as a Professor and the Echo360 has a simple link that you copy and paste into D2L brightspace to provide for the students. After all isn't it much more work to see students failing, not interested, and explaining to them outside of class how to do something and the correct way to achieve that goal? If you think of this as a two part system then the work you do on the Echo360 recording system and the work you do in class with students will be much more beneficial with everyone.

Once homework is the new classwork was created a thirty percent raise in overall grade average could be seen not to mention student presentation.

Why does flipping the traditional classroom work? According to feedback from students the flipping of the classroom works: students feel more prepared for class with lecturing videos online before the next class meeting. Students also said that the class time was used more efficiently with working in groups, with the Professor, and having feedback from the Professor immediately rather than having feedback after homework had been graded. How are Professors able to see an improvement with overall student progression with flipping the traditional classroom work? Professors are able to see more student enrollment progression with hands on experience through homework in the classroom. Professors are able to jump in and help students rather than given feedback without the class demonstration as usually seen with graded homework. ? Maybe it's time to try a new way of facilitating a classroom and see if it is something that students enjoy and actually benefit from. Most of us lecture during class time and then assign homework but is this really the most efficient use of class time? Students in classes with traditional lecturing were 1.5 times more likely to fail than students in classes with active learning [1].

Homework being taught in class is just another way in which Professors are able to achieve maximum time efficiency standards and students are able to make the most of their classroom time. While flipping the course work and creating lecturing videos outside of class may not seems like a viable idea to the person regarding this, then you have been challenged. Try this explained above method out for one class term and see for yourself what a difference it really can make!

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How Does Technology Impact Our Personal Needs

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ABSTRACT

In the age of always-on technologies, meeting personal needs can be challenging. The pressure to work faster, maintain an active presence in family life, and make more money can make it difficult to satisfy one's own personal (physiological) needs (sleeping, eating, hydrating, etc.). Maslow's hierarchy of needs suggests that our goal is to eventually find our "ideal self" and be "self-actualized," which is located at the top of his pyramid. Other stages involve developing self-esteem, finding love or belonging, and being safe. Physiological needs are located at the bottom of the pyramid, thus suggesting that they are the most basic needs. Modern additions to this theory have suggested that while technology does help satisfy the needs higher up in the pyramid (related to being social), technology does not address physiological needs. Thus, while most people spend a lot of time on technology, technology cannot help them satisfy their most basic need.

We argue that coping with the increased pressure technology brings has made the image of the ideal self change to something that may be out of reach for most people. More formally, due to the information transparency of others' activities on the web, alongside the pressure to keep up with social demands, we argue that technology can put more pressure on people to find an unrealistic ideal self, and thus forgetting to take care of themselves and their most basic needs.

This study tests what specific facets of life cause a person to overlook their personal needs. Specifically, we look at work pressure, family pressure, optimism, technology invasion, income, and gender to understand what is causing one to feel like they have not satisfied his or her own needs. To do this, we conducted a Mechanical Turk survey designed to measure this balance between work, family, and personal life and collected data from 160 working professionals. We found that family pressure, pessimism, feeling the constant access to technology, and having a lower income caused people to feel like they did not satisfy their personal needs. We also found that women were less likely to satisfy their personal needs than men. Implications for busy professionals are provided as well as avenues for future researchers.

How Reliable is Walsh's Fragility Index? An Exploration of the Distribution of the Fragility Index using the Bootstrap Approach

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ABSTRACT

The results of Fisher's Exact Test are typically measured with the observed significance level, or p-value. The p-value is a measurement of the probability of observing counts in the 2×2 table which are at least as contradictory to a null hypothesis of independence as that which was observed. However, there are drawbacks to making decisions solely on the p-value. The p-value fails to indicate the sizes of the sampled groups. Results which may be statistically significant, based on the p-value, may not have a meaningful importance to managers and decision makers. Small differences in the p-value can lead researchers to very different conclusions. Our prior research advocates for the inclusion of the Fragility Index, as proposed by Walsh, et al., to supplement the observed significance level when investigating the differences in dichotomous outcomes based on a dichotomous categorical variable. We have also extended Walsh's approach to other hypothesis testing procedures involving counts and proportions. The nature of the sampling distribution of the Fragility Index has not been explored. Our new research seeks to discover the nature of the sampling distribution of Walsh's Fragility Index with a bootstrapping approach.The resampling approach is presented, and implemented using data sets suitable for the classroom. Confidence intervals for Walsh's Fragility Index are then developed and investigated.

Hypothesis testing: How much do we really know about how to use it?

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Abstract: Statistical analysis is one of the main tools for every empirical study. In statistics, the Hypothesis Testing is one of the essential tools that have been used in many different disciplines, including Economics, Marketing, Management, Psychology, to name a few. But despite its popularity among researchers, Hypothesis Testing is a very controversial topic and even thoughtful and intelligent statisticians and researchers have major disagreements about the value of Hypothesis Testing. The classical Hypothesis Testing framework has been criticized since the late 1920s, especially by Bayesians. There has been heated debates between Fisher and Neyman–Pearson and some statisticians simply dislike p-values. Even philosophers have published many articles on what Hypothesis Testing is really doing.

There has been a series of studies on the level of understanding of Hypothesis Testing, its assumptions, and the interpretation of p-values and test results (Gigerenzer, 2018). In this paper we want to investigate to what extent these survey results are replicable. We also want to see if the general understanding of the "trained professionals" and/or the graduate students about Hypothesis Testing are as bad as depicted in some of these previous studies or not? We provide our case, which involves a ritual of performing statistical Null Hypothesis Testing that requires close scrutiny and can shed light on the recent concerns with the lack of scientific transparency. We present the results of our pilot study on Hypothesis Testing literacy among academics and practitioners who were participants in three different business conferences, and compare them to the previous results in the literature. The results of the pilot study are alarming, to say the least and show a deep misunderstanding about this statistical tool. For future research, we plan to collect more data and analyze it. We also plan to point out ways to improve the statistical practices in social sciences and find out if there are better ways to teach the Hypothesis Testing in classrooms more effectively.

Impact of Martial Arts Training and Rank on Perceived Brand Importance

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Paul W. Clark

Kasser (2002) suggested that individuals undergoing life transitions may experience “status panic,” where their identity is temporarily incomplete and in flux. MAs a result, these individuals may turn to materialistic outlets in an effort to compensate for holding an incomplete identity. First year college students, for instance, are more likely to own logoed university items than fourth year students, and inexperienced athletes are much more likely to wear highly visible, branded sportswear than experienced athletes.
This paper examines the impact of overall time training and rank in martial arts on perceived brand importance in training gear and apparel. Following the work of Kasser, brands/labels should be more important to those just beginning martial arts training or those of lower rank. To examine this relationship, an online survey was administered to 198 practitioners of Brazilian Jiu Jitsu (BJJ). The sample was 70.2% male, 77.8% white, 5.1% Hispanic, 2.5% Asian, and 2.0% Black. Ages ranged from 19-59, with a median of 34 and a standard deviation of 8.3. Results indicated that a higher rank in Brazilian Jiu Jitsu was associated with a greater importance of brands in martial arts training gear. Explanations for this unexpected finding were explored.

Counter to the findings in Kasser (2002), results indicate that there is a positive relationship between self-worth and greater importance of labels/brands in training gear, meaning, martial artists with a more positive self-worth were more likely to place greater importance on brands in training gear and apparel. Possible explanations and implications for these findings are discussed.

Intuitive Ways to Teach the International Parity Conditions in an Undergraduate International Finance Course

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Introduction for the Presentation

- This presentation is about the basic relationships between currencies, interest rates, inflation, and international competitiveness.
- Many textbooks used in undergraduate international finance courses do not provide a thorough analysis of the international parity conditions.
- Nor, do they provide a thorough discussion of the behavior behind these conditions.

Introduction for the Presentation

- The opportunity for students to develop an intuitive understanding of these relationships is missed.
- I have tried to provide students with simple, intuitive examples that illustrate these relationships.
- My goal is to help students understand why things happen the way they do, which is a skill that can be applied to any market.

Section I

Currencies and Interest Rates: Understanding the Meaning of the FX Forward Premium and Forward Discount

Section I Introduction

- Many undergraduate international finance courses use textbooks that teach that the forward premium or discount on a currency is approximately equal to the arithmetic difference in interest rates between two countries.
- By using compound annual rates, students see that the relationship is exact.
- And they gain through the examples that I use an intuitive understanding of what the forward premium and forward discount really mean.

Connecting Spot & Forward Markets and Interest Rates

- The relationship between spot, forwards, and interest rates is the key analytical result of this chapter.
- It is useful to express the forward premium or discount as the annualized percent deviation from the spot rate.
- Doing so allows us to understand the relationship between interest rates, the spot exchange rate, and the forward exchange rate.

Calculating the Forward Premium

- Suppose the € is appreciating from $S(\$/€) = 1.1321$ to $F_{180}(\$/€) = 1.1389$.
- The 180-day forward premium for the € is given by:
- $f_{180,€} = \frac{1.1389 - 1.1321}{1.1321} \times \frac{360}{180} = 1.20131\%$.
- This formula assumes every month has 30 days, and notice that we use the foreign currency price of the € to calculate its forward premium.

Calculating the Forward Discount

- How do we calculate the forward discount on the $? By using its foreign currency price.
- $f_{180,\$} = \frac{0.87804 - 0.88331}{0.88331} \times \frac{360}{180} = -1.1932\%.$
- Where €0.87804 / $1 = €1/$1.1389 and €0.88331 / $1 = €1/$1.1321.

The Generalized Formula

- The generalized formula for a forward premium or discount is:
- $f_{N,HCUR}$ =
- $$\frac{F_N(FCUR/HCUR) - S(FCUR/HCUR)}{S(FCUR/HCUR)} \times 360/N.$$

Calculation Tip

- There is one key feature of this formula that is important to highlight.
- Notice that when the forward premium of the € is calculated the exchange rate is $/€. That is, we use the foreign currency price of the currency whose premium/discount is being calculated.
- Whenever you are calculating the forward premium/discount or percent change of a currency, always use the foreign currency price of that currency.

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An Example: Percent Change

- Suppose $/£ = 1.40 today and a 6 months ago the exchange rate was 1.30.
- Calculate the percent change for the £ and the $.
- %Chg £ = (1.40/1.30) -1 = +7.692%.
- %Chg $ = (0.71429/0.76923) -1 = -7.142%.

Key Forward Exchange Rate Relationships

- The forward discount or premium on a % basis represents the annualized % deviation of the forward exchange rate from the spot.
- Why is this important to know?
- Because the forward discount/premium connects the exchange rate between two currencies with the interest rate differential between the two countries.
- That's the payoff for working through this chapter.

The Payoff : A Detailed Example

- Consider the following:
- ¥/$ $/¥
- Spot 105.0 .009523810
- F_{2Y} 104.0 .009615385
- $f_{2Y,\$}$ = -0.47619%. (CAR = -0.47733%)
- $f_{2Y,¥}$ = +0.48077%. (CAR = +0.47962%)
- **Why do we care?**

CAR Calculation

- ¥/$ $/¥
- Spot 105.0 .009523810
- F_{2Y} 104.0 .009615385
- $f_{2Y,\$} = (104/105)^{0.5} - 1 = -0.47733\%$
- $f_{2Y,¥} = (.009615385/.009523810)^{0.5} - 1 = +0.47962\%$

Investment Strategies Starting in ¥

- Suppose you are a portfolio manager in Tokyo, and you have raised ¥100MM to invest for 2 years. And suppose the 2-year yen interest rate is 3%.
- There are two possible investment strategies:
- a) Portfolio I: invest for 2 years in yen.
- b) Portfolio II: convert the yen to $, invest at the $ interest rate for two years, and sell the $ forward at F_{2Y} = ¥104/$. (All of these transactions occur at the same time.)

Investment Strategies Starting in ¥

- Portfolio I will yield ¥106,090,000.
  (= ¥100MM x $(1.03)^2$.)
- The question is: what US 2-year interest rate will make you indifferent between the two strategies?
- Why is this a useful question to ask?
- Here is Portfolio II:
- [¥100MM x ($1/¥105) x $(1+ i_{\$})^2$] x ¥104/$.

Investment Strategies Starting in ¥

- [¥100MM x ($1/¥105) x $(1+ i_{\$})^2$] x ¥104/$
- Notice the steps of this equation:
- Convert ¥ to $ Invest $ Sell $ Forward
- [¥100MM x ($1/¥105) x $(1+ i_{\$})^2$] x ¥104/$
  = ¥106,090,000.
- Solve for $i_{\$}$.
- $i_{\$}$ = 3.4940%.

Investment Strategies Starting in ¥

- We can interpret this result in a couple ways.
- First, $(i_{\$} - i_{¥}) \sim= -f_{2Y,\$}$. And $\sim= f_{2Y,¥}$.
- Or more precisely,
- $(1+i_{\$} / 1+ i_{¥}) = (1.03494 / 1.03) - 1 = +0.47961\%$
  $= f_{2Y,¥}$ (CAR).
- $(1+i_{¥} / 1+ i_{\$}) = (1.03 / 1.03494) - 1 = -0.47732\%$
  $= f_{2Y,\$}$ (CAR).

Investment Strategies Starting in $

- Now suppose you are a US fund manager who has \$1MM to invest for 2 years, and $i_{\$} = 3\%$.
- There are two possible investment strategies:
- a) Portfolio I: invest for 2 years in \$.
- b) Portfolio II: convert the \$ to yen, invest at the yen interest rate for two years, and sell the yen forward at $F_{2Y} = ¥104/\$$. (All of these transactions occur at the same time.)

Investment Strategies Starting in $

- Portfolio I will yield $1,060,900.
- The question is: what yen 2-year interest rate will make you indifferent between the two strategies?
- Here is Portfolio II:
- [$1MM x (¥105/$) x $(1+ i_{¥})^2$] x $/¥104.
- Once again, notice the steps of this equation:
- Convert $ to ¥ Invest ¥ Sell ¥ Forward

Investment Strategies Starting in $

- [$1MM x (¥105/$) x $(1+ i_{¥})^2$] x $/¥104 = $1,060,900.
- $i_{¥}$ = 2.50835%.

Investment Strategies Starting in $

- We can interpret this result in a couple ways.
- First, $(i_{¥} - i_{\$}) \sim= f_{2Y,\$}$. And $\sim= -f_{2Y,¥}$.
- Or more precisely,
- $(1+i_{¥} / 1+ i_{\$}) = (1.0250835 / 1.03) – 1 = -0.47733\%$
  $= f_{2Y,\$}$ (CAR).
- $(1+i_{\$} / 1+ i_{¥}) = (1.03 / 1.0250835) – 1 = +0.47962\%$
  $= f_{2Y,¥}$ (CAR).

Bringing It All Together

- One more example that brings all this together.
- Repeating the details:
- ¥/$ $/¥
- Spot 105.0 .009523810
- F_{2Y} 104.0 .009615385
- $f_{\$,2Y}$ = -0.47619%. (CAR = -0.47733%)
- $f_{¥,2Y}$ = +0.48077%. (CAR = +0.47962%)

Bringing It All Together

- Suppose $i_{\$} = i_{¥} = 3\%$.
- If you are the Japan portfolio manager, then Portfolio I will yield ¥106,090,000.
- And Portfolio II will yield:
- $[¥100MM \times (\$1/¥105) \times (1.03)^2] \times ¥104/\$ =$ ¥105,079,619.
- Under these conditions, no one would invest in $ because of the principal loss.

Bringing It All Together

- How much is the capital loss on an annualized basis?
- $(¥105,079,619 / ¥106,090,000)^{0.5} - 1 = -0.47733\%$.
- Which is the forward discount on the $ (CAR).
- So, the higher US interest rates offset the capital loss an investor would experience by investing via the $ market, if the dollar and yen interest rates are the same.

Bringing It All Together

- Alternatively, if you are the US portfolio manager, then Portfolio I will yield $1,060,090.
- And Portfolio II will yield:
- $[\$1MM \times (¥105/\$1) \times (1.03)^2] \times \$1/¥104 = \$1,071,101.$
- Under these conditions, no one would invest directly in $ because the yen strategy produces higher returns for the firm's clients.

Bringing It All Together

- How much is the capital gain from investing via the ¥ on an annualized basis?
- ($1,071,101 / ¥1,060,900)$^{0.5}$ – 1 = +0.47962%.
- Which is the forward premium on the ¥ (CAR).
- So, the lower yen interest rates offset the capital gain an investor would experience by investing via the yen market, if the dollar and yen interest rates are the same.

The Grand Finale

- Now for the grand finale.
- Back to the beginning:
- $[¥100MM \times (\$1/¥105) \times (1+ i_{\$})^2] \times ¥104/\$. = ¥100MM \times (1 + i_{¥})^2.$
- $[(\$1/¥105) \times (1+ i_{\$})^2] \times ¥104/\$ = (1 + i_{¥})^2 .$
- $[1/Spot \times (1+ i_{\$})^2] \times Forward = (1 + i_{¥})^2 .$
- $[1/Spot \times (1+ i_{\$})^t] \times Forward = (1 + i_{¥})^t .$

The Grand Finale

- $[1/\text{Spot} \times (1+ i_{\$})^t] \times \text{Forward} = (1 + i_{¥})^t$.
- Rearranging terms:
- $$\frac{(1 + i_{¥})^t}{(1 + i_{\$})^t} = \frac{F}{S}.$$
- This is called the "Interest Rate Parity Condition."
- If IRP holds, then the portfolio manager is indifferent between the two investment strategies.
- Huzzah.

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A Final Observation

- The material in this section intuitively develops the logic behind the International Fischer Effect, without mentioning the IFE by name.
- When the class gets to the IFE at the end of the chapter on parity conditions, the better students will quickly be able to articulate the difference between the equations for Relative PPP and the IFE.

Section II

- **The Relationship between Currencies and Inflation.**

Section II Introduction

- When you ask the class, “What happens to a country’s competitiveness if its currency weakens?”, the most common answer is that competitiveness improves.
- In this section students learn that the answer depends on the relationship between currencies and inflation. They learn that it is possible for a currency to weaken, and yet the country’s international competitiveness can erode.

Section II Introduction

- In this section we use examples to highlight the possible relationships between currencies, inflation, and competitiveness.
- This section also provides an intuitive introduction to the Real Exchange Rate Index, one of the most useful indicators of a potential Balance of Payments crisis.
- Students will understand the behavior behind the RERI, and why a RERI > 1.0 is a warning sign for a currency crisis.

Purchasing Power Parity

- PPP is the basic framework for analyzing the relationship between currencies and inflation.
- The idea behind PPP is sounds simple: currency movements are determined by the inflation differential between the two currencies. For the purpose of preserving trade competitiveness.
- Suppose expected inflation in Australia for the next two years increases from 2% per year to 4% per year, while expected inflation in New Zealand remains at 5%. Which currency will strengthen versus the other?

Purchasing Power Parity

- And, of course, why does the PPP relationship work the way it does?
- There are two variations on PPP that we will discuss:

  1.) Absolute PPP, and

  2.) Relative PPP.

Absolute PPP

- Absolute PPP states that the exchange rate between two currencies should equal the ratio of the countries' price levels.
- $S(\$/£) = P_{\$} / P_{£}$.
- Where $P_{\$}$ = A price index of tradeable goods and services produced in the US.
- $P_{£}$ = A price index of tradeable goods and services produced in the UK.

Absolute PPP Example

- If $P_{\$}$ = \$1,600 and $P_{£}$ = £1,000 and Absolute PPP holds, then the spot rate will be:
- $S(\$/£) = P_{\$} / P_{£}$
- S(\$/£) = \$1.60 / £1.
- What does this mean? Let's rewrite Absolute PPP as:
- **$P_{\$} = P_{£}$ x S(\$/£)**.
- Can you interpret this?

Absolute PPP Example

- $\mathbf{P_{\$} = P_{£}\ x\ S(\$/£)}$.
- This means that the prices of UK goods converted to $ through the spot rate will equal the prices of goods sold in the US.
- To be more down to earth, the price of a Burberry coat sold at Harrod's in London, <u>when converted to dollars at the spot rate</u>, will have the same $ price as a Burberry coat selling at Saks 5th Avenue.

Absolute PPP Example

- Expanding this relationship:
- $P_{\$} = P_{£} \times S(\$/£)$
- $P_{\$} = P_{CAD} \times S(\$/CAD)$
- $P_{\$} = P_{RUB} \times S(\$/RUB)$
- $P_{\$} = P_{SGD} \times S(\$/SGD)$
- $P_{\$} = P_{JPY} \times S(\$/JPY)$
- $P_{\$} = P_{INR} \times S(\$/INR)$……

Absolute PPP Example

- This relationship is called the "Law of One Price," and it means that: **"Everything costs the same when valued in a common currency."**
- The Law of One Price is the main result of Absolute PPP.

Absolute PPP: With Inflation

- Suppose US inflation is 5%, $\Pi_{\$} = 5\%$, and UK inflation is 3.5%, $\Pi_{£} = 3.5\%$.
- Then,
- $S(\$/£) = \frac{\$1{,}600 \times 1.050}{£1{,}000 \times 1.035} = \frac{\$1{,}680}{£1{,}035} = \frac{\$1.6232}{£1}$.
- Notice that the $ depreciated versus the £.
- Why? To preserve trade competitiveness.

Absolute PPP and Inflation

- Notice that after the $ depreciation PPP still holds:
- The $ price of UK goods: £1,035 x $\frac{\$1.6232}{£1.00}$ = $1,680.
- The £ price of US goods: $1,680 x $\frac{£1.00}{\$1.6232}$ = £1,035.
- The dollar weakened just enough to preserve PPP. **"Everything costs the same when valued in a common currency."**

Absolute PPP and Inflation

- What's the lesson?
- Countries with higher inflation have weak currencies to preserve trade competitiveness.
- (Something to think about: Does this statement also mean that countries with weak currencies must have high inflation?)

PPP, Π, and %Δs

- Compare the percent changes in the $ and the £ with the inflation differential between the US & UK.
- Remember: when analyzing currencies, always use the foreign currency price. Which is applied below.
- %Chg £ = (1.6232 – 1.600) / 1.600 = 1.45%.
- %Chg $ = (0.61607 – 0.6250) / 0.6250 = -1.43%.
- The arithmetic difference is, of course : 1.5%. More precisely: (1.05/1.035) – 1 = +1.45%.
  (1.035/1.05) -1 = -1.43%.

PPP and Π: Example 2

- The solution to the previous problem was that \$1.6232 / £ preserves PPP when $\Pi_{\$} = 5\%$ and $\Pi_{£} = 3.5\%$.
- Suppose, instead, that after the inflation the exchange rate is: \$1.6720 / £.
- Let's check whether PPP holds.
- The \$ price of £ goods = £1,035 x \$1.6720 / £. = \$1730.52
- And…

PPP and Π: Example 2

- …the £ price of $ goods is: $1,680 x £ / $1.672 = £1004.78.
- After Π and at $1.672 / £:
- Goods made in the US cost $1,680, while UK exports to US cost $1,730.52.
- Goods made in the UK cost £1035, while US exports to UK cost £1,004.78.
- US goods have gained competitiveness, while UK goods have lost competitiveness.

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PPP and Π: Example 2

- Why did we get these results? Let's look at the currency percent changes.
- %Chg £ = (1.672 – 1.600) / 1.600 = +4.500%.
- %Chg $ = (0.59809 – 0.6250) / 0.6250 = -4.3062%.
- Now, the Π differential is 1.5%. So, if the $ weakens to $1.672/£, the $ weakens by more than is required to preserve PPP, and so, US goods gain competitiveness.

PPP and Π: Example 3

- The solution to the original problem was that \$1.6232 / £ preserves PPP when $\Pi_{\$} = 5\%$ and $\Pi_{£} = 3.5\%$.
- Suppose, instead, that after the inflation the exchange rate is: \$1.6150 / £. The \$ still weakens versus £.
- Let's check whether PPP holds.
- The \$ price of £ goods = £1,035 x \$1.6150 / £. = \$1671.53.
- And…

PPP and Π: Example 3

- …the £ price of $ goods is: $1,680 x £ / $1.615 = £1040.25.
- After Π and at $1.615 / £:
- Goods made in the US cost $1,680, while UK exports to US cost $1,671.53.
- Goods made in the UK cost £1035, while US exports to UK cost £1,040.25.
- US goods have lost competitiveness, while UK goods have gained competitiveness.

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PPP and Π: Example 3

- Why did we get these results? Let's look at the currency percent changes.
- %Chg £ = (1.615 – 1.600) / 1.600 = +0.94%.
- %Chg $ = (0.6192 – 0.6250) / 0.6250 = -0.93%.
- Now the Π differential is 1.5%. So, if the $ weakens to $1.615/£, the $ weakens by less than is required to preserve PPP, and so, US goods lose competitiveness.

Relative PPP

- Absolute PPP states that exchange rates should equal the ratio of the two countries price indexes.
- One, tongue in cheek, example of Absolute PPP is the Big Mac Index. Read these pages in the text.
- Relative PPP states that how a currency gets to the level we observe in the market today does not matter. What matters is that from now forward the exchange rate will be determined by the inflation differential between the two countries.

Relative PPP

- This result can be written as follows:
- $E(S_t) = S_0 \times (1+\Pi_{HCUR})^t / (1 + \Pi_{FCUR})^t$
- Where:
- $E(S_t)$ = expected spot rate at time t.
- S_0 = current spot rate, defined as HCUR / FCUR.
- Π = inflation.

Relative PPP

- $\frac{E(S_t)}{S_0} = (1+\Pi_{HCUR})^t / (1 + \Pi_{FCUR})^t$
- The left side equals the (1 + the expected %Δ) in the £, where S=$/£.
- Relative PPP states that the expected percent change in the exchange rate is equal to the difference in the rates of inflation.

Relative PPP

- Back to slide 28.
- "Suppose expected inflation in Australia for the next two years increases from 2% per year to 4% per year, while expected inflation in New Zealand remains at 5%. Which currency will strengthen versus the other?"
- Let's say that the AUD/NZD exchange rate is 1.15.
- $\frac{E(S_2)}{S_0} = (1.04)^2 / (1.05)^2$
- $E(S_2)$ = AUD1.1282 / NZD.

Relative PPP

- Find the annual % chg (AR) in the two currencies.
- NZD % chg AR = $\frac{1.1282 - 1.15}{1.15 \times 2} = -0.948\%$
- Or, CAR = -0.952%.
- AUD % chg AR = $\frac{0.88637 - 0.86957}{0.86957 \times 2} = +0.966\%$
- Or, CAR = +0.961%.
- The expected % changes equal the Π differential between the countries. (1.05/1.04) -1= +0.962%. And (1.04/1.05) -1 = -0.952%.

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Section III

A Digression:
the Real Exchange Rate Index.

Section III Introduction

- Undergraduate textbooks often teach the RERI as a plug and chug process without discussing in detail the importance of the concept as a key indicator of a potential currency crisis.
- I use the examples from the section on PPP to reveal that we have already done the RERI conceptually. We just need to put our results in the proper form.

A Digression: The Real Exchange Rate Index

- How can we analyze the combined effects of inflation and currency movements in a way that captures the net effect of these movements on a country's competitiveness?
- The answer is a concept called "The Real Exchange Rate Index."
- We will do a quick lesson in this section.

A Digression: the RERI

- Recall the original problem: With $\Pi_{\$} = 5\%$ and $\Pi_{£} = 3.5\%$, and with $S_1 = \$1.6232/£$.
- Goods made in the US cost \$1,680, while UK exports to US cost \$1,680. $\underline{RERI_{\$} = 1{,}680/1{,}680 = 1.00}$.
- Goods made in the UK cost £1035, while US exports to UK cost £1,035. $\underline{RERI_{£} = 1{,}035/1{,}035 = 1.00}$.
- Here PPP holds, everything costs the same when valued in a common currency, and both RERIs equal 1.00.

A Digression: the RERI

- Let's assess competitiveness when S_1 = \$1.672/£.
- Goods made in the US cost \$1,680, while UK exports to US cost \$1,730. $RERI_{\$} = 1{,}680/1{,}730 = 0.9708$.
- Goods made in the UK cost £1035, while US exports to UK cost £1,005. $RERI_{£} = 1{,}035/1{,}004.78 = 1.0301$.
- Here PPP does not hold. US goods gained competitiveness, and the $RERI_{\$}$ falls below 1.0. UK goods lose competitiveness, and the $RERI_{£}$ =1.0301.
- Notice $RERI_{\$} = 1 / RERI_{£}$.

A Digression: the RERI

- Let's assess competitiveness when S_1 = \$1.615/£.
- Goods made in the US cost \$1,680, while UK exports to US cost \$1,671. $\underline{RERI_{\$} = 1{,}680/1{,}671.53 = 1.0051}$.
- Goods made in the UK cost £1035, while US exports to UK cost £1,040. $\underline{RERI_{£} = 1{,}035/1{,}040.25 = 0.9950}$.
- PPP does not hold. US goods lost competitiveness, and $RERI_{\$}$ rises above 1.0. UK goods gain competitiveness, and $RERI_{£}$ falls below 1.0.
- Notice $RERI_{\$} = 1 / RERI_{£}$.

Section IV

- **The International Fisher Effect**

Section IV Introduction

- Many students struggle with the question, “Will the $ appreciate or depreciate if US interest rates rise?”
- The answer is, of course, that it depends on what causes interest rates to increase. China selling Treasuries or the Fed tightening lead to opposite results.

Section IV Introduction

- When equations for Relative PPP and the IFE are put side by side, students realize the importance of understanding the causes (China/the Fed?) of the disturbance they are observing (higher interest rates).
- This is a valuable lesson regardless of the market that is being studied.
- Ultimately, the IFE is linked back to the examples from the very beginning that deal with investing in Japan or the US. We have come full circle.

Components of Interest Rates

- Irving Fisher, a famous American economist, wrote that nominal interest rates are comprised of two components: expected inflation, Π^e, and a real rate of return, ρ.
- So, we can write: $(1+i_{\$})^t = (1+\Pi^e_{\$})^t \times (1+\rho_{\$})^t$. (1)
- And, $(1+i_{€})^t = (1+\Pi^e_{€})^t \times (1+\rho_{€})^t$. (2)

International Real Rates of Return

- If we are talking about countries where there are no impediments to the free flow of capital, then it is reasonable to assume that investors behave in such a way that real rates of return are equal.
- For example, if $\rho_{\$} > \rho_{€}$. Then investors will favor US investments until $\rho_{\$} = \rho_{€}$.

The International Fisher Effect

- So, assuming that $\rho_{\$} = \rho_{€}$, if we divide equation 1 by equation 2 we get:
- $\frac{(1+i_{\$})^t = (1+\Pi^e_{\$})^t \times (1+\rho)^t}{(1+i_{€})^t = (1+\Pi^e_{€})^t \times (1+\rho)^t}$.
- Now, we can substitute into Relative PPP:
  $\frac{E(S_t)}{S_0} = (1+\Pi^e_{HCUR})^t / (1 + \Pi^e_{FCUR})^t$. And get….
- IFE: $\frac{E(S_t)}{S_0} = (1 + i_{\$})^t / (1 + i_{€})^t$. (Where S = \$/€.)

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Interpreting the IFE

- Relative PPP: $\frac{E(S_t)}{S_0} = (1+\Pi^e_{\$})^t / (1 + \Pi^e_{€})^t$.
- IFE: $\frac{E(S_t)}{S_0} = (1 + i_{\$})^t / (1 + i_{€})^t$.
- We know what Relative PPP means: Countries with high inflation have weak currencies in order to preserve trade competitiveness.
- So, does the IFE mean that countries with high interest rates have weak currencies?

Interpreting the IFE

- So, does the IFE mean that countries with high interest rates have weak currencies?
- The answer is a very firm NO!
- For many central banks, the chosen policy to combat a weak currency is to raise interest rates. Why? To attract foreign capital in search of high interest rates.
- So, what does the IFE mean?

Interpreting the IFE

- IFE means that:
- Countries with weak currencies have high interest rates for the purpose of attracting capital.
- The IFE is linked back to the three ¥/$ examples from the beginning of the lecture.

Section V

- **Concluding Comments**

Concluding Comments

- Many students struggle with the basic relationships between currencies, interest rates, inflation, and international competitiveness.
- Using examples I created, students can learn the intuition behind these relationships, and develop a deeper understanding of why behavior matters.

The End

- Questions?
- Thank you.

LEARNING DESCRIPTIVE STATISTICS WITH DATA AND EXAMPLES ABOUT STUDENTS

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ABSTRACT

Many undergraduate business students have mixed attitudes toward their introductory business statistics class. In general, students value the potential usefulness of statistics to their career. They realize the difficulty for them to learn statistics. Students are interested in learning statistics. However, students are less prepared for the challenge in the class. This research is to show the use of students' data about their experience on campus and examples about students themselves to improve their learning of descriptive statistics. The survey of students' attitudes toward statistics is conducted at the very beginning of the first day of the semester, and is also administrated again at the end of week 3 of the semester when the coverage of the descriptive statistics is finished. The paper will discuss the differences in the changes of students' attitudes before and after this portion of the course.

INTRODUCTION

Many undergraduate business students have mixed attitudes toward their introductory business statistics course. As Candace Schau (1995), Millar & Schau (2010) and Wang et al.(2018) revealed, students in statistics class realize the potential usefulness of the knowledge and analytic skills from the class. Students have positive affection for the applications of statistics in business world, and are very much interested in learning the contents. Students also feel they have reasonable cognitive competence and mathematical background to handle the course. Numerous studies indicated, however, students have negative feeling of the difficulty of the course. They realize that they have to spend more effort in the class. Instructors for statistics have tried many ways to improve students learning. They try to motivate students, reduce students' anxiety, and develop innovative pedagogy with the support of new technology (Callingham et al., 2018 ; Carnell, 2008; Dierker, 2016; Garfield, 1993; Gelman & Nolan, 2017; Jamie, 2002; Neumann & Neumann, 2013; Smith, 1998; Stork, 2003).

This research is to show the use of students' data to learn descriptive statistics. A short survey is conducted at the beginning of the course. The survey questions include items about what students have experienced on campus, such as, graduation year, major, year in school, gender, living arrangements, age, home zip code, the average number of hours per week students worked during summer, the amount of money spent on textbooks for the semester, the weekly average amount of hours students spent on your smart phones or watching TV, students' overall satisfaction at the university, professors eagerness in class, and students' expectations on the first day of this course including the learning difficulty, applicability to their careers, comfortability using computers, and knowledge of using Excel.

A total of 91 students responded to the survey. Students were asked to form their own groups of four members. Among the questions for students to discuss in groups are:

1) Which of the terms below is suitable to describe a variable, and the data collected for that variable?
   a. Numerical, b. Interval, c. Categorical, d. Ratio, e. Discrete

f. Nominal, g. Interval, h. Continuous, i. Ordinal, j. Frequency

k. Bar chart, l. Scatter plot, m. Average, n. Division

2) The following questions help to clarify confusions:
   a. Are the student majors in an alphabet listing measured by ordinal or nominal scale?
   b. Are the zip codes of the university and the surrounding community numerical or categorical? Which of the measurement scales should be used to measure the data of zip code?
   c. Why is a scatter plot not useful for living arrangement and major?
   d. Why do we not compute the average of zip codes of students' home address?

The follow is a portion of the data for the average number of hours students said they spent on smart phone or watched TV per week.

15	6	10	30	1	5	10	5	1	10
3	7	5	5	7	6	10	15	6	5

3) What is the frequency, relative frequency, and cumulative relative frequency for students who said they watched TV for five hours?
4) What is the minimum, maximum, first quartile, median, third quartile, and the average? A follow up question is whether we can find the value of the average from a box plot.
5) What chart to use if we want to know whether students who spend more money on their textbooks actually spend less time on their smart phone or watch TV? There is a weak positive correlation between the two variables. Students tried to explain their findings. This process led to the discussions of the sampling methods and survey errors.
6) Suppose the survey is conducted at the entry to the library, what is the possible survey errors?
7) Suppose our study needs to have a sample with 60% of female students and 40% of male students, what is the best survey method to be used to administrate the survey?

The following table shows the hypothesized grades, GPA, standard deviation, and coefficient of variation of four students of Smith, Doe, Jack and Kai. As shown on the table, Smith and Doe have the same level of GPA of 3; and Doe and kai have the same value of standard deviation of 1.155. Students are asked to play the role of recruiters on campus. Students are asked to decide:

8) Who would they hire between Smith and Doe based on their academic performance? Students immediately point out Smith is more consistent than Doe. This discussion leads to the concepts of variation and risk. Students quickly realize that the performance comparison of Smith and Doe needs to consider both their GPAs and standard deviations. The discussions naturally introduce the measures of variations, such as range, deviations, variance, and standard decision. To show the standard deviation is determined by how far each grade is from their GPA, students are asked to compare the performance consistency or variation between Doe and Kai, both have a standard deviation of 1.155.

To show the limitations of using the average alone, Jack's grades are introduced with the values of his GPA of 2.143 and standard deviation of 1.069. Students are asked to rank the three students' performance based on their standard deviations, interpret meanings, and ask them to see the similarity

of this comparison to the comparison of the standard deviation of Apple Computers' stock price and that of a penny stock. This process naturally leads students to see the limitations of using standard deviations alone to measure performance. It is thus the time to introduce the coefficient of variations as follows, and rank Smith, Doe and Jack's performance with the values of their coefficients of variations.

$CV_{Smith} = 0/3 = 0$ $CV_{Doe} = 1.155/3 = .384$ $CV_{Jack} = 1.069/2.143 = .499$ $CV_{Kai} = 1.155/2=.577$

The discussions conclude with questions why top firms coming to campus for recruiting have GPA requirements, say, 3.2, for screening GPAs of applicants.

Table 1 Students Course Grades, GPA and Standard Deviation

Name	COB202	ACC241	MKT200	POSC110	MUS140	FIN230	IB200	GPA	STD	CV
Smith	3	3	3	3	3	3	3	3	0.000	.000
Doe	3	4	4	1	4	3	2	3	1.155	.385
Jack	1	2	3	2	4	2	1	2.143	1.069	.499
Kai	2	1	1	4	1	2	3	2	1.155	.577

As part of the requirement for assessing students learning, students are asked to work on a project with the same set of student data. The objective is for students to develop their analytic skills with Excel formulas, tables and charts, to be able to use descriptive statistics, and be able to interpret the meanings related to their lives on campus. Students warmly discussed questions, such as, 1) Is the year in school categorical or numerical variable? 2) Is it measured on an ordinal or an interval scale or a ratio scale? 3) What type of survey error is there if a few survey forms based on Schau (2003) are passed to students on a dining table in D – Hall? 4) What type of survey error is there if a question asked is "how many times you have downloaded copyrighted music online?"

In summary, the pedagogy innovation to improve statistics instruction with students' data and examples has proven to be effective by many (Carnell, 2008; Stork, 2003). The use of the students' survey data and examples for descriptive statistics in this paper indicates that students understand better, and feel less stressed. Students react positively to the use of the data and examples about themselves, and like the group discussions in class. The survey data from administrating Schau's 36 items Pre and Post instruments before and after the coverage of the descriptive statistics will be analyzed (Schau, 2003).

Acknowledgement: the author sincerely appreciated Dr. Scott Stevens at James Madison University for sharing his videos about teaching descriptive statistics and probability.

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Marine Animal Data Tagging Technology: Market Research in the United States and Canada

Trevor Greene, MBA Student and Shadda Corwin Coastal Carolina University

ABSTRACT

In October of 2017 our team partnered with *The Client* to conduct market research and analysis to aid in introducing their technology to the United States and Canadian markets. A large portion of this process included the development and distribution of a 43-question survey and an analysis of 7 competitors. The survey and competitor analysis were created based on the United States and Canadian markets.

The Client sought information that included: a competitor analysis (size, characteristics, and prices), a market survey with results, and a potential customer database. The information collected is provided in this report.

The survey and competitor analysis produced the following results:

1. 56 respondents, with 38 respondents completing the survey entirely
2. Respondents were split almost equally between the US/Canada and ex-US/Canada countries
3. 46% of respondents were in the education sector, 28% of respondents were in the government, and 26% were in non-profit and private
4. Animal migration and/or behavior is the most prevalent research focus, at 58% in the US and Canada and 71% outside of the US and Canada
5. Archival tags were the most used tags, with 72% of respondents using them
6. A large percentage of respondents reported being interested in deploying tag types that they were not currently using
7. 69% of survey respondents studied fish, others studying aquatic crustaceans, aquatic reptiles, marine mammals, and seabirds
8. The most commonly used sensors include temperature and depth
9. Cost was the most frequently reported reason that respondents did not use data tags for their research
10. Respondents in the US and Canada are more confident that their funding over the next 12 months will stay the same or increase
11. Top seven (7) competitors include Company A, Company B, Company C, Company D, Company F, Company E, and Company G
12. Company A was the most frequently used competitor, with 38% of respondents using their products

13. In regard to social media and online presence, the least active competitor is Company G, and the most active competitor is Company C and Company F
14. Company B advertises the most customizable data tags

Based on the research and analysis, the team's recommendations for *The Client* are:

1. **Enter the US market and primarily target the government sector.**
2. **Enter the US market and target the higher education sector.**
3. **Implement the following marketing strategies.**

Background

Information logging using data loggers is an extremely valuable research tool when studying aquatic science. Data collection is an essential part of conducting research, enabling detailed analysis of animal migration, distribution, feeding and spawning behavior, movement, and geographic location.

Companies, such as *The Client*, have been able to provide researchers with the tools that are necessary to conduct such research. *The Client* is able to do this through the development of data loggers designed to monitor and measure various parameters of study subjects, including temperature, depth, salinity, tilt, light, heart rate, and acceleration.

The Client, an international company founded in 1985, is one of the leading data logger development companies producing some of the smallest data loggers on the market, which are used in research studies of both marine and wildlife animals and their environments. Currently *The Client* has a strong presence in the Icelandic and European markets and is seeking to expand into the U.S. and Canadian markets with their unique line of products.

In October of 2017 Trevor Greene and Shadda Corwin, members of the Wall Fellows Program at Coastal Carolina University, partnered with *The Client* to conduct market research and analysis, to be presented to the marketing team in May 2018. The deliverables included the following:

- Survey outcome with results from questionnaire;
- Competition analysis, and;
- Prospect data base of potential buyers within US and Canada

The team worked with an advisory team, including students and faculty at Coastal Carolina University, to provide the requested deliverables. Additional resources were provided by *The Client*, Coastal Carolina University faculty, and a wealth of other public information platforms to aid in the production of the survey, prospect database, competitor analysis the recommendations for *The Client*.

Objectives

As stated in the background, the scope of work included deliverables as follows:

- Survey outcome with results from questionnaire
- Competition Analysis
- Prospect database of potential buyers within USA and Canada

The deliverables were then broken down into specific objectives. For the "survey outcome with results from questionnaire," objectives included:

- Creating a survey that would provide an estimation of the market size, characteristics, competition, and list of users of other manufacturer's satellite tags
- Distributing the survey to the appropriate individuals
- Collecting and analyzing responses from survey respondents
- Utilizing the data from survey responses to provide recommendations to *The Client*

For the "competitor analysis," objectives included:

- Identifying *The Client* competitors in the marine data tagging market
- Researching competitors including background, prices, products, specifications, and online presence
- Utilizing the data from the competitor research to provide recommendations to *The Client*

For the "prospect database of potential buyer within the USA and Canada," objectives included:

- Identifying potential sources for future customers and current marine data tag users
- Compiling names, titles, levels of education, and contact information for each potential customer and current marine data tag users

Deliverables on these objectives are detailed herein and include actionable insight and recommendations for the consideration of *The Client*.

Competitor Analysis

Overview

This section contains the contents of the competitor analysis conducted by the team. The analysis includes seven competitors and six social media platforms and provides updates to those that were studied in the prior project two years ago. The purpose, as outlined by the objectives, was to understand the market and the progressiveness and responsiveness of the companies to the evolving needs of the customers. In accordance with the information provided to the research team during the February Skype call, this competitor analysis focuses on the companies that produced archival data tags, as well as the competitors identified by the survey respondents. The research includes the history of the company, social media highlights/online presence, tag specifications and some prices of tags (specifically archival tags). This analysis includes individual social media accounts, websites, and newsletters which are used to update customers. The information gathered in the analysis was utilized to aid in the creation of recommendations.

Table 1: Summary of Top Competitors' Social Media & Online Presence

	Facebook	Twitter	Instagram	YouTube	LinkedIn	Blog	Newsletter
The Client	●	●					
Company B	●	●			●		
Company C	●	●		●	●		●
Company D		●					●
Company E						●	
Company F	●	●		●	●		●
Company G							
Company A		●			●		●

Beyond the list of competitors that were provided by *The Client*, the team identified an additional major competitor, Company A. In the survey conducted, it was found that Company A provided tags to 15 out of the 39 respondents, making Company A one of the leading providers of data tags in the U.S. and Canadian markets. For more detailed information on Company A, please refer to Appendix 2: Competitor Analysis.

Key Competitor Similarities and Differences

While looking at the seven competitors, the team found the following to be significant:

- Competitor Websites[1]:
  - Company E redesigned portions of their website within the last two years, by updating to a more modern design throughout.
  - Company D has added a "Newsletter & Social Media" page to their website in the last two years.
  - Company C has added a Twitter social media icon within the last two years.
  - Company A, Company G, Company F, and Company B have not changed or updated their website design within the last two years.
- Each competitor, with the exception of Company G, has some form of social media and/or newsletter to keep the customers up to date on company news and advancements

[1] Information regarding the websites from two years ago were received through https://archive.org/ and the competitors' respective websites.

- Company C provides environmental consulting services to assist clients with system selection, research design and implementation, equipment training and data analysis

- Company B offers the *Company B Data Portal,* which captures, decodes and stores data online, supports automatic data retrieval by government mandated data management systems, and provides an intuitive interface to review data anywhere/anytime there is internet access

- Company B has advertised the most customizable tags of all the other competitors

- The smallest tag offered by the researched competitors is the *Product X* tag designed by Company E. This tag can be customized with the following sensors: temperature, depth, acceleration, light, inertia, magnetism, or conductivity. The tag measures at XXmm x XXmm, which is comparable to *The Client's Product X* (XXmm x XXmm) that only measures temperature and depth.

- The largest tag offered by the researched competitors is the *Product X*, produced by Company B. The tag includes temperature and tilt sensors and measures in at XXmm x XXmm.

Website Analysis

Overview

The following statistics were gathered by analyzing *The Client's* company website. *The Client* recently updated their website in November of 2017 after many years. Analytics were compiled using the Google Analytics platform and, for comparative purposes, analyzed year over year utilizing data from Q1 2017 and Q1 2018.

In the first full quarter that the new website has been live *The Client* has seen improvements in some metrics, however, resources should be devoted to improving those which have declined. A slight dip in users, as well as total sessions, is concerning and should be addressed by exploring new ways to increase visibility and engagement, as well as attract new users. On the other hand, *The Client* has seen an increase in session duration, meaning users are spending more time on the website than in the same period the previous year. Bounce rate also decreased, indicating less users are leaving the website after viewing only one page.

Engagement

- 23% decrease in all unique website users
    - 24% decrease in new users
        - This decrease could be attributed to a number of factors, such as a lack of engaging content, lack of linking to social media platforms, little blog engagement, poor SEO optimization, etc.
- 12% decrease in sessions (total site visits)
    - 2% decrease in page views
        - While a slight decrease in sessions itself is not a major cause for concern, as established users could just be viewing the site less frequently (for example their question was answered by the FAQ and their need was

addressed), this is an area that should be monitored and addressed if they decline further

- 41% increase in session duration
    - A little over 4 minutes on average, compared to less than 3 minutes
        - This statistic is an important indicator of site performance as it tells us how long users are actually spending on the website. Statistics comparing year over year data for *The Client's* website indicate that users are spending more time on the website on average, a positive change compared to 2017.
- 21% decrease in bounce rate
    - A decrease in bounce rate indicates that fewer users are leaving the site after visiting only one page
        - Such an improvement could be attributed to many factors, such as a better optimized information flow, more engaging content a better user experience, and more appealing visuals

Acquisition

- 31% decrease in organic search traffic
    - Organic search traffic is an important metric to measure and monitor as it indicates how much of *The Client's* web traffic is coming from customers who search for terms that are relevant to the products and services that *The Client* provides.
        - A decrease in organic search engine referrals could be attributed to poor SEO optimization, as well as a number of search engine algorithm discrepancies that could affect how the site ranks in search results. This decrease should be addressed by exploring third party site optimization services that will conduct an analysis on the backend of the website and correct any issues that could be leading to poor search engine rankings. In addition, *The Client* could benefit from having the company website optimized with key search terms and phrases.
- 65% increase in social media driven traffic
    - This metric indicates that *The Client* has made some progress on receiving website referrals from social platforms, although the total volume is still small relative to all traffic. *The Client* can benefit from actively monitoring these channels and ensuring that unique, relative content is being published on social platforms and being linked back to the company website.

Behavior Flow

- Based on the tracked behavior flow of users, the *The Client* website appears to be optimized well to drive traffic to key product pages from the home page. This is important as visiting a product page is a good indicator that a customer is interested in the products and could potentially purchase. *The Client* can improve on these metrics by capturing more contact forms from users who are visiting these pages, thus resulting in a lead for the sales team to pursue.

Detailed analytics and charts can be found in Appendix 4 "Website Analytics Report"

Survey Analysis & Results

Survey Methodology

Overview

The research process began with the development of a 43-question survey (please refer to Appendix 1: Survey Questions), that was distributed to researchers across the U.S and Canada using the online platform, Qualtrics. This platform allows for the distribution of the survey by email and provides the team with the ability to send follow-up emails. The survey recipient would receive the survey along with a disclaimer notice (please refer to Appendix 2: Survey Disclaimer).

The survey went live on December 20, 2017 and was sent to a total of 1,432 individuals and 56 individuals responded to the survey. Of those that responded, 38 finished the survey in its entirety. During the analysis process 6 respondents, all of whom completed only 2% of the survey, were removed due to an incomplete data set. This resulted in the inclusion of 50 respondents in the data analysis. The survey was closed on March 19, 2018.

The survey was first distributed to the contact lists previously provided to the research team by *The Client*, which included 590 contacts. It was then distributed to an additional 842 contacts, who were identified by the research team as part of the prospective database. The team compiled the prospective database by researching universities and listing the contacts and scientists for those universities. The team then sought out contacts within the government, including the Departments of Natural Resources from the different states.

The data received was analyzed in respect to the objectives outlined by the research team, in accordance with deliverables requested by *The Client*.

The research team sought to develop a survey that could glean information from both current data tag users and non-data tag users. Each of the respondents were asked questions regarding: job title, level of education, location, species studied, and other demographic questions. The team then identified questions for each group of respondents based on valuable information that each group could provide.

Some of the questions posed to current data tag users included questions regarding: funding and purchasing, current providers, type(s) of data tag(s) used, and current importance and satisfaction ratings.

The team then explored questions to ask non-data tag users, that would benefit *The Client* the most. Some of the questions posed to non-data tag users included questions regarding whether they would be interested in a certain type of tag, what type of animals would they be looking to tag, why they are not currently using data tags as a means of data retrieval, and if they have plans to use data tags in the future.

Survey Results

(Q1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11)

The following results were produced and analyzed from the distributed 43-question Qualtrics survey. A total of 56 individuals responded to the survey. Of those that responded, 38 finished the survey in its entirety. During the analysis process 6 respondents, all of whom completed only 2% of the survey, were removed due to an incomplete data set. This resulted in the inclusion of 50 respondents in the data analysis. All results are displayed as a graphical representation, as well as further described in respective appendices as listed.

Respondent Profile

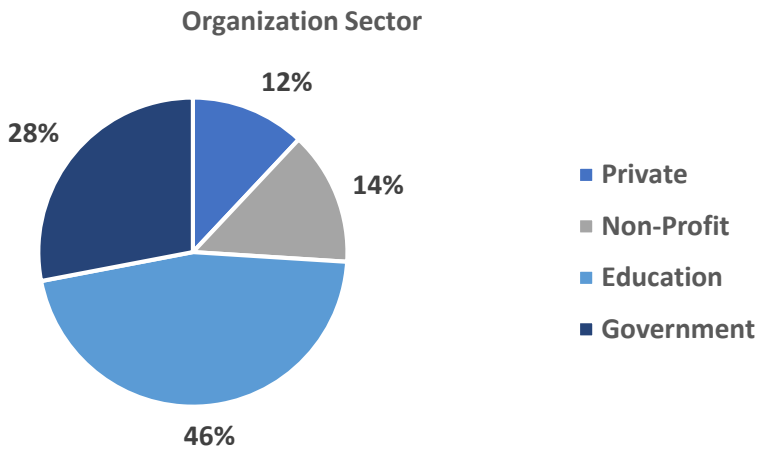


Figure 1: The distribution of sectors each respondent identified their organization to belong to. (Q2 n=50)

The largest group of survey respondents reported belonging to an organization in the educational sector, while the next largest group reported belonging in the government sector. These sectors were primary targets for the research team while generating leads for potential respondents, explaining the large variance in responses from the private and non-profit sectors.

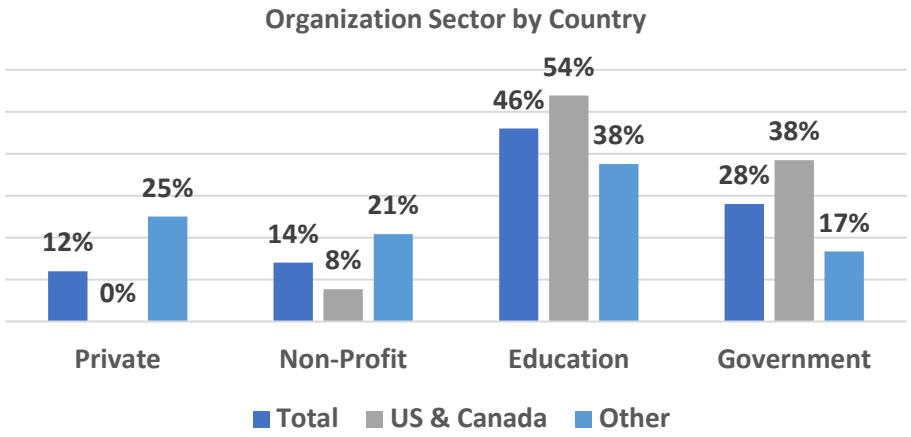


Figure 2: The distribution of sectors each respondent identified their organization to belong to, organized by country where their primary research is focused. (Q2/Q6 n=50)

Respondents whose research is primarily focused in countries other than the United States and Canada were much more likely to report belonging to an organization in the private and non-profit sectors, while respondents whose research is primarily focused in the United States and Canada were more than twice as likely to report belonging to an organization in the government sector and slightly more likely to report belonging to an organization in the education sector.

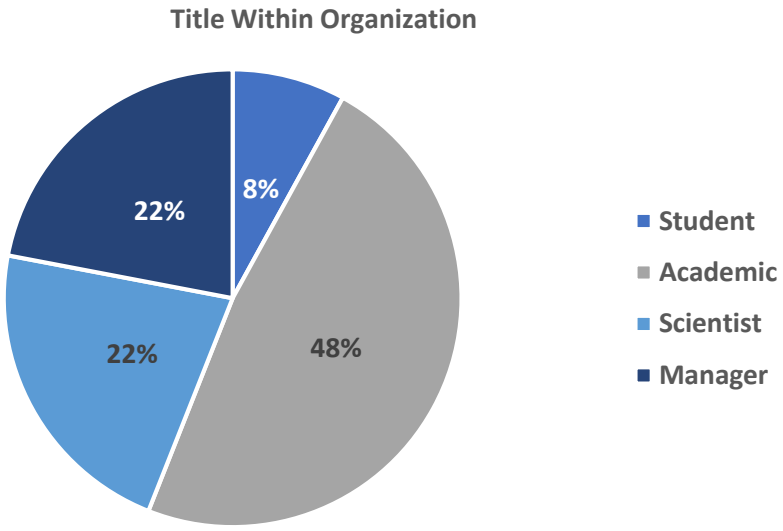


Figure 3: The distribution of titles each respondent reported within their organization, categorized. (Q3 n=50)

Of the titles reported by each survey respondent; 48% reported titles categorized in the academic field, 22% reported titles categorized in the scientific field, and 22% reported titles categorized as management roles.

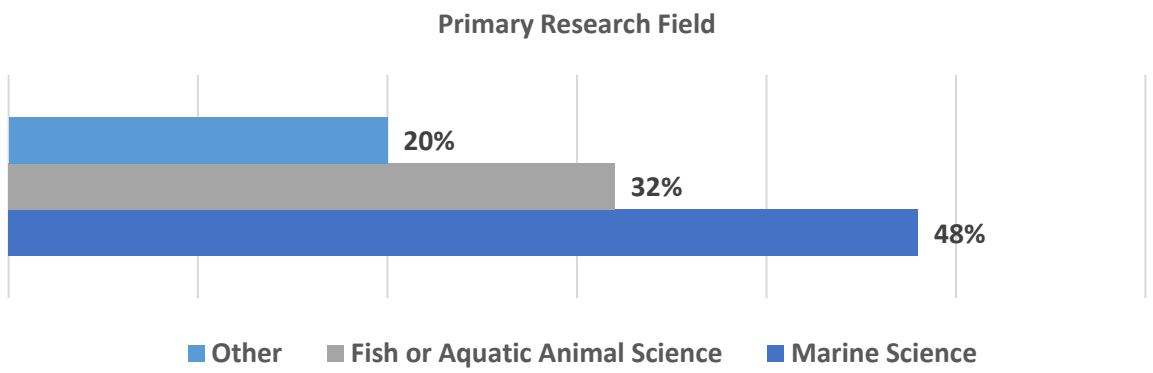


Figure 4: The distribution of fields each respondent reported as their primary research field. (Q4 n=50)

Roughly half of all survey respondents reported their primary research field to be marine science, while roughly one third reported fish or aquatic animal science to be their primary research field.

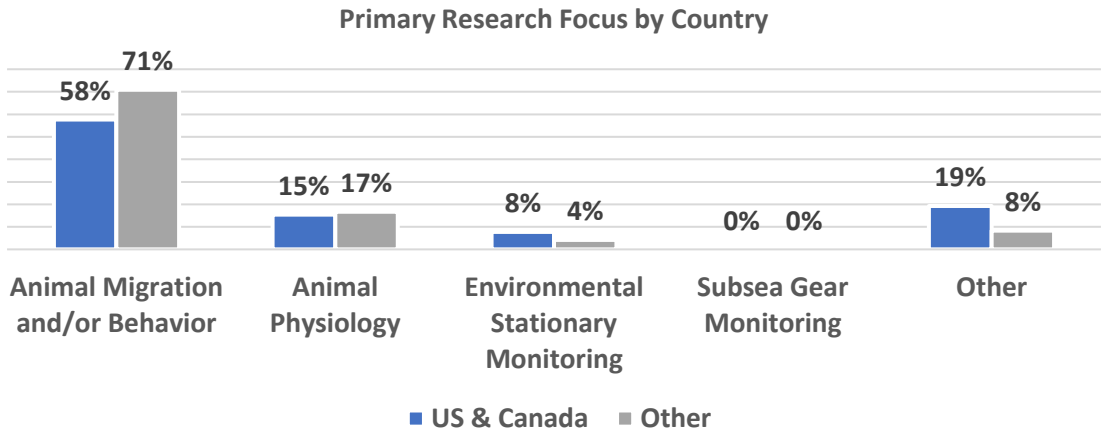


Figure 5: The distribution of areas each respondent reported as their primary research focus, organized by country where their primary research is focused. (Q5/Q6 n=50)

Roughly 64% of survey respondents reported animal migration and/or behavior as the area in which their research was primarily focused. Respondents in the United States and Canada were slightly less likely to report this area as their primary research focus when compared to those in other countries.

Of those respondents who selected other as their primary research focus, the following areas were specified;

- Marine protected areas
- Stock assessment
- Fish behavior and parasite control
- Animal ecology
- Biological oceanography
- Fish population dynamics
- Endangered species recovery

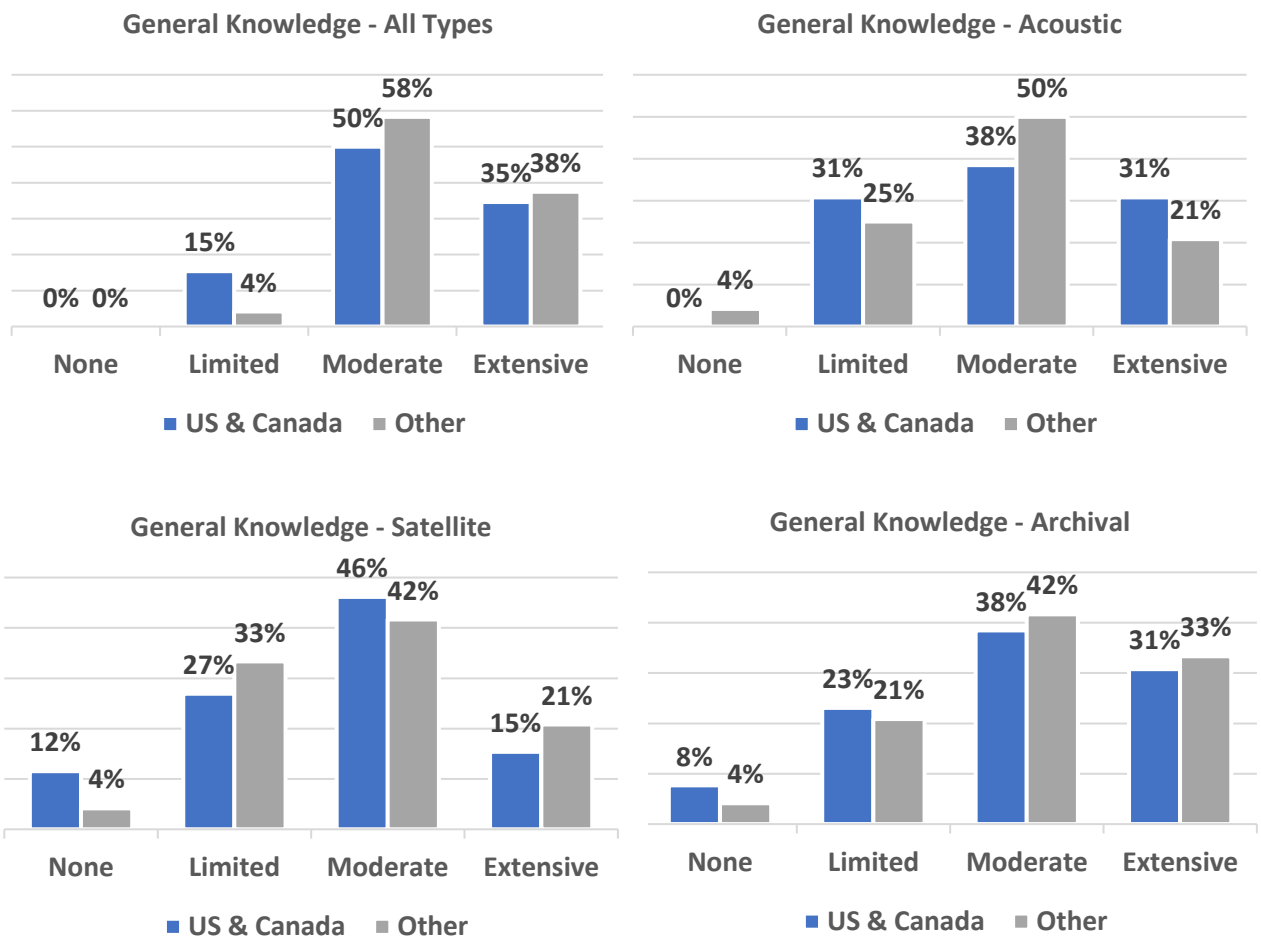


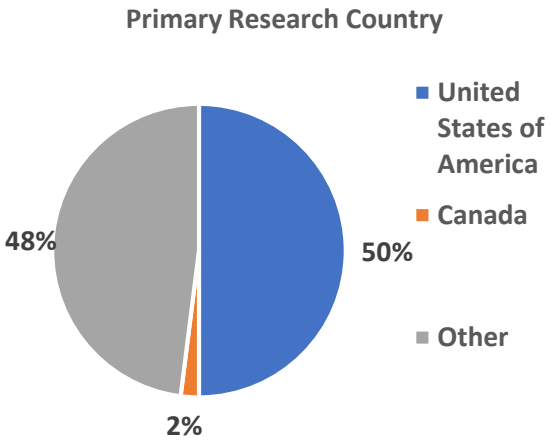
Figure 6: The level of knowledge reported by each respondent for each type of electronic tag, organized by country where primary research is focused. (Q6/Q8/Q9/Q10/Q11 n=50)

When asked to describe their general knowledge of all types of electronic tags (that contain sensors to measure variables like temperature, depth, salinity, light, etc), 90% of survey respondents described their knowledge as moderate to extensive.

When asked the same question for acoustic electronic tags less than half, or 44% of survey respondents, described their general knowledge as moderate, with 98% describing their general knowledge as limited to extensive.

When asked the same question for satellite electronic tags 74% of survey respondents described their general knowledge as limited or moderate. Compared to all other types of electronic tags, survey respondents reported extensive general knowledge significantly less frequently.

When asked the same question for archival tags 72% of survey respondents described their general knowledge as moderate to extensive.



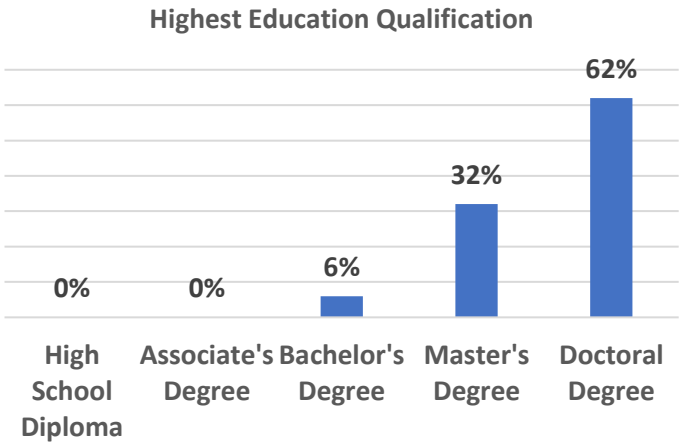


Figure 7: The distribution of countries where respondents reported their primary research is focused. (Q6 n=50)
Figure 8: Highest education qualification gained, as reported by respondents. (Q7 n=50)

In analyzing the United States and Canadian markets, survey respondents were segmented by the location where their primary research is focused. Survey respondents were evenly split, with 50% of respondents in the United States and Canada and 50% in other countries.

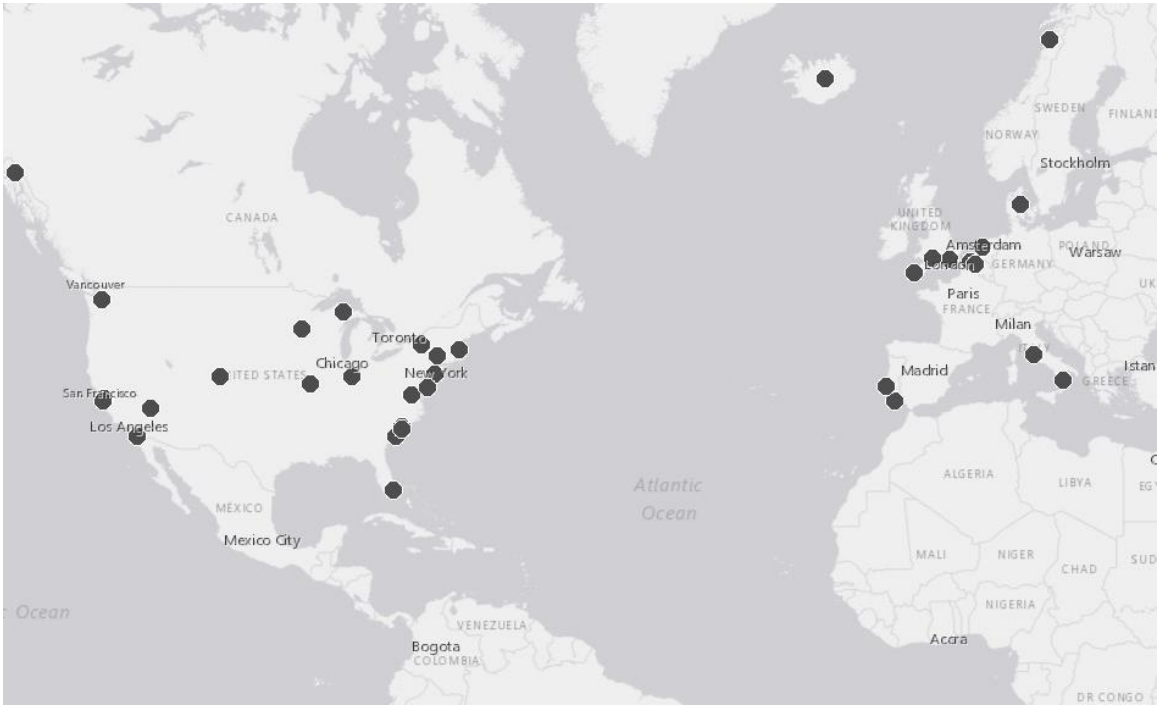


Figure 9: The distribution of countries where respondents reported their primary research is focused.

Data Tag Users

Current Usage
(Q12, 13, 14, 22, 51, 52, 53, 23)

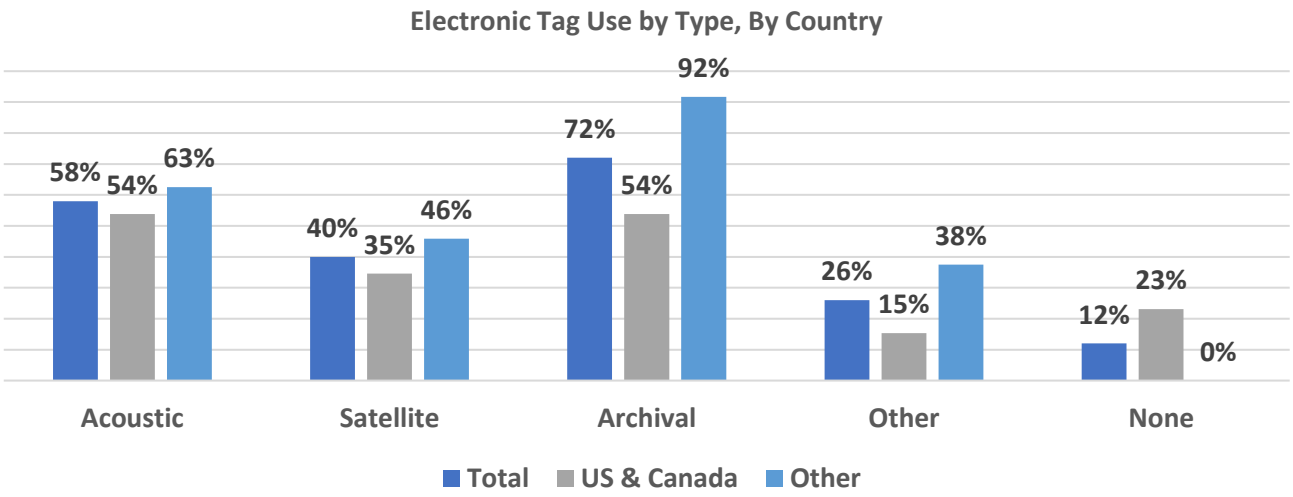


Figure 10: The distribution of each type of electronic tag reported as currently in use by respondents, organized by country where their primary research is focused. (Q12/Q6 n=50)

Survey respondents were asked to indicate which types of electronic tags their organizations currently have in use. Use of archival electronic tags were reported most frequently among all respondents. When segmented based on primary research location there was a large variance between archival electronic tag use in the United States and Canada and Other countries, with the latter being much more likely to use archival electronic tags.

Use of acoustic electronic tags were the second most frequently reported among all respondents. Among those respondents who indicated using other electronic tags, GSM and PIT were the most frequently reported. Survey respondents in the United States and Canada reported similar usage among acoustic and archival electronic data tags, while slightly less reported using satellite electronic tags.

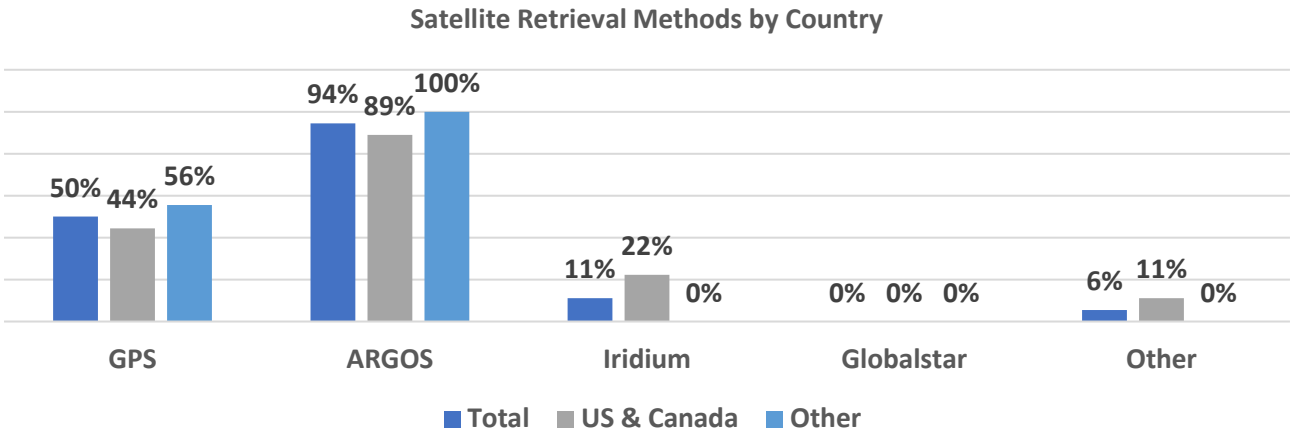


Figure 11: Type of satellite retrieval method currently in use by respondents who indicated having satellite tags in use, organized by country where primary research is focused. (Q13/Q6 n=18)

Of the survey respondents who indicated that their organizations currently have satellite electronic tags in use, 94% reported using ARGOS retrieval. The next most frequently reported retrieval method was GPS, with half of respondents indicating use. Iridium, Globalstar, and other retrieval methods were reported, although infrequently. There were no significant variances in reporting among countries.

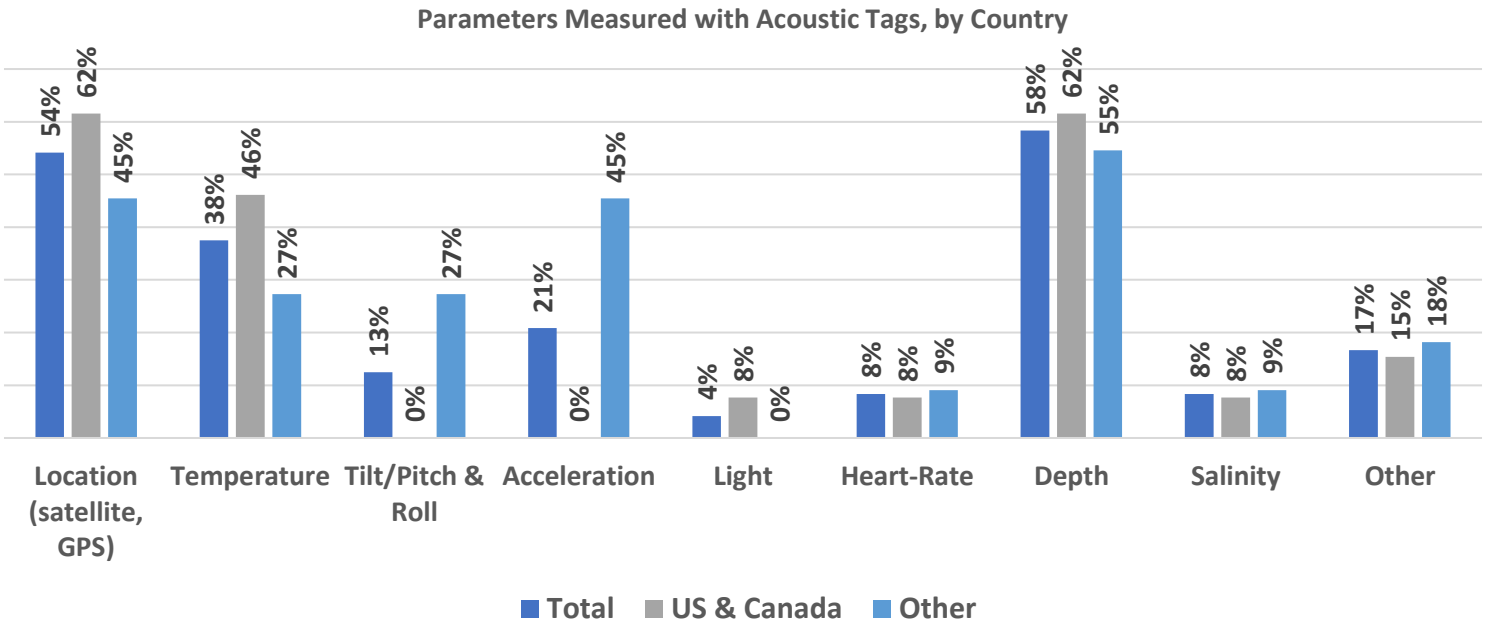


Figure 12: Type of parameters measured with acoustic tags by respondents who indicated having acoustic tags in use, organized by country where primary research is focused. (Q22/Q6 n=24)

Survey respondents who reported that their organization currently has acoustic electronic tags in use were asked to indicate which parameters they measure with the deployed devices. The most frequently

reported parameters were depth, location (satellite/GPS), and temperature. There were no significant variances in parameters reported by country.

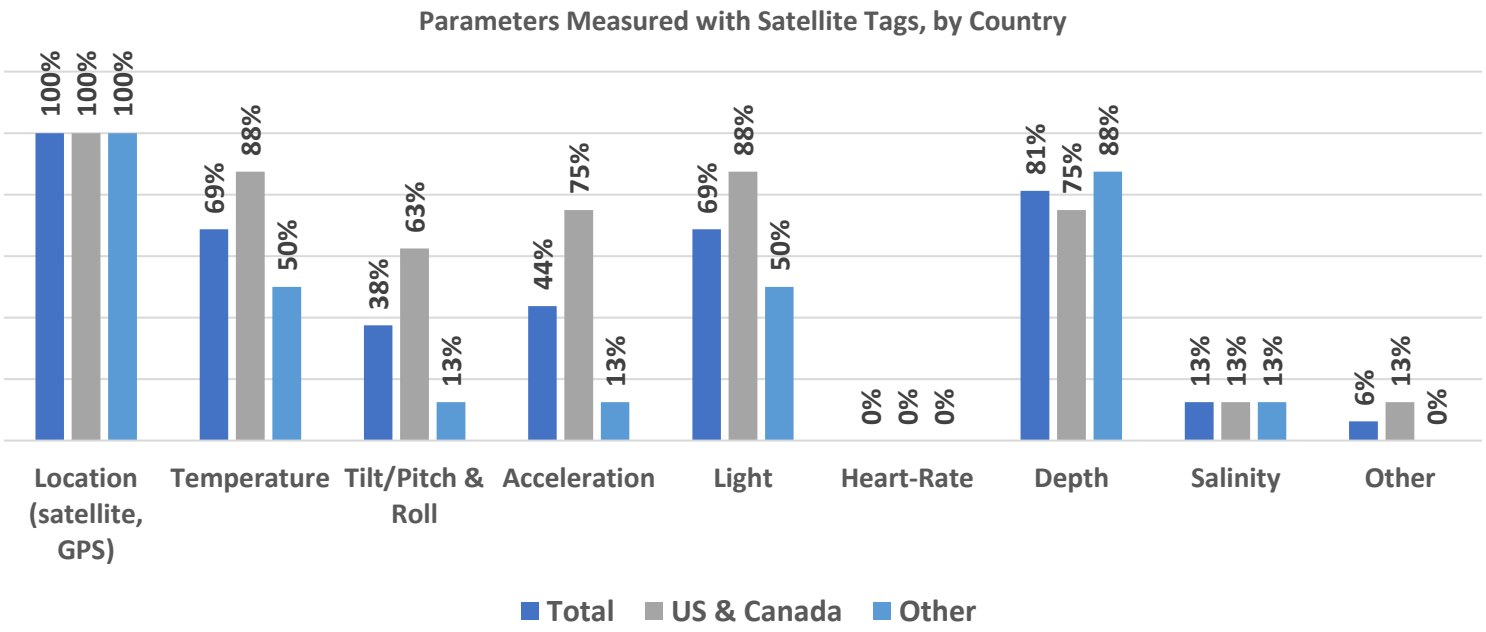


Figure 13: Type of parameters measured with satellite tags by respondents who indicated having satellite tags in use, organized by country where primary research is focused. (Q51/Q6 n=16)

Survey respondents who reported that their organization currently has satellite electronic tags in use were asked to indicate which parameters they measure with the deployed devices. The most frequently reported parameters were location (satellite/GPS) and depth, with temperature and light tying for third. There were no significant variances in parameters reported by country.

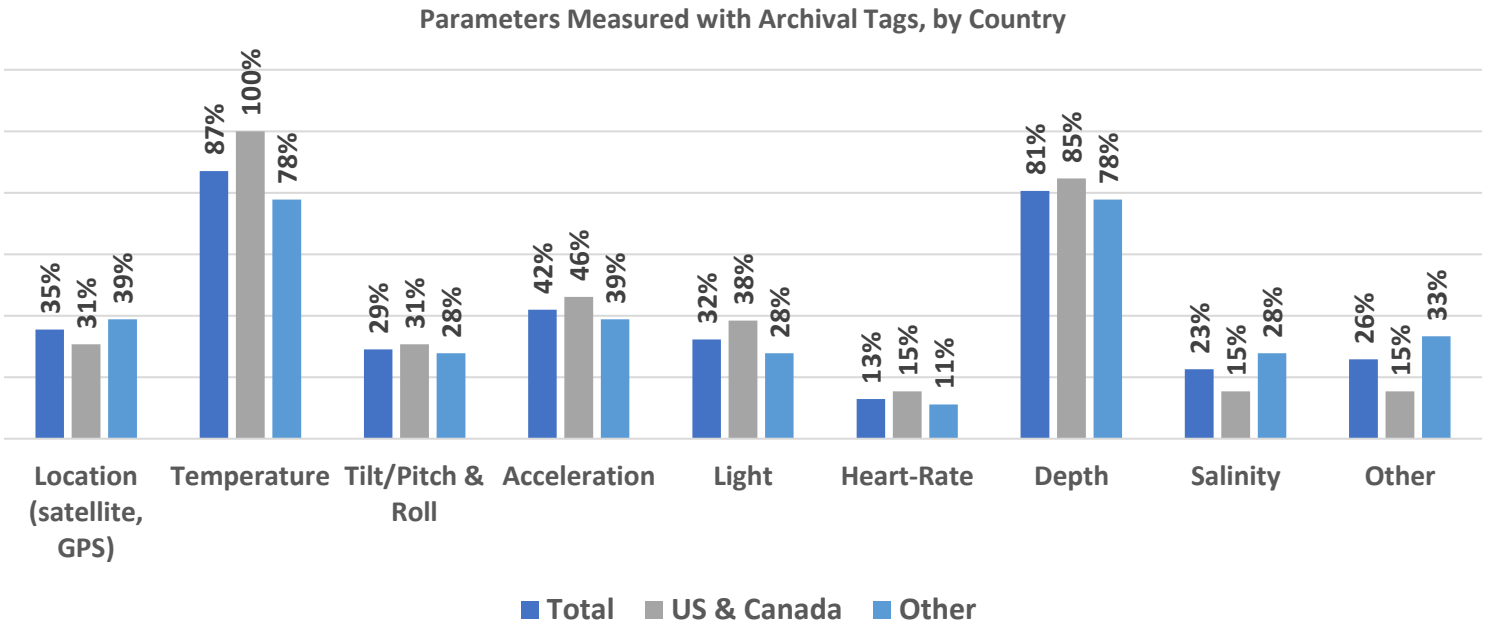
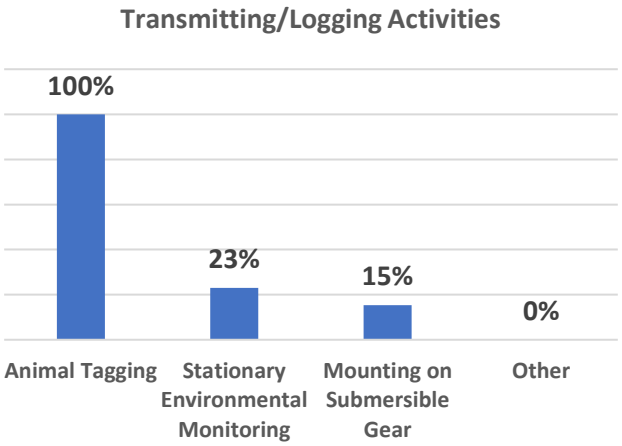


Figure 14: Type of parameters measured with archival tags by respondents who indicated having archival tags in use, organized by country where primary research is focused. (Q52/Q6 n=31)

Survey respondents who reported that their organization currently has archival electronic tags in use were asked to indicate which parameters they measure with the deployed devices. The most frequently reported parameters were temperature, depth, and acceleration, with location (satellite/GPS) trailing closely behind. Survey respondents reporting measuring using Other parameters, among them; humidity, p02, conductivity, acoustics, gape, and oxygen level. There were no significant variances in parameters reported by country.



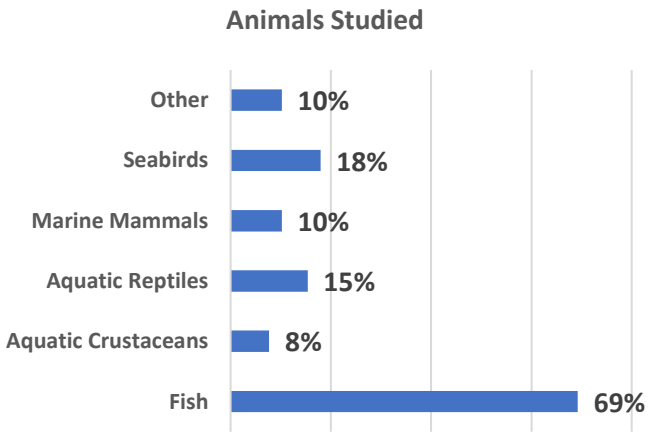


Figure 15: Reported usage of transmitting and/or logging electronic tags by activity (Q23 n=39)
Figure 16: Animals studied using electronic tags, as reported by respondents (Q24 n=39)

When asked if their organization had used electronic tags, transmitting and/or logging, in their research, 100% of respondents indicated that they had utilized electronic tags for animal tagging.

When asked which animal(s) their organization studied using electronic tags, 69% of respondents indicated that they had studied fish, with a smaller percentage spread among aquatic crustaceans, aquatic reptiles, marine mammals, and seabirds.

Customer Perceptions
(Q25, 54, 55, 28)

An importance-performance analysis was performed by asking survey respondents to indicate how important 13 features are in their using of electronic tags, and how satisfied they are with those 13 features in the tags they are currently using. Respondents reported using the scale below;

Importance	**Satisfaction**
5 = Very Important	5 = Very Satisfied
4 = More Important	4 = More Satisfied
3 = Important	3 = Satisfied
2 = Somewhat Important	2 = Somewhat Satisfied
1 = Not Important	1 = Not Satisfied
N/A	N/A

Importance-Performance Analysis was first proposed and introduced by Martilla and James (1977) as a means by which to measure satisfaction with a product or service. The IPA approach recognizes satisfaction as the function of two components: the importance of a product or service and the performance of an industry in providing that service or product. The combined ratings for those two components then provide an overall view of satisfaction with clear directives as to where resources should be focused.

The four quadrants in importance-performance analysis are characterized as;

- Concentrate Here – High Importance, Low Satisfaction
- Keep Up the Good Work – High Importance, High Satisfaction
- Low Priority – Low Importance, Low Satisfaction
- Possible Overkill – Low Importance, High Satisfaction

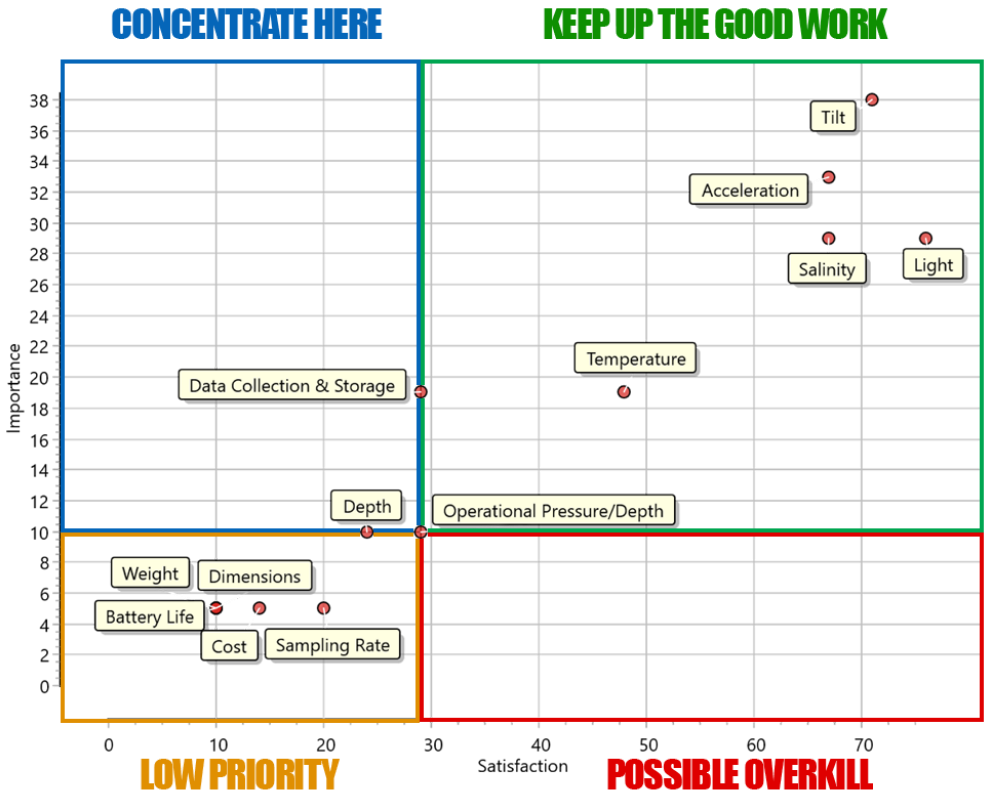


Figure 17: GAP analysis of feature importance and current satisfaction in ***acoustic*** *electronic tags (Q25 n=21)*

As you will see in Figure 17, survey respondents who reported currently using acoustic tags were asked to rank 13 features by how important they are to them in using acoustic tags, as well as how satisfied they are with the features in the acoustic tags they are currently using. A GAP analysis was performed on the results and yielded the following insight;

Data collection and storage, depth, and operational pressure/depth were identified as 'concentrate here' parameters for acoustic electronic tags.

Weight, dimensions, battery life, cost, and sampling rate were identified as 'low priority' parameters for acoustic electronic tags.

Tilt, acceleration, salinity, light, and temperature were identified as 'keep up the good work' parameters for acoustic electronic tags.

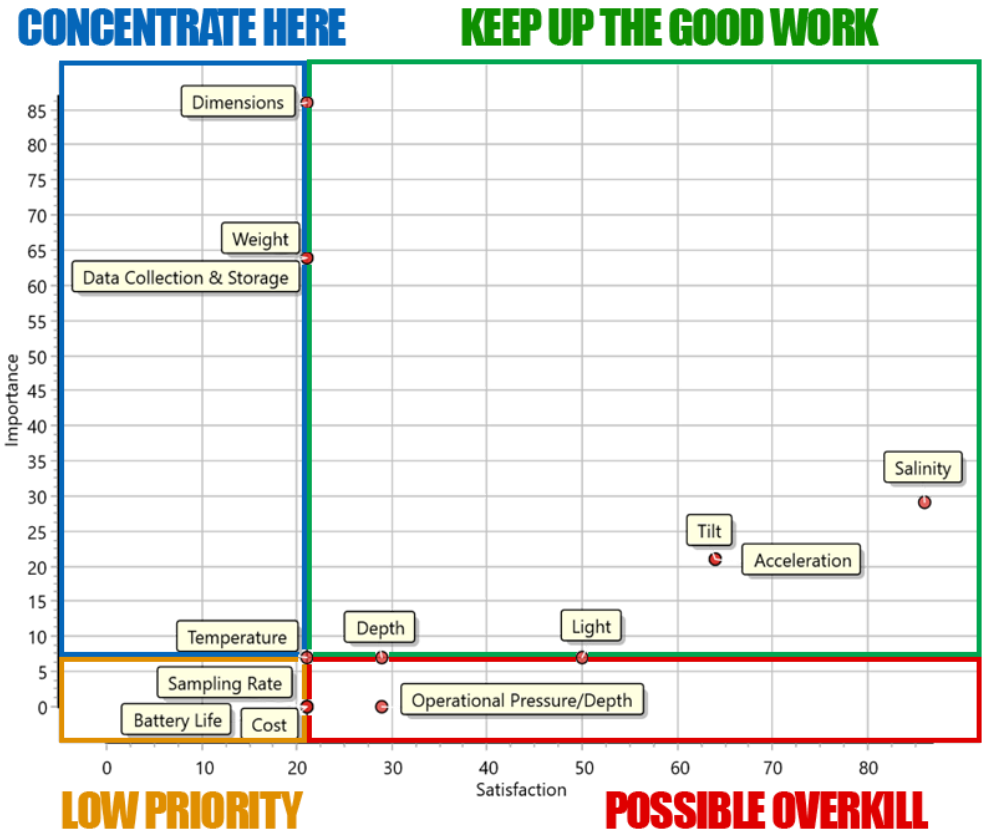


*Figure 18: GAP analysis of feature importance and current satisfaction in **satellite** electronic tags (Q54 n=14)*

Survey respondents who reported currently using satellite tags were asked to rank 13 features by how important they are to them in using satellite tags, as well as how satisfied they are with the features in the satellite tags they are currently using. A GAP analysis was performed on the results and yielded the following insight;

Dimensions, weight, and data collection and storage were identified as 'concentrate here' parameters for satellite electronic tags.

Temperature, sampling rate, battery life, and cost were identified as 'low priority' parameters for satellite electronic tags.

Salinity, tilt, and acceleration were identified as 'keep up the good work' parameters for satellite electronic tags.

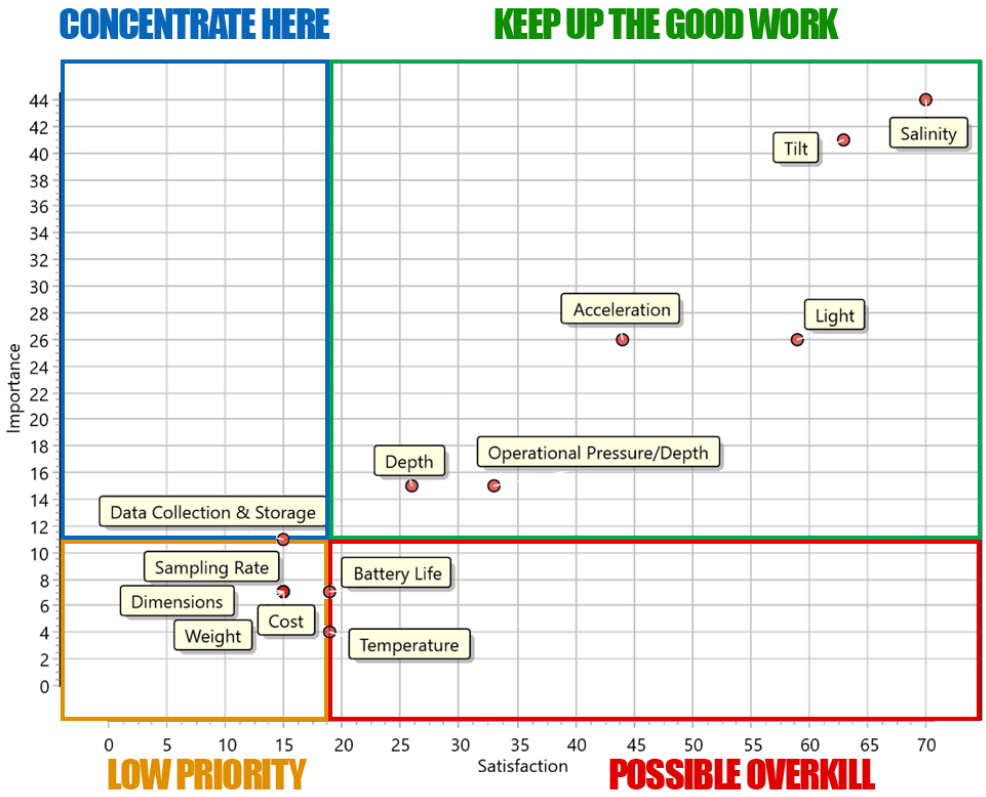


Figure 19: GAP analysis of feature importance and current satisfaction in ***archival*** *electronic tags (Q55 n=27)*

Survey respondents who reported currently using archival tags were asked to rank 13 features by how important they are to them in using archival tags, as well as how satisfied they are with the features in the archival tags they are currently using.

Data collection and storage was identified as a 'concentrate here' parameter for archival electronic tags.

Sampling rate, dimensions, weight, cost, battery life, and temperature were identified as 'low priority' parameters for archival electronic tags.

Salinity, tilt, acceleration, and light were identified as 'keep up the good work' parameters for archival electronic tags.

Potential Interest
(Q29, 30, 31, 32, 33, 34, 35, 38)

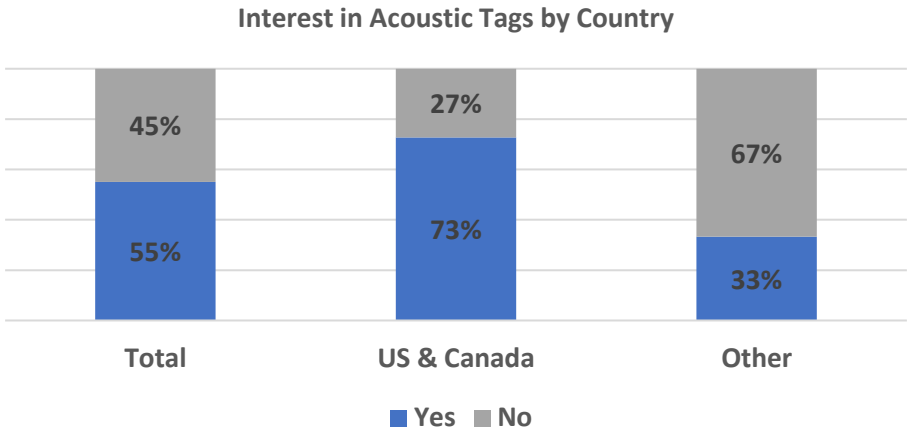


Figure 20: Interest in deploying acoustic electronic tags by respondents who indicated they did not currently have acoustic tags in use, organized by country where primary research is focused. (Q29/Q6 n=20)

Survey respondents who indicated that they did not currently have acoustic tags in use were asked if their organization would be interested in deploying acoustic electronic tags. 55% of all respondents reported that they would be interested, while 45% reported that they would not. When organized by the country where the respondents primary research is focused there is a large variance, with those in the United States and Canada 40% more interested in deploying than those in Other countries.

Of those respondents who reported that their organization would be interested in deploying acoustic electronic tags, the following responses were indicated as primary drivers;

- Would be interesting to use in Lake Superior work
- Time budgeting
- Depends on science question to be addressed
- If more feasible or efficient
- Radio performs poorly
- For research
- Real time nature of data
- Yes, Good research tool

Of those respondents who reported that their organization would not be interested in deploying acoustic electronic tags, the following responses were indicated as primary drivers;

- May not be useful for study species
- No need for our studies
- Lack of manpower and resources
- Why should we
- Not applicable to seabirds foraging areas
- No current question requiring acoustic

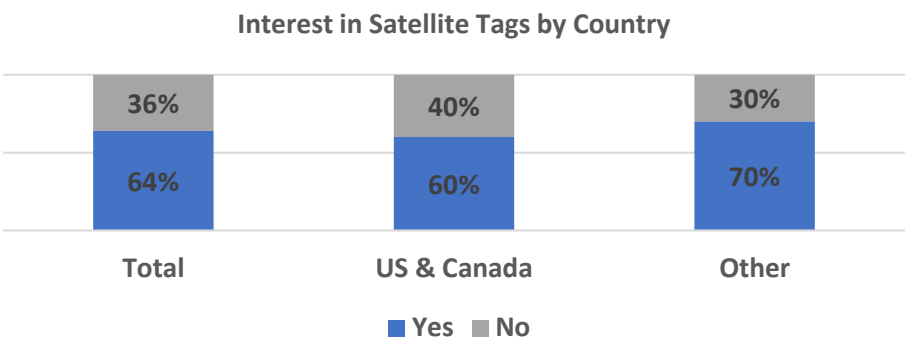


Figure 21: Interest in deploying satellite electronic tags by respondents who indicated they did not currently have satellite tags in use, organized by country where primary research is focused. (Q31/Q6 n=25)

Survey respondents who indicated that they did not currently have satellite tags in use were asked if their organization would be interested in deploying satellite electronic tags. 64% of all respondents reported that they would be interested, while 36% reported that they would not. When organized by the country where the respondents primary research is focused there is no significant variance.

Of those respondents who reported that their organization would be interested in deploying acoustic electronic tags, the following responses were indicated as primary drivers;

- Could be interesting, though currently cost prohibitive
- The fish we work with tend to spend some time at the surface, so it might be possible. Could eliminate the expense of maintaining extensive in situ receivers and provide data when the fish are not within range of those receivers. Might give people track
- Study species is in a remote location
- Depends on ARGOS fees
- To use in the future
- Has some advantages over acoustic tags
- Could be use over large distribution ranges
- To track immature seabirds or birds which are very hard to recapture in the long term
- Real time nature of data
- We have research questions for which we could use sat tags
- Yes. good tool
- Would be able to answer many more questions
- If they were detectable in very remote locations from potentially deep water - then yes

Of those respondents who reported that their organization would not be interested in deploying acoustic electronic tags, the following responses were indicated as primary drivers;

- To large and expensive
- Because we work with fish primarily
- Excessive cost
- Tags would be too big for the size fish we work with
- Fish do not surface
- Too expensive

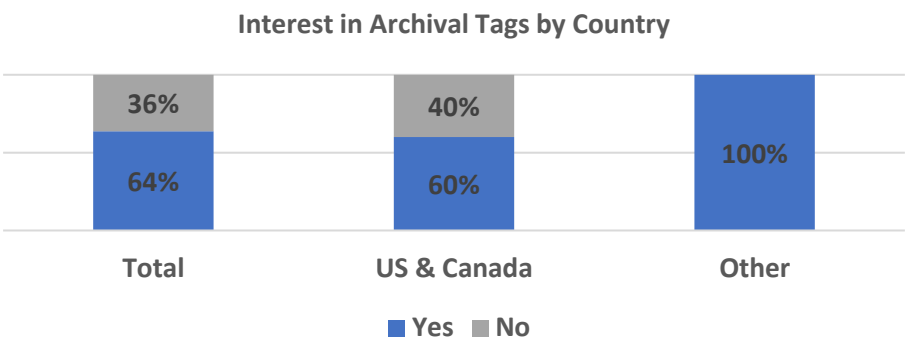


Figure 22: Interest in deploying archival electronic tags by respondents who indicated they did not currently have archival tags in use, organized by country where primary research is focused. (Q33/Q6 n=11)

Survey respondents who indicated that they did not currently have archival tags in use were asked if their organization would be interested in deploying archival electronic tags. 64% of all respondents reported that they would be interested, while 36% reported that they would not. When organized by the country where the respondents primary research is focused there is a significant variance, although the Other segment is represented by a single survey response.

Of those respondents who reported that their organization would be interested in deploying acoustic electronic tags, the following responses were indicated as primary drivers;

- Could be useful for evaluating habitat use
- Has some advantages over acoustic tags
- We have research questions for which we could use archival tags

Of those respondents who reported that their organization would not be interested in deploying acoustic electronic tags, the following response was indicated as the primary driver;

- Difficulty in retrieving data (or recovering the device)

Survey respondents were asked if there are any sensors or parameters currently not available in products for their application that they would like to see available. The following responses were collected;

- SWS on an antenna
- One that will kill and potentially float (for retrieval) a tagged fish when the telemetry tag wears out, or at any particular et time in the future.
- Remotely downloadable GPS + TDR + temp + salinity
- Pressure for altimetry
- Intravascular pH
- Archival acoustic transmitter all in one
- Individual storage and transmission of x,y,z axes of accelerometer data
- Compass (animal headings)
- Heart rate for large fish with slow bpm, store depth profile for 1 week and acoustic transmission
- Gyroscope

- Poison ingestion
- Oxygen, chlorophyll
- Spawning Indicators, Proximity Sensors
- Better tags all around for high latitude deep water fish
- Cheap small programmable GPS tags
- Salinity stable over months.
- Depth or temperature in small JSATS acoustic tags
- Ability to record sounds at set intervals or continuously at various times of day
- Salinity
- Motion activated recharge of battery

Funding & Purchasing

(Q16, 17, 20, 21) (Q15, 18, 19)

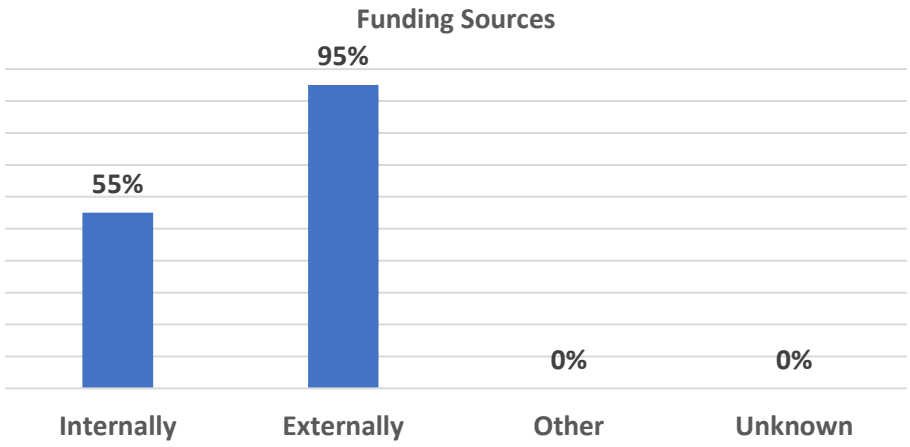


Figure 23: Organization funding sources for electronic tag purchases. (Q16 n=40)

95% of respondents reported that their organization receives at least partial funding for electronic tag purchases from external sources, while 55% of respondents reported that their organization receives at least partial funding for electronic tag purchases from internal sources.

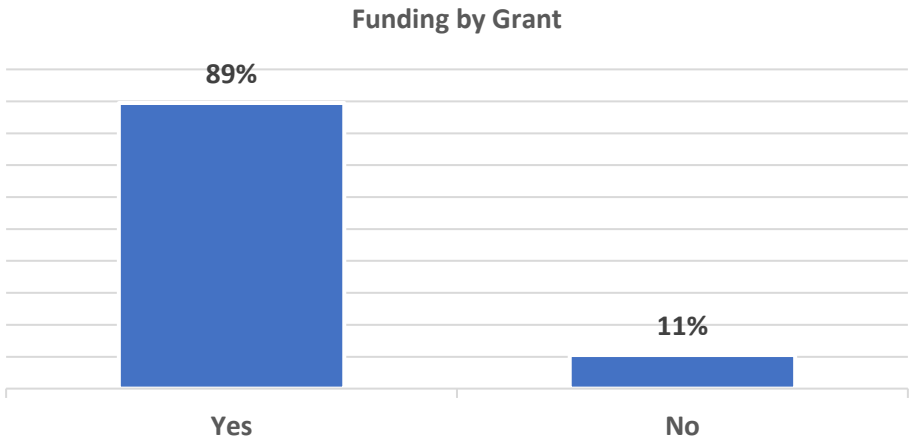


Figure 24: Electronic tag purchases funded by a grant, by respondents who reported external or other funding for their organizations electronic tag purchases. (Q17 n=38)

Of the respondents who indicated that their organizations electronic tag purchases are funded by any means other than internally, 89% reported that their electronic tag purchases are funded by a grant.

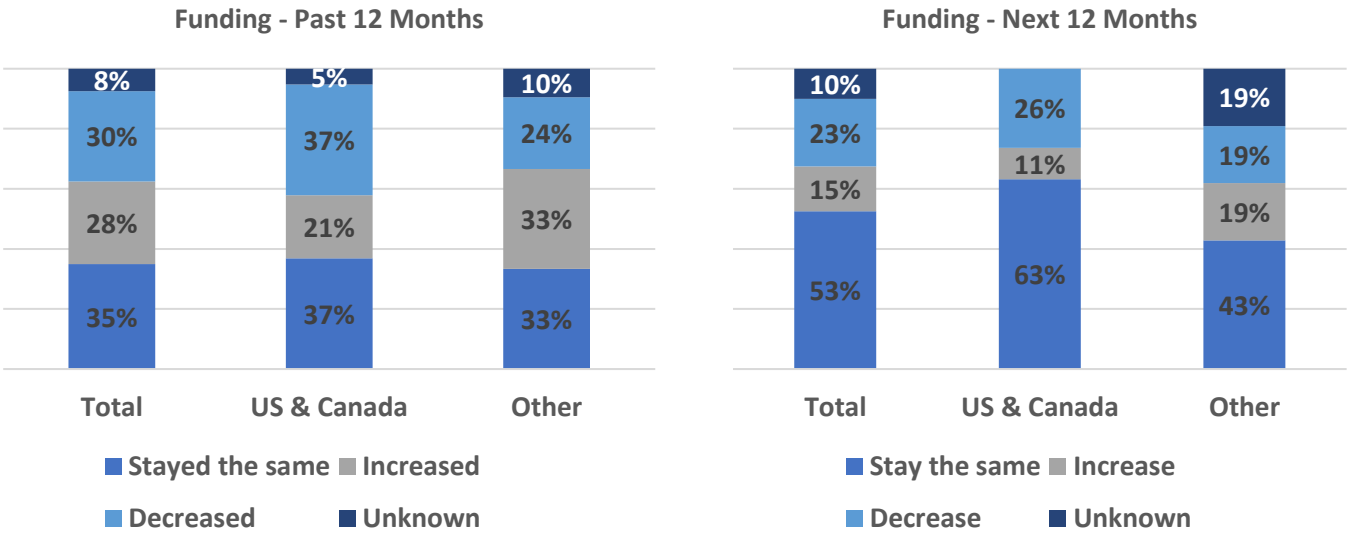


Figure 25: Funding changes in the past 12 months, organized by country where primary research is focused. (Q20/Q6 n=40)
Figure 26: Funding changes anticipated in the next 12 months, organized by country where primary research is focused. (Q21/Q6 n=40)

Survey respondents were asked to report if their research funding had stayed the same, increased, or decreased over the past 12 months. When organized by the country where the respondents primary research is focused there was a significant variance, with those whose research is focused in the United States and Canada reporting a decrease in funding more frequently and those in Other countries reporting an increase in funding more frequently.

Survey respondents were also asked to anticipate if their research funding will stay the same, increase, or decrease over the next 12 months. When organized by the country where the respondents primary research is focused there was also a significant variance, with those whose research is focused in the United States and Canada reporting confidence that their funding would remain the same more frequently than those in Other countries.

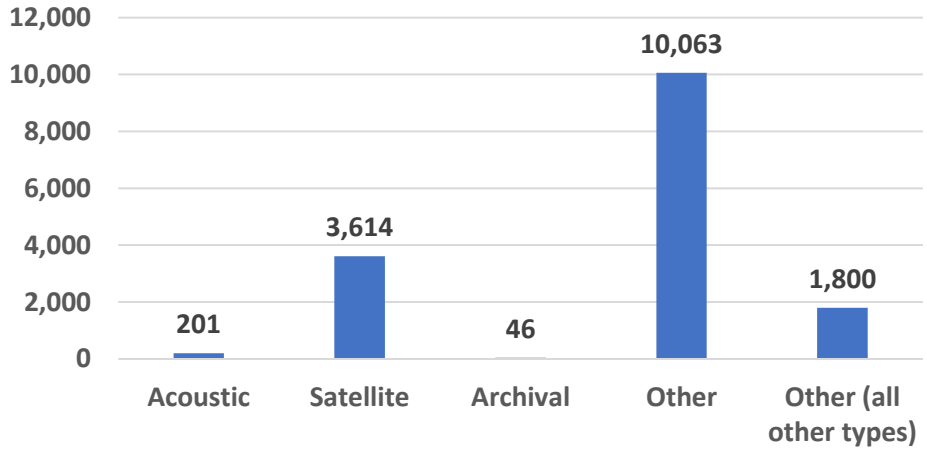


Figure 27: Average amount of electronic tags purchased by respondents' organization annually, organized by electronic tag type (Q15 n=32)

When asked approximately how many electronic tags the respondents' organization purchases annually there was a large variance between tag types. This variance is due in part to particularly large purchase patterns reported by a small number of survey respondents.

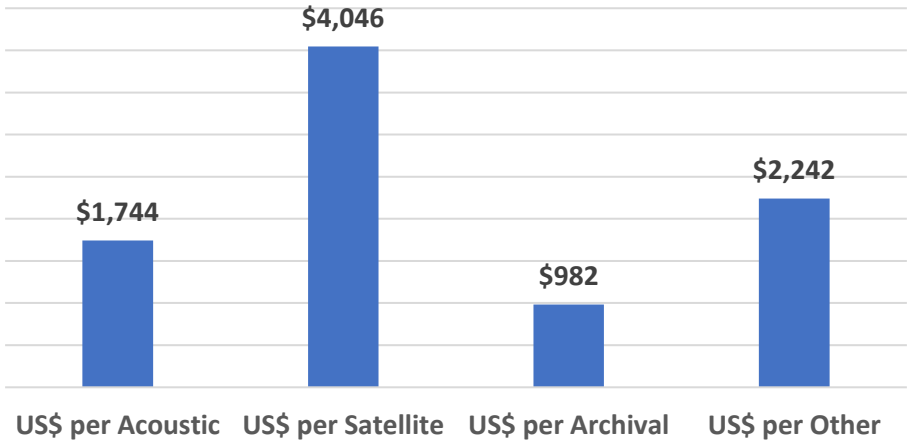


Figure 28: Average amount paid per electronic tags by respondents' organization, organized by electronic tag type (Q19 n=31)

When asked, on average, how much the respondents' organization pays per electronic tag there was also a large variance between tag types. Satellite tags were reported as the most expensive, with respondent organizations spending $4,046 per tag on average. Archival tags were reported as the least expensive, with respondent organizations spending $982 per tag on average.

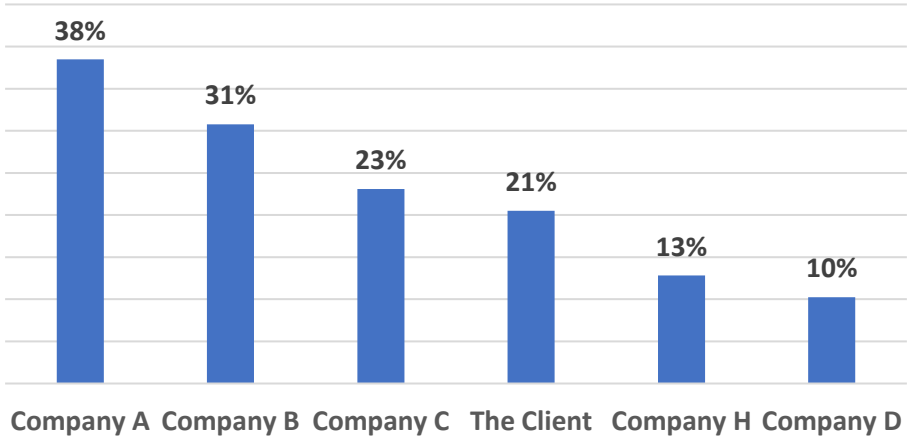


Figure 29: Manufacturers who supply electronic tags to respondents' organization, organized by frequency reported. (Q18 n=39)

Company A was the most frequently reported manufacturer to supply respondents' organizations with electronic tags, with 38% indicated use of their products. Company B, Company C, *The Client*, Company H, and Company D were the next five most frequently reported manufacturers. Thirty-five different manufacturers were reported among all respondents, with most respondents reporting more than one as a supplier.

Non-Data Tag Users

Potential Interest
(Q29, 30, 31, 32, 33, 34, 35, 36, 37, 38)

Survey respondents who reported that their organization did not currently have any electronic tags in use were asked to indicate why. Cost was the most frequently reported driver for non-use. Other respondents indicated electronic tags were not needed for their work. (Q35 n=5)

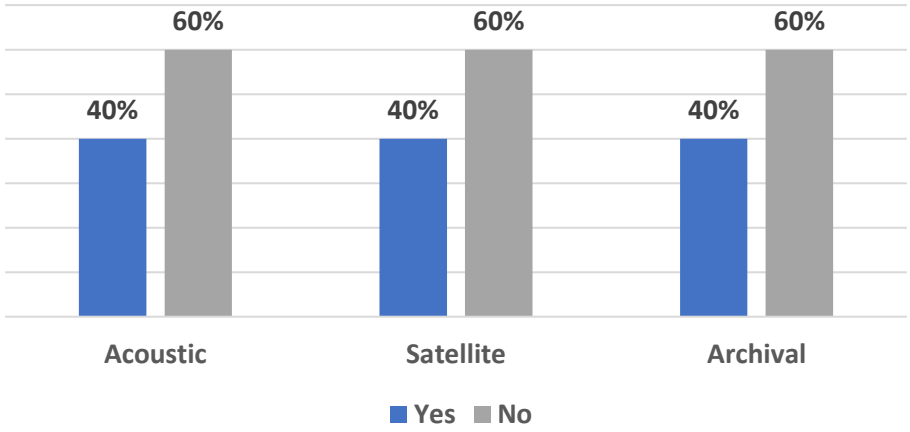


Figure 30: Organization interest in deploying electronic tags, organized by electronic tag type reported as not currently in use by respondent. (Q29/Q31/Q33 n=5)

Survey respondents who reported that their organization did not currently have any electronic tags in use were asked if their organization would be interested in deploying acoustic, satellite, or archival tags. There was no variance among the three tag types with 40% of non-tag users reporting that their organization would be interested in deploying each tag type and 60% reporting that they would not be interested.

Of those respondents who reported that their organization would be interested in deploying acoustic electronic tags; 'basic ecological research' and 'tracking movement of fish in/out of reservoirs' were indicated as the primary drivers. Of those respondents who reported that their organization would not be interested in deploying acoustic electronic tags; 'not very feasible given the wide spatial extent' and 'no animal research' were indicated as the primary drivers.

Of those respondents who reported that their organization would be interested in deploying satellite electronic tags; 'potentially higher possibility of data return' and 'basic ecological research' were indicated as the primary drivers. Of those respondents who reported that their organization would not be interested in deploying satellite electronic tags; cost was indicated as the primary driver.

Of those respondents who reported that their organization would be interested in deploying archival electronic tags; 'information that can potentially be used for determining movement routes' and 'basic ecological research' were indicated as the primary drivers. Of those respondents who reported that

their organization would not be interested in deploying archival electronic tags; 'don't know what they are' was indicated as the primary driver.

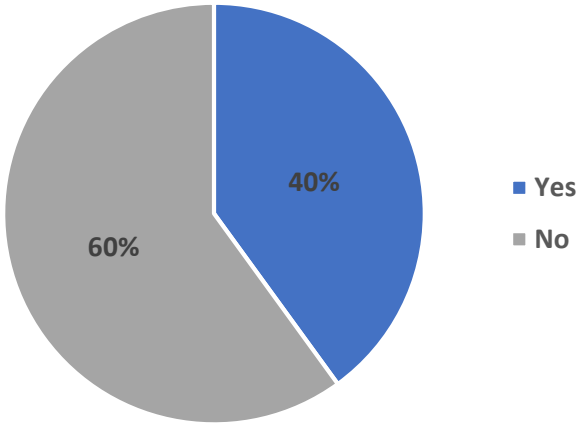


Figure 31: Organization plans to use electronic tags in the future, by respondents who reported their organization did not currently have any electronic tags in use. (Q36 n=5)

Of those respondents who indicated that their organization has plans to use electronic tags in the future; 1 respondent indicated interest in tagging fish and 1 respondent indicated interest in tagging aquatic crustaceans. (Q37 n=2)

When asked if there were any sensors or parameters that were not currently available in products for their application, but desired by the respondent, 'GPS positions, but this is feasible to collect under water in large spatial areas' and 'affordability' were reported. (Q38 n=2)

Conclusions

It is important that *The Client* approaches the US market with an understanding of the various sectors and the potential within each. Based on the survey results and competitor analysis research, two sectors have been identified as potential avenues for entrance to the US market. These sectors are government and education. In addition, advancing *The Client's* marketing strategies will also aid in entering the US and Canadian market.

Government

Respondents in the US and Canada within the government sector were split between marine science and fish/aquatic animal science, although most reported focusing their research on animal migration and behavior. General tag knowledge among these respondents was moderate to extensive, although they were slightly less confident when asked about tags individually. Roughly half of the government sector reported using acoustic tags, with archival being the next most popular tag. Satellite tag use was reported infrequently. PIT tags were identified by multiple respondents as currently in use. Company C was the most popular tag manufacturers in the government sector. Respondents who indicated that they currently have no electronic tags in use reported little interest in using them in the future. On the other hand, those who do currently use tags expressed interest in using new types. Respondents who do not currently use acoustic tags expressed some interest, with those who did not citing feasibility as their main barrier. Respondents who do not currently use satellite tags expressed some interest in anticipation of higher chances of collecting data, while those who did not mentioned cost as the primary barrier. Respondents who do not currently use archival tags expressed little interest, citing difficulty in retrieval and little knowledge on how they work.

Most of *The Client's* main competitors in the US and Canadian markets participate in selling to the US government. Company C, Company B, and Company F are all registered as approved vendors. Company A applied in April of 2018 and will likely be approved in the following months. Revenue from sales to the government among these competitors over the past twelve years has exceeded $35.5 million. In addition to identifying government revenue for each competitor, data on each awarded contract was identified and compiled.

A detailed report of government contract activity among competitors, along with a list of awarding agencies, is provided as a digital file, titled "*Government_Sector_Competitor_Activity.xls*".

Detailed recommendations for entering the government sector of the US and Canadian markets can be found in Recommendations.

Education

Respondents in the US and Canada that indicated they were in the education sector were primarily in the marine science sector and focused their research on animal migration and behavior with a smaller group reporting animal physiology. General tag knowledge among these respondents was moderate, with no significant variance among the different tag types. Most respondents reported using acoustic and archival tags, with a few reporting uses of satellite tags. PIT tags were identified by multiple respondents as currently in use. Company A was the most popular tag manufacturer among the education sector, with Company B, Company C, and *The Client* being next. Most respondents reported a combination of internal and external funding, with a large segment reporting exclusively external funding. All respondents indicated purchases being funded by a grant of some sort. Respondents who indicated that they currently use electronic tags expressed interest in using new types. All respondents who do not currently use acoustic tags reported that they would be interested in deploying them in the future. Most respondents who do not currently use satellite tags expressed interest in using them in the future, although funding was a main area of concern. All respondents who do not currently use archival tags expressed interest in using them in the future.

Detailed recommendations for entering the education sector of the US and Canadian markets can be found in Recommendations.

Marketing Strategies

Based on the information gathered during the competitor research, current competitors currently use platforms that include: social media, websites, blogs, and newsletters. Two of the seven identified competitors have an active presence on the social media platform, YouTube, through this platform they are able to share and promote videos of their products and their customers. A high quality and engaging video can be a highly effective value proposition and contribute to customer conversion and retention. In addition to YouTube, the majority of the competitors have a presence on Facebook which allows for the direct contact between the customer and company. According to a study conducted by the Pew Research Center, Facebook and YouTube are the most utilized social media platforms in the United States.[2] Unique content that is interesting and rich in detail can also improve the company's SEO, establish credibility, and engage the target audience.

Detailed recommendations for implementing different market strategies for the US and Canada can be found in Recommendations.

[2] http://www.pewinternet.org/2018/03/01/social-media-use-in-2018/

Recommendations

Based on the research and analysis, the team's recommendations for *The Client* are:

I. Enter the US market and primarily target the government sector;

a. Register as a government contractor and bid on federal contracts (see Appendix 5 "*Quick Start Guide for International Registrants*" for specific details on how to register as a government contractor)

b. Additional details of contracts that have been awarded to competitors can be found in the "*Government_Sector_Competitor_Activity.xls*" spreadsheet. This database is a great place to start in identifying a niche where *The Client* can compete for market share.

II. Enter the US market and target the higher education sector;

a. Participate in conferences and expos based in the US to increase exposure and engagement with students and faculty

   i. Potential conferences include:

      1. 2018 Ocean Sciences Meeting – February 11-16, 2018 in Portland, Oregon
      2. 6th International Conference on Marine Science – September 21-22, 2018 in Dallas, Texas

b. Explore implementing a student program, including possible scholarships or research initiatives

   i. Company A has a similar program, although arguably weak in terms of value to students and educators. Take advantage of this by offering a similar program, along with actual value to capture this demographic (i.e. discounts, scholarships, publishing opportunities, etc.)

III. Implement the following marketing strategies;

a. Promote new innovations through all platforms; blog, social media, advertising, etc.

b. Identify niche demographic profile and target across relevant platforms (website, social media, advertising, etc.)

   i. For example, a potential niche demographic would be scientists at universities and government agencies, targeted through advertising, grassroots marketing, and relationship building among agencies

c. Create an active blog to keep the website's activity high, which will lead to better search engine results.

   i. A blog is an effective platform for communicating your scientific research, product developments, and industry advancements to major stakeholders — and the public

   ii. An engaging, interactive blog can encourage collaboration and strengthen the scientific communities that are essential to fostering a positive image and perception of *The Client*

d. Create Instagram, YouTube, and LinkedIn accounts to stay ahead of the competition and reach a larger audience.

   i. Repost relevant material (i.e. when a university professor/student conducts new research)

The competitor analysis was developed for the use of *The Client* in further familiarizing you with your US and Canadian competitors. It was compiled using the resources available to the team, this included websites published by the competitors, social media platforms, Coastal Carolina University faculty and staff members, and the other team members. The competitor analysis meets all of the outlined objectives (please refer to Objectives).

Company A

Company A, located in XX, was established in XX and is currently a leader in the design and manufacturing of acoustic telemetry equipment. Company A equipment is used to conduct world-class studies in lakes, rivers and oceans that require real-time active tracking, whether that be long-term, large scale passive monitoring or fine scale positioning with detailed accuracy. The technology was developed in a university research laboratory and the products include various types and sizes.

Company A currently interacts with their customer base through Twitter and various newsletters. Company A has XX followers, XX likes and XX tweets on their Twitter account. They tweet about their new developments and research articles. They also retweet their customer posts that are using their products. This is an active social media account.

Company A offers; X tags, which are used to track the subject animals; acoustic X tags, which are used to measure acceleration, temperature and depth; and X tags which are meant to be followed by boat and as such have a shorter lifespan. Included are charts comparing the X tags offered by Company A.

The X Tags can transmit 3D acceleration of the tagged fish, the tag also has the ability to transmit depth data. The X and X tags can be used in a variety of ways but are commonly used to measure swimming speed via tail beat acceleration, detecting mortality through predation, seismic blasting, toxic spills, feeding events, spawning activity, nocturnal/diurnal activity, wave action and activity responses to changed oxygen, and salinity and temperature in the environment of the study subject.

Type of Tag:	Product X	Product X	Product X	Product X
Sensors	X	X	X	X
Depth sensor range	X	X	X	X
Depth sensor resolution	X	X	X	X
Depth sensor accuracy	X	X	X	X
Acceleration sensor range	X			
Length (mm)	X	X	X	X
Weight in air (g)	X	X	X	X
Weight in water (g)	X	X	X	X
Maximum deployment length	X			

*** indicates the specification is dependent upon the configuration model

Company A temperature and depth tags (XX to XX) can be highly customized, with different temperature ranges, depth ranges and battery type. Depending on the battery size, the tag will last between one month and several years, they can also give a transmission range of over several hundred feet. These tags are implantable in the study subject.

Competitor Analysis

Company B

Company B was founded in XX and has been one of the leading providers of advanced wildlife telemetry solutions for the past XX years. They are a XX owned business based in XX. Their tags can be used to study a variety of marine animals, including penguins, turtles, cetaceans, and large fish. Company B prides itself on their extensive product range, which include over XX shapes and technology combinations, and their online data solutions, such as the *Company B Data Portal*. Their portal captures, decodes and stores data online, supports automatic data retrieval by government mandated data management systems, and provides an intuitive interface to review data anywhere/anytime there is internet access. Company B has XX partnering organizations and have active projects in XX different countries.

On a social media aspect, Company B has a presence on two of the three major social media platforms; Facebook and Twitter. While their Twitter appears to be relatively new, they still post frequently and are stimulating a following. Company B currently has XX likes on Facebook and posts frequently about their staff and scientific articles that they are related to their area of research. They also have a newsletter that keeps their customers informed on new developments.

Company B has X different XX tags, they are the Product X, Product X and the Product X. The Product X tags are a sophisticated combination of X and X technology and are designed to track large-scale movements and behavior of fish and other animals which do not spend enough time at the surface to allow the use of real-time X tags. The data in Product X tags are stored in their onboard memory and, after it is released from its host animal, it uploads a summary of the data to satellites.

Type of Tag	Product X	Product X	Product X
Attachment Type	X	X	X
Sensors	X	X	X
Depth sensor range	X	X	X
Depth sensor resolution	X	X	X
Depth sensor accuracy	X	X	X
Temperature sensor range	X	X	X
Temperature sensor resolution	X	X	X
Temperature sensor accuracy	X	X	X
Tilt sensor range	X	X	X
Tilt sensor resolution	X	X	X
Light sensor (when installed)	X	X	X
Wet/dry sensor	X	X	X
Length (mm)	X	X	X
Diameter (mm)	X	X	X
Weight (g)	X	X	X
Pressure rating (m)	X	X	X

Operating temperature range (C)	X	X	X
Recommended Storage temperature range	X	X	X
Memory	X	X	X
Maximum deployment length	X	X	X

The X tags are flexible data-archiving instruments, with the X tag being the most cost effective archival tag. The data for these tags must be physically recovered to retrieve the data.

Type of Tag:	Product X	Product X
Attachment Type	X	X
Sensors	X	X
Depth sensor range	X	X
Depth sensor resolution	X	X
Depth sensor accuracy	X	X
Temperature sensor range	X	X
Temperature sensor resolution	X	X
Temperature sensor accuracy	X	X
Light sensor (when installed)	X	X
3D Accelerometer range	X	X
3D Accelerometer resolution	X	X
3D Magnetometer range	X	X
3D Magnetometer resolution	X	X
Speed sensor range	X	X
Speed sensor resolution	X	X
Stomach temperature range	X	X
Stomach temperature resolution	X	X
Stomach temperature accuracy	X	X
Maximum sampling rate	X	X
Wet/dry sensor	X	X
Length (mm)	X	X
Diameter (mm)	X	X
Weight (g)	X	X
Pressure rating (m)	X	X
Operating temperature range (C)	X	X
Recommended Storage temperature range	X	X
Memory	X	X
Maximum deployment length	X	X

*** indicates the specification is dependent upon the configuration model

Company B also offers customizable tags depending on the needs of the customer.

Company C

Company C was founded in XX on a tradition of excellence in the development of fish and wildlife monitoring systems for many years. Devices designed by Company C allow researchers to track animals, birds and fish of almost any size, in almost any environment. Currently, Company C has partners conducting research in more than XX countries – on every continent and in every ocean. Company C is committed to providing innovative solutions for a sustainable future. In addition to their products, Company C provides environmental consulting services to assist clients with system selection, research design and implementation, equipment training and data analysis.

Company C holds four social media accounts, Facebook, Twitter, YouTube and LinkedIn. The company's LinkedIn has XX followers. On their Facebook page, they post content about once a week and have XX users that liked their page. Their Twitter account has a smaller following of about XX followers. This may be due to infrequent posting on this platform. Their activity on Twitter is inconsistent with their Facebook postings.

The Product X Series allows users to gain valuable insights into the life cycle of the species that they are studying. They are compact and reliable tags used to collect and store time, temperature and depth data.

Type of Tag	Product X	Product X	Product X	Product X	Product X	Product X
Attachment Type	X					
Sensors	X		X		X	
Temperature sensor range	X					
Temperature sensor resolution	X					
Temperature sensor accuracy	X					
Wet/dry sensor	X					
Dimensions (mm)	X	X	X	X	X	X
Weight (g)	X	X	X	X	X	X
Pressure rating (m)	X			X		
Memory	X	X	X	X	X	X
Maximum deployment length	X			X		

*** indicates the specification is dependent upon the configuration model

Company C also offers the Product X series, which are X tags. The hydrodynamic design of the tag provides superior stability and causes less drag, which causes other tags to detach from the study animal too soon. The Product X has two standard models, the X and the X, and one custom programmed model, the X. The X and the X provide users with position estimates and daily summary data that includes temperature, SST, and depth. The X is designed for short-term post release survivorship studies and the X can be configured for short or long-term studies.

Type of Tag	Product X	Product X	Product X
Attachment Type	X		
Sensors	X		
Temperature sensor range	X		
Temperature sensor resolution	X		
Temperature sensor accuracy	X		
Depth sensor options	X		
Depth resolution	X		
Depth accuracy	X		
Wet/dry sensor	X		
Dimensions (mm)	X		
Weight in air(g)	X		
Buoyancy	X		
Memory	X		
Maximum deployment length	X	X	X

*** indicates the specification is dependent upon the configuration model

The other two tags that have been added to their collection include the Product X series and the Product X series. The Product X series is used for the collection and storage of precision time stamped depth, temperature and light-based geolocation data. This series allows the user to: track migration/movement of the tagged animal; conduct behavior identification and characterization studies, such as feeding, spawning, and migration; and conduct ocean observation studies.

Type of Tag	Product X	Product X
Attachment Type	X	
Sensors	X	X
Temperature sensor range	X	X
Temperature sensor resolution	X	X
Temperature sensor accuracy	X	X
Depth sensor options	X	X
Depth resolution	X	X
Depth accuracy	X	X
Light sensor	X	X
Wet/dry sensor	X	X
Dimensions (mm)	X	X
Weight in air(g)	X	X
Weight in water	X	X
Operating temperature range (C)	X	X
Memory	X	X
Maximum deployment length	X	X

The Product X series was built of the success of Company C's Product X series. The Product X series are X tags for marine animals. The series offers increased data recording capabilities and has a more

compact design. These tags are ideal for users seeking reliable long-term life-cycle-related data for fish or avian species.

Type of Tag	X	X	X	X	X	X	X
Attachment Type	X						
Sensors	X		X		X		X
Temperature sensor range	X						
Temperature sensor resolution	X						
Temperature sensor accuracy	X						
Pressure accuracy	X						
Pressure resolution	X						
Wet/dry sensor	X						
Dimensions (mm)	X	X	X	X	X	X	X
Weight (g)	X	X	X	X	X	X	X
Pressure rating (m)	X			X			
Memory	X			X			
Minimum life	X	X	X	X	X	X	

* at the sampling interval of every 10 seconds
** at the sampling interval of every 5 seconds
*** indicates the specification is dependent upon the configuration model

Company D

Company D was founded in XX and is based in the XX. Company D is a world leader in marine science and technology, providing innovative solutions for the aquatic environment, biodiversity and food security. Over the past XX, Company D has evolved from a small fisheries laboratory in XX, founded in XX, to the international organization it is today. Now, XX is the Headquarters of Company D.

Company D is only on one social media platform, Twitter. They have a following of X users and post about 1-3 times a month on their page. Their website also offers a newsletter to keep subscribers up to date, however, they have not sent out a new one since September of 2017.

Below is a Statement of Cash Flows for the company indicating their financial standings.

	Note	2016-17 £'000	£'000	2015-16 £'000 (Restated)	£'000 (Restated)
Cash flows from operating activities					
Net expenditure			(21,525)		(21,463)
Adjustments for non-cash transactions					
Depreciation charge	7	2,120		2,045	
Amortisation	8	0		23	
Impairment	9	117		1,674	
Auditor's remuneration	4	45		46	
Facilities management contract		4,266		4,220	
Defra Estates Recharges		1,773		0	
Defra management charges		249		200	
Loss on disposal	4	18		93	
			8,588		8,301
Decrease/(Increase) in receivables		743		1,295	
(Decrease)/Increase in payables		291		(1,454)	
(Decrease)/Increase in provisions		(202)		265	
			832		106
Net cash inflow/outflow from operating activities			**(12,105)**		**(13,056)**
Cash flows from investing activities					
Purchase of property, plant and equipment		(3,182)		(1,433)	
Proceeds of disposal of property, plant and equipment		24		0	
Net cash flow from investing activities			**(3,158)**		**(1,433)**
Cash flows from financing activities					
Excess cash funding repaid to Defra			0		(7,600)
Defra Funding			17,700		22,252
Net financing			**17,700**		**14,652**
Net increase / (decrease) in cash and cash equivalents in the year			**2,437**		**163**

The Product X is one of the smallest and lightest data loggers. It has been upgraded since its original release in X, with its light weight and ultra-small size, it helps ensure that the tagged fish or birds act as naturally as possible.

Type of Tag	Product X			Product X	
Sensors	X				
Temperature sensor range	X				
Temperature sensor resolution	X				
Temperature sensor accuracy	X				
Depth sensors	X				
Depth sensor resolution	X	X	X	X	X
	X	X	X	X	X
Depth sensor accuracy	X				
Wet/dry sensor	X				
Dimensions (mm)	X			X	
Weight in air (g)	X			X	
Weight in water	X			X	
Operating temperature range (C)	X				
Memory	X			X	X

The Product X delivers high performance while maintaining the data loggers programming flexibility. All sensors can be independently programmed to suit the researcher's specific needs.

Type of Tag: Product X				
Sensors	X			
Depth sensors	X			
Depth sensor resolution (at 12 bit setting)	X	X	X	
	X	X	X	
Depth sensor accuracy	X			
Temperature sensor range	X			
Temperature sensor resolution	X			
Temperature sensor accuracy	X			
Accelerometer Range (user selectable) and Resolution at 12 bit Setting	X	X	X	X
	X	X	X	X
Accelerometer Rate	X			
Wet/dry sensor	X			
Dimensions (length x width x height)	X			
Weight in air (g)	X			
Weight in water (g)	X			
Operating temperature range (C)	X			
Memory	X			
Example Logging Duration**	X			

** under normal operating conditions and single memory fill. Multiple deployments may significantly affect the tag life
*** indicates the specification is dependent upon the configuration model

The Product X is a combination of the X tag and the X tag; a user-programmable release mechanism. The user can program the unit to separate itself from the animal on a set data and it does not affect the logging capability.

Type of Tag	Product X			
Attachment Type	X			
Sensors	X			
Temperature sensor range	X			
Temperature sensor resolution	X			
Temperature sensor accuracy	X			
Depth sensors	X			
Depth sensor resolution	X	X	X	X
	X	X	X	X
Depth sensor accuracy	X			
Wet/dry sensor	X			
Dimensions (mm)	X			
Weight in air (g)	X			
Weight in water	X			
Operating temperature range (C)	X			
Memory	X			
Typical Logging Rates* *Logging both temperature and pressure*	X		X	
	X		X	
	X		X	
	X		X	
Battery Life	X			

* under normal operating conditions and based on logging continuously
** logging at 10Hz unconditional fast-logging rate. Tags must have X feature activated to achieve this rate
*** indicates the specification is dependent upon the configuration model
**** limited by battery life expectancy

Company E

Company E was founded by a biologging researcher in XX and their headquarters is located in XX. They combined X technologies with research experiences that were gained through long practical uses in the field experiments. Company E develops and produces many different electronic tags, including custom-made tags designed for the specific researchers' needs.

Company E does not have a presence on any social media platforms and only informs their customer base through their blog, located on their website.

The X tags that this company sells are called X and X tags. These tags can be customized depending on the customer need. Below are the basic specifications of the tags:

Type of Tag	Product X	Product X
Sensors	X	
Temperature sensor range	X	
Temperature sensor resolution	X	X
Temperature sensor accuracy	X	
Depth sensor	X	
Depth sensor accuracy	X	
Depth sensor resolution	X	
Light sensor	X	
Accelerometer sensor range	X	
Accelerometer sensor resolution	X	
Gyroscope sensor range	X	X
Magnetometer sensitivity	X	X
Magnetometer sensor range	X	X
Dimensions (mm)	X	X
Weight in air (g)	X	X
Weight in water (g)	X	X
Operating temperature range (C)	X	
Memory	X	
Battery life (Basic model)	X	X

*** indicates the specification is dependent upon the configuration model

Company F

Company F was created in XX as XX and renamed Company F in XX. Company F is headquartered in XX and have distributors in Ecuador, France, Japan, New Zealand & Australia, Norway, Portugal, Spain, and Vietnam. Company F designs miniature submersible archival tags that can be used in fisheries and biological research. The tags that they develop give researchers the opportunity to gather information over long periods of time, in environments that may be difficult to reach otherwise. One of the company's newest tag series is the Product X, which offer temperature and depth with RF communication. Company F is most well known for their device called the Product X.

Company F has two social media platforms but do not generate much traffic on either. On Facebook, they have X likes and do not post often. They also have a Twitter page with a following of X users where they seem to post more frequently than they do on Facebook. Company F keeps their website updated, including blog posts and tour dates for consumers.

The Product X from Company F is one of the X data loggers on the market and are advertised as such. The X tag has three different versions, the X, X, and X. They are tested up to Xm and can be marked with a custom logo and reward message for easy retrieval. They are completely submersible and waterproof.

Type of Tag	Product X	Product X	Product X
Price	X	X	X
Sensors	X		
Temperature sensor range	X	X	X
Temperature sensor resolution	X	X	X
Temperature sensor accuracy	X	X	X
Dimensions (mm)	X		
Weight (g)	X		
Memory (Values)	X	X	X

Company G

Company G, established in XX, is a XX manufacturer of innovative scientific research tools, mainly compact-sized, reliable data loggers for marine animal behavioral, position and environmental studies. They are located in XX and their products include submersible, multiple sensors loggers. These loggers have sensors such as depth (pressure), swim speed, temperature, acceleration in 3D, salinity (conductivity), movie and magnetic field strength. The products are used for a wide range of wild animal species such as fishes, birds, turtles, seals and whales.
Company G's online presence is limited in nature. Company G does have an XX website but does not have any known social media platforms and does not include many updates about the company through their website.

The Product X and Product X tags created by Company G are used to provide behavioral information and positions of animals such as birds, dolphins, seals, and penguins. The Product X has the added feature of being able to track these animals and therefore provide the positions of the animals as well. The Product X tag is best used for providing environmental and behavioral data for he tagged animal. It is most used to investigate physiology in relation to migration behavior.

Type of Tag	Product X	Product X	Product X
Sensors	X	X	X
Depth sensor range	X	X	X
Depth sensor resolution	X	X	X
Acceleration sensor range	X	X	X
Acceleration sensor resolution	X	X	X
GPS sensor accuracy	X	X	X
Temperature sensor range	X	X	X
Temperature sensor resolution	X	X	X
Speed sensor range	X	X	X
Speed sensor resolution	X	X	X
Salinity sensor range	X	X	X
Salinity sensor resolution	X	X	X
Dimensions (mm)	X	X	X
Weight (g) in air	X	X	X
Weight (g) in water	X	X	X
Memory	X	X	X
Recording duration	X	X	X

Company G's Product X and Product X are used to study kinematics, biomechanics and migration, searching and foraging behavior of the animal, usually small fishes and birds, that is being tags. The tags are reusable, compact and self-contained, with a depth trigger and programmable start time.

Type of Tag	
Sensors	X
Temperature sensor range	X
Temperature sensor resolution	X
Depth sensor range	X
Depth sensor resolution	X
Acceleration sensor range	X
Acceleration sensor resolution	X
Speed sensor range	X
Speed sensor resolution	X
Magnetic sensor range	X
Magnetic sensor resolution	X
Dimensions (mm)	X
Weight (g) in air	X
Memory	X
Recording duration	X

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MATHEMATICAL MODELS FOR A SPACE ALLOCATION PROBLEM

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ABSTRACT

In this paper, the space allocation problem (SAP) is defined as the task of assigning groups of items (or products) to storage locations for predefined periods, without exceeding the capacities of the locations, such that the total distance items travel is minimized. The total travel distance of an item is the sum of the distances the item travels from its origin (source) location to an assigned storage location and from an assigned storage location to its destination location. First, an efficient mathematical model is presented for the SAP. Then, the problem is modeled as a transportation problem with additional side constraints. Also, a small problem instance is presented and solved using both models.

INTRODUCTION

In this paper, the space allocation problem (SAP) is defined as the task of assigning groups of items (or products) to storage locations for predefined periods, without exceeding the capacities of the locations, such that the total distance items travel is minimized. The total travel distance of an item is the sum of the distances the item travels from its origin (source) location to an assigned storage location and from an assigned storage location to its destination location. During the planning horizon, different groups of items can be assigned to the same storage location either at different time periods or at the same time period, if the capacity of the location is not exceeded. Therefore, the SAP uses a shared storage policy as opposed to a dedicated storage policy (**Goetschalkx and Ratliff, 1990**). As a result of the above assumption, a group of items can be assigned to multiple storage locations (e.g., capacity of a storage location is not large enough to hold all items). Last, while in storage, a group of items assigned to a storage location in one period cannot be reassigned to a different storage location in another period (i.e., no reallocations).

This research was motivated by the problem of assigning groups of items to storage areas outside a reactor containment building (RCB) during planned outages at an electric power plant. More specifically, before performing outage activities (e.g., maintenance, preventative maintenance, surveillance, etc.) within the RCB, resources (e.g., equipment, materials, toolboxes, etc.) required to perform outage activities are moved from origin locations to assigned storage areas outside the RCB until they are moved to destination locations within the RCB at or near the locations (workspaces) where the resources are used to perform outage activities. In this paper, this problem is defined as the SAP. However, the problem of assigning activities and their required resources to workspaces and idle resources to storage locations is called the dynamic space allocation problem and is considered in **McKendall et al. (2005)**, **McKendall and Jaramillo (2006)**, **McKendall (2008)**. As a result, for each item group the origin (source) and destination locations as well as the beginning and ending storage times are known. Last, each item group is assigned to storage for at least two or more periods.

To the best of our knowledge, the SAP presented in this paper was first presented in **Kim and Park (2003)**. The authors first considered the SAP where products are assigned to storage locations within a manufacturing environment. They formulated the problem as a minimum cost multi-commodity flow problem with integrality restrictions on the flows. Then they used Lagrangean relaxation and a subgradient optimization method to solve the SAP. The proposed methods were adapted to the SAP where reallocations are allowed. **Kim and Park (2003)** mentioned two other applications of the SAP. The problem of assigning transshipment cargo (from a vessel) to storage locations in either a warehouse or a marshalling yard for a

period of time and then loaded onto another vessel. Similarly, the problem of assigning containers to storage locations in a container yard is another application that was mentioned.

The contributions of this paper are as follow.

1) To present a new application of the SAP (i.e., the problem of assigning resources to storage locations during planned outages at an electric power plant).
2) To present new mathematical programming formulations for the SAP. More specifically, the first formulation is a direct formulation of the SAP, and the second formulation is a transportation model with additional constraints. Both are linear programming models, instead of a more complex minimum cost multi-commodity flow problem with integer restriction on the variables, as given in the literature.

The SAP problem presented here is related to the dynamic generalized assignment problem (DGAP) presented in **Moccia et al. (2009),** which has applications in the management of items at warehouses or storage yards. The main differences between SAP and DGAP are as follows.

1) In the DGAP, a group of items cannot be divided between different storage areas as in the SAP.
2) In the DGAP, items assigned to storage locations can be reassigned to different storage locations. That is, reallocation is allowed, but is limited, as opposed to no reallocations as in the proposed SAP.

Moccia et al. (2009) note that fragile items or hazardous materials tend not to be reallocated. Also, **Zhang et al. (2003)** discuss reducing re-handling efforts in an environment with high space utilization. For these reasons, the SAP in this paper does not allow for reallocations of items while in storage, as mentioned earlier. The DGAP and SAP with reallocations are equivalent problems only in the special case where all groups of items are unit-sized (**Moccia et al., 2009**). See **Ang et al. (2012)** for a storage assignment problem in unit-load warehouses.

The SAP is a very popular and widely studied problem for assigning items to storage locations. Besides minimizing the total distance items travel, other objectives have been considered in the literature. For example, **Bazzazi et al. (2009)** considered a SAP which temporarily assign inbound/outbound containers to storage blocks at each time period with the aim of balancing the workload between storage blocks in order to minimize the storage/retrieval times of containers. Also in the container terminal literature, **Lin and Chiang (2017)** considered a SAP with the objective of minimizing the potential number of gantry movements during the storage assigning process and the retrieval process. Furthermore, there are several papers in the literature which considers the SAP as a sub-problem to an integrated problem. For example, **Zhang et al. (2003)** considered a two-stage SAP in the storage yards of terminals. The mathematical model for the first stage determines the total number of containers to be assigned to each storage block to balance the number of containers to be handled among blocks in each period. The model for the second stage allocate the numbers of containers of each vessel to the storage blocks in each period to minimize the total distance traveled by the material handling equipment (i.e., trucks). **Tang et al. (2016)** considered an integrated SAP and ship scheduling problem in bulk cargo terminals.

The paper is organized as follows. Next, an efficient mathematical model is presented for the SAP. Afterwards, a small SAP instance is presented and solved using the model. Following, a transportation model is presented and used to solve the small SAP instance. Then, concluding remarks are given.

THE SPACE ALLOCATION PROBLEM

The SAP is defined as the problem of assigning groups of items to storage locations for pre-defined periods over a multi-period planning horizon such that storage location capacities are not violated, and the sum of the distances the items travel is minimized. The total travel distance of an item is the sum of the distances the item travels from its origin (source) location to an assigned storage location and from an assigned storage location to its destination location.

The assumptions of the SAP are as follows.

1) A shared storage policy is used for assigning groups of items to storage locations. That is, during the planning horizon, different groups of items can be assigned to the same storage location either at different time periods or at the same time period, if the capacity of the location is not exceeded.
2) A group of items can be assigned to multiple storage locations (e.g., capacity of a storage location is not large enough to assign all items).
3) A group of items assigned to storage location(s) cannot be reassigned to different storage location(s) during its stay in storage (i.e., no reallocations).
4) For each item group, the units of storage space required for storing, the origin (source) and destination locations as well as the beginning and ending storage times are known.
5) The distances between origin/destination locations and storage locations are known.
6) Each item group is assigned to storage for at least two or more periods. It is important to note that this assumption may be relaxed as discussed below, when presenting the constraints for this assumption.
7) The objective is to minimize the total distance the items travel during a multi-period planning horizon.

Next, the notation and the mathematical model are presented for the SAP.

Notation

First, the notation for the data and the decision variables are presented as follows.

j the item group index where $j = 1, \ldots, J$;
l the storage location index where $l = 1, \ldots, L$;
t the time index where $t = 0, \ldots, T$;
p the origin or destination location index where $p = 1, \ldots, P$;
s_j the origin (or source) location of item group j;
d_j the destination location of item group j;
b_j the start (or beginning) storage time of item group j;
e_j the ending storage time of item group j;
r_j the units of space required for storing item group j;
C_l the capacity of storage location l;
$Dist_{pl}$ the distance between origin/destination location p and storage location l;

The decision variables are as follows.

x_{jlt} the amount of group item j assigned to storage location l at time t;

Mathematical Model

Next, a mathematical model is presented for the SAP.

$$\text{Minimize } z = \sum_{j=1}^{J} \sum_{l=1}^{L} \left(Dist_{s_j l} x_{jlb_j} + Dist_{d_j l} x_{jle_j} \right) \quad (1)$$

$$\text{s.t.} \quad \sum_{l=1}^{L} x_{jlt} = r_j \qquad \forall j, t = b_j, \ldots, e_j \quad (2)$$

$$\sum_{j=1}^{J} x_{jlt} \leq C_l \qquad \forall l, t \quad (3)$$

$$x_{jlt} = x_{jl(t+1)} \qquad \forall j, l, t = b_j, \ldots, e_j - 1 \quad (4)$$

$$x_{jlt} \geq 0 \qquad \forall j, l, t = b_j, \cdots, e_j \quad (5)$$

Objective function (1) minimizes the sum of the travel distances of the groups of items from their origin locations to their assigned storage locations and from the assigned storage locations to their destination locations. Constraints (2) ensure that the total amount of storage space required for each group of items (for

instance item group j) is assigned to storage during its storage time (between time b_j and e_j). Constraints (3) ensure that the space capacity of each location is not exceeded in each period. Constraints (4) are used to ensure that each group of items are assigned to the same storage location(s) during their storage time (i.e., no reallocations). Recall, assumption (6) given above. Each item group is assigned to storage for at least two or more periods. This assumption can be relaxed if necessary. More specifically, if an item group is assigned to storage for only one period, this constraint should not be used for that item group. In (5) the restrictions on the decision variables are given. Notice the decision variables are not restricted to integers, since the constraint matrix in this model has the same structure as the constraint matrix for a transportation model with additional variables. This will be discussed further in the next section. As a result, the above SAP formulation is a linear programming (LP) model. This is a major advantage over the integer linear programming model presented in the literature (i.e., minimum cost multi-commodity flow problem with integer restriction on the variables). Therefore, we are able to solve large-size problems optimally and quickly. Next, a SAP instance is solved using the proposed LP model and the commercial solver CPLEX.

A SAP Instance

Consider a SAP instance with 3 groups of items (J = 3), 3 locations (L = 3), 5 origin/destination locations (P = 5), and 4 time periods (T = 4) in the planning horizon. The data for the groups of items are given in **Table 1** below. For example, items of group 3 (j = 3) requires 30 units of storage space (r_3 = 30) between time 1 and 4 (b_3 = 1 and e_3 = 4). More specifically, items of group 3 are moved from origin (or source) location 3 (s_3 = 3) to a storage location(s) at time 1 (b_3 = 1). The items will remain in storage until time 4 (e_3 = 4). Afterwards, it is moved from storage to its destination location 5 (d_3 = 5). The data for the locations are given in **Table 2** below. First, the distances between the origin/destination locations and the storage locations are given. For example, the distance between origin (or source) location 3 (p = 3) and storage location 1 (l = 1) is 5 distance units ($Dist_{31}$ = 5), and the distance between storage location 1 (l = 1) and destination location 5 (p = 5) is 7 distance units ($Dist_{51}$ = 7). Also, the capacities of storage locations 1, 2, and 3 are 40, 40, and 30 units of space, respectively. That is, C_l = (40, 40, 30).

Item Group (j)	Origin Location (s_j)	Destination Location (d_j)	Start Time of Storage (b_j)	End Time of Storage (e_j)	Number of Space Units (r_j)
1	1	3	0	2	35
2	2	4	1	3	20
3	3	5	1	4	30

Table 1. Data for the groups of items.

		Storage		
		1	2	3
	1	20	5	10
	2	15	7	12
$Dist_{pl}$ =	3	5	12	17
	4	7	10	12
	5	7	15	17
	C_l	40	40	30

Table 2. Data for the locations.

Using the input data in Tables 1 and 2 and the LP model presented above, which consists of objective function (1) subject to constraints (2) – (5), the optimal solution is obtained for the SAP instance using CPLEX 11.0 commercial solver. The nonzero values of the decision variables are $x_{120} = x_{121} = x_{122} = 35$, $x_{211} = x_{212} = x_{213} = 10$, $x_{221} = x_{222} = x_{223} = x_{231} = x_{232} = x_{233} = 5$, $x_{311} = x_{312} = x_{313} = x_{314} = 30$, and the objective function value (OFV) is 1380 (OFV = z = 1380). The optimal solution (i.e., the assignment of item groups to storage locations) is represented graphically in **Figure 1** below. Time is represented on the horizontal axis. The 3 storage locations are represented on the vertical axis. Consider item group 3 where the notation 3 (3, 5, 30) in the graph (i.e., item group # (origin #, destination #, # units of item)) indicates that all 30 items in item group 3, with origin location 3 and destination location 5, is assigned to storage location 1 between time 1 and 4. Notice 10, 5, and 5 units of item group 2 are assigned to storage location l, 2, and 3, respectively, between time 1 and 3. Notice the demand of storage space is high (i.e., capacity tightness is high) between time 1 and 2. In other words, between time 1 and 2, all 40 units of capacity in storage locations 1 and 2 are used up, and only 5 units of storage location 3 is used. Capacity tightness, for a time period, is defined as the sum of the units of items required for storage during a period divided by the sum of the total units of storage available. Therefore, capacity tightness for the time period between time 1 and 2 is 0.77 (i.e., capacity tightness = $(r_1 + r_2 + r_3)/(C_1 + C_2 + C_3)$ = (35 + 20 + 30)/(40 + 40 + 30) = 0.77). However, the capacity tightness for time periods between time 0 and 1 and between time 3 and 4 are 0.32 and 0.27, respectively, which is low. Nevertheless, the total distance items travel is 1380 distance units (z = 1380).

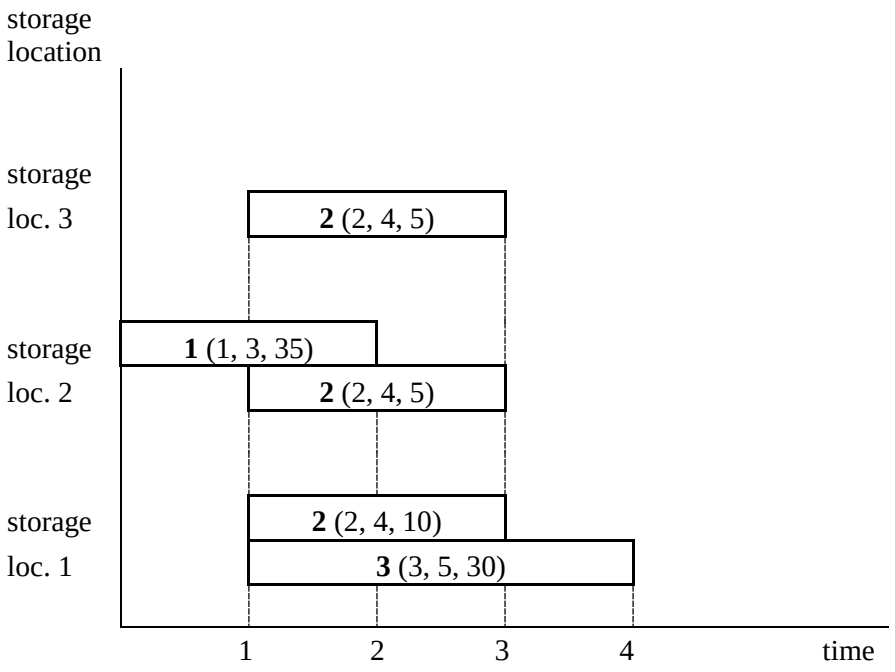

Figure 1. Display of optimal solution graphically.

Notice in objective function (1) above, the total distance a group of items j travel is the sum of the distances the items travel from its origin location (s_j) to its assigned storage location(s) and from its assigned storage location(s) to its destination location (d_j). For example, consider item group 1 in the SAP instance above. See **Tables 1 and 2**. The total distance items in item group 1 travel is the distance the 35 units (recall $x_{120} = x_{121} = x_{122} = 35$) travel from origin location $s_1 = 1$ to storage location 2 ($Dist_{12} = 5$ distance units) and from storage location 2 to destination location $d_1 = 3$ ($Dist_{32} = 12$ distance units). The total distance (per unit) item group 1 travels is 17 distance units. Hence, the total distance the 35 items travel is 35(12 + 5) = 595 distance units. Similarly, the total distances items of item groups 2 and 3 travel are 425 and 360 distance

units, respectively, which gives a total of 1380 distance units (recall $z = 1380$). More importantly, objective function (1) can be simplified by calculating the distances (beforehand) the items travel (per unit) if assigned to each storage location. As discussed above, if item group 1 is assigned to storage location 2, then the total distance travel per unit is 17 distance units. Similarly, if item group 1 is assigned to storage location 1, the total distance travel per unit is 25 ($Dist_{11} + Dist_{31} = 20 + 5$) distance units. Use the formula below to calculate the travel distance (per unit) of assigning each item group to each storage location.

$$Dist2_{jl} = Dist_{(s_j)l} + Dist_{(d_j)l} \quad (6)$$

See **Table 3** below for the travel distance (per unit) of assigning item groups to storage locations. As a result, the following objective function can replace objective function (1), which makes the formulation for the SAP even more efficient.

$$\text{Minimize } z = \sum_{j=1}^{J} \sum_{l=1}^{L} Dist2_{jl} x_{jlb_j} \quad (7)$$

Using the distance matrix in **Table 3** has two advantages. Besides simplifying the objective function as discussed above, the SAP can now be modeled as a transportation problem with additional side constraints. See next section for details.

$Dist2_{jl}$ =		1	2	3
	1	25	17	27
	2	22	17	24
	3	12	27	34
	C_l	40	40	30

Table 3. Travel distance (per unit) of assigning item groups to storage locations and storage capacities.

A TRANSPORTATION MODEL FOR THE SAP

Recall, **Kim and Park (2003)** formulated the SAP as a minimum cost multi-commodity flow problem with integrality restrictions on the flows, and used Lagrangean relaxation and a subgradient optimization technique to solve the SAP. Below, the SAP is modeled as a transportation problem with side constraints. See **Figure 2** below for the corresponding transportation network model. Using the notation defined earlier, the supply nodes represent each storage location l in each period t, represented on node as (l, t), with its storage capacity (C_l) preceding the node. The demand nodes represent each item j in each period t, represented on node as (j, t), with the amount of storage space required for item (r_j) succeeding the node. It is important to note that the demand nodes should only consider the time each item is assigned to storage. For example, consider item group 1 in the SAP instance presented earlier in **Tables 1 and 2**. The three demands nodes for item group 1 are represented as (1, 0), (1, 1), and (1, 2), since item group 1 is assigned to storage from time 0 to 2. Similarly, demand nodes for item group 2 are (2, 1), (2, 2), and (2, 3), since item group 2 is assigned to storage from time 1 to 3. This is discussed further later, after presenting the transportation model. Next, the notation and the mathematical model are presented for the transportation model for the SAP.

Notation

First, the notation for the data and the decision variables are presented as follows.

u supply node index where $u = 1, \ldots, U$;

v demand node index where $v = 1, \ldots, V$;
a_u the capacity of storage space for supply node u;
b_v the units of space required for demand node v;
c_{uv} distance between supply node u and demand node v;

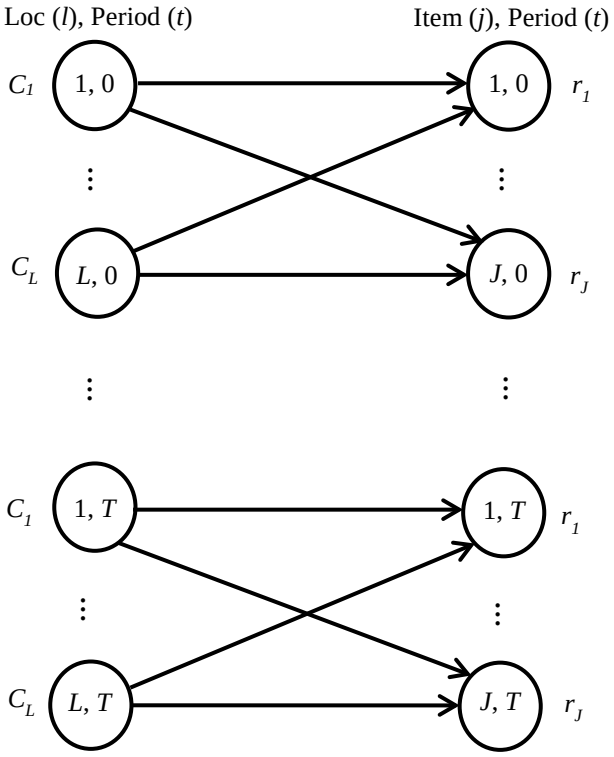

Figure 2. Transportation network model for the SAP.

The decision variables are as follows.

y_{uv} the units of items transferred from supply node u to demand node v;

Mathematical Model

Next, a mathematical model is presented for the transportation model for the SAP.

$$\text{Minimize } z = \sum_{u=1}^{U}\sum_{v=1}^{V} c_{uv}y_{uv} \tag{8}$$

$$\text{s.t.} \quad \sum_{u=1}^{U} y_{uv} = b_v \qquad \forall v \tag{9}$$

$$\sum_{v=1}^{V} y_{uv} \le a_u \qquad \forall u \tag{10}$$

$$y_{u'v'} = y_{u''v''} \qquad \forall u', v', u'', v'' \tag{11}$$

$$y_{uv} \ge 0 \qquad \forall u, v \tag{12}$$

Objective function (8) minimizes the sum of the total travel distances the groups of items travel during the time horizon. Constraints (9) ensure that the amount of space required (demanded) in each period an item group is in storage is satisfied. Constraints (10) ensure that the space capacity of each location in each period is not exceeded. Constraints (11) are used to ensure that each group of items are assigned to the same storage location(s) during their storage time. It will be explain in detail below, when it is use to solve the SAP instance. Also, the restrictions on the decision variables are given in (12). Notice this model is

equivalent to a transportation model with additional side constraints (11). As a result, the variables are not restricted to integers in (12). Therefore, the above formulation is an LP model and is able to solve large-size problems optimally and quickly. Next, the SAP instance presented earlier is solved using the proposed transportation model and the commercial solver CPLEX.

The SAP Instance

Consider the SAP instance presented earlier with input data in **Tables 1 and 3**. After representing the SAP as a transportation problem network as described earlier, the input data is presented in **Table 4** below. Notice that there are 15 supply nodes (U = 15) and 10 demand nodes (V = 10). Recall, the supply nodes represent each storage location l at each time t, represented on node as (l, t), and the demand nodes represent each item group j at time t, represented on node as (j, t). Recall, the demand nodes should only consider the time each item is assigned to storage, as discussed earlier. For example, consider row 6 (i.e., u = 6) which gives the data for supply node (3, 1), which represents storage location 3 at time 1, where storage location 3 at time 1 has a capacity of 30 units of space (i.e., a_6 = 30). Now consider column 3 (i.e., v = 3) which gives the data for demand node (2, 1), which represent item group 2 at time 1, where item group 2 at time 1 requires 20 units of space (i.e., b_3 = 20). Therefore, the assignment cost for u = 6 and v = 3 is 24 (i.e., c_{63} = 24). That is, the travel distance (per unit) of assigning item 2 to storage location 3 at time 1 is 24 distance units (see **Table 3**). Notice c_{96} = 0, since the travel distance (per unit) of assigning item 2 to storage location 3 was already considered at time 1 (c_{63} = 24) and should not be consider at time 2 (c_{96} = 0) or 3 ($c_{12,8}$ = 0). In other words, the travel cost for an item group needs to be considered only at the time it is assigned to a storage location and assigned a zero in the remaining periods it is in storage. Also, the "M"s in the cost matrix represent a large number (e.g., M = 1000), which indicates an infeasible assignment. Take for instance c_{12} = M, which indicate assigning item group 1 (at time 1) to storage location 1 (at time 0) is impossible, since the periods are not the same.

		1	2	3	4	5	6	7	8	9	10	
		(1, 0)	(1, 1)	(2, 1)	(3, 1)	(1, 2)	(2, 2)	(3, 2)	(2, 3)	(3, 3)	(3, 4)	a_u
1	(1, 0)	25	M	M	M	M	M	M	M	M	M	40
2	(2, 0)	17	M	M	M	M	M	M	M	M	M	40
3	(3, 0)	27	M	M	M	M	M	M	M	M	M	30
4	(1, 1)	M	0	22	12	M	M	M	M	M	M	40
5	(2, 1)	M	0	17	27	M	M	M	M	M	M	40
6	(3, 1)	M	0	24	34	M	M	M	M	M	M	30
7	(1, 2)	M	M	M	M	0	0	0	M	M	M	40
8	(2, 2)	M	M	M	M	0	0	0	M	M	M	40
9	(3, 2)	M	M	M	M	0	0	0	M	M	M	30
10	(1, 3)	M	M	M	M	M	M	M	0	0	M	40
11	(2, 3)	M	M	M	M	M	M	M	0	0	M	40
12	(3, 3)	M	M	M	M	M	M	M	0	0	M	30
13	(1, 4)	M	M	M	M	M	M	M	M	M	0	40
14	(2, 4)	M	M	M	M	M	M	M	M	M	0	40
15	(3, 4)	M	M	M	M	M	M	M	M	M	0	30
	b_v	35	35	20	30	35	20	30	20	30	30	

Table 4. Input data (c_{uv} matrix) for the transportation model.

Once the input data matrix in **Table 4** is constructed, the transportation model (8) – (12) can be used to solve the SAP instance. The LP model, which consists of objective function (8) subject to constraints (9), (10), and (12), is the traditional transportation model. As stated earlier, the additional side constraints (11) are used to ensure that each group of items are assigned to the same storage location(s) during their storage time. For the SAP instance, constraints (11) are as follows for each item group.

Item group 1:	$y_{11} = y_{42}$	$y_{21} = y_{52}$	$y_{31} = y_{62}$
	$y_{42} = y_{75}$	$y_{52} = y_{85}$	$y_{62} = y_{95}$
Item group 2:	$y_{43} = y_{76}$	$y_{53} = y_{86}$	$y_{63} = y_{96}$
	$y_{76} = y_{10,8}$	$y_{86} = y_{11,8}$	$y_{96} = y_{12,8}$
Item group 3:	$y_{44} = y_{77}$	$y_{54} = y_{87}$	$y_{64} = y_{97}$
	$y_{77} = y_{10,9}$	$y_{87} = y_{11,9}$	$y_{97} = y_{12,9}$
	$y_{10,9} = y_{13,10}$	$y_{11,9} = y_{14,10}$	$y_{12,9} = y_{15,10}$

(13)

For example, consider item group 1. See **Table 4** to understand how these constraints are constructed. Constraint $y_{31} = y_{62}$ ensure that if item group 1 is assigned to storage location 3 at time 0, then it is assigned to storage location 3 at time 1. Also, it should be assigned to storage location 3 at time 2 (i.e., $y_{62} = y_{95}$).

Using the input data in **Table 4** and the transportation model with side constraints (i.e., LP model (8), (9), (10), (12), and (13)), the optimal solution is obtained for the SAP instance using CPLEX 11.0 commercial solver. See **Table 5** below for the optimal solution with OFV 1380. For example, consider the decision variables for item group 1, y_{21}, y_{52}, and y_{85}, and how they are set equal to each other in constraint set (13). Also, $y_{21} = y_{52} = y_{85} = 35$ indicate that all 35 units of item group 1 is assigned to storage location 2 between time 0 and 2. Notice the row supply (location capacity) and column demand (item group space requirements) are satisfied. Also, the optimal solution and OFV obtained for the transportation model are the same as in the efficient SAP model presented earlier. See **Figure 1** for a graphical display of the solution.

		1	2	3	4	5	6	7	8	9	10	
		(1, 0)	(1, 1)	(2, 1)	(3, 1)	(1, 2)	(2, 2)	(3, 2)	(2, 3)	(3, 3)	(3, 4)	a_u
1	(1, 0)	0	0	0	0	0	0	0	0	0	0	40
2	(2, 0)	35	0	0	0	0	0	0	0	0	0	40
3	(3, 0)	0	0	0	0	0	0	0	0	0	0	30
4	(1, 1)	0	0	10	30	0	0	0	0	0	0	40
5	(2, 1)	0	35	5	0	0	0	0	0	0	0	40
6	(3, 1)	0	0	5	0	0	0	0	0	0	0	30
7	(1, 2)	0	0	0	0	0	10	30	0	0	0	40
8	(2, 2)	0	0	0	0	35	5	0	0	0	0	40
9	(3, 2)	0	0	0	0	0	5	0	0	0	0	30
10	(1, 3)	0	0	0	0	0	0	0	10	30	0	40
11	(2, 3)	0	0	0	0	0	0	0	5	0	0	40
12	(3, 3)	0	0	0	0	0	0	0	5	0	0	30
13	(1, 4)	0	0	0	0	0	0	0	0	0	30	40
14	(2, 4)	0	0	0	0	0	0	0	0	0	0	40
15	(3, 4)	0	0	0	0	0	0	0	0	0	0	30
	b_v	35	35	20	30	35	20	30	20	30	30	

Table 5. Optimal solution (y_{uv}) for the SAP Instance using the proposed transportation model.

Comparison of the Models

Although both models obtained the same results, the transportation model has many more variables, but the same number of constraints, since both models (i.e., constraint matrix) have the same structure. See comparison of models in **Table 6** for the SAP instance given in **Tables 1 and 3**. The number of variables in the transportation model is five times the number of variables in the efficient SAP model, since there are 5 time periods (i.e., t = 0, 1, 2, 3, 4) in the planning horizon (i.e., cardinality of t is 5, $|t|$ = 5). However, both models have the same number of constraints. Therefore, the SAP is solved more efficiently using the SAP model presented first.

Model	# of Variables	# of Constraints
SAP	$L\sum_{j=1}^{J}(e_j - b_j + 1)$ = 3(3 + 3 + 4) = 30	$\sum_{j=1}^{J}(e_j - b_j + 1) + L\|t\| + L\sum_{j=1}^{J}(e_j - b_j)$ = (3 + 3 + 4) + 3(5) + 3(2 + 2 + 3) = 46
Transportation	$L\|t\|\sum_{j=1}^{J}(e_j - b_j + 1)$ = 3(5)[3 + 3 + 4] = 150	(same equation as above) 46

Table 6. Comparison of the proposed models.

CONCLUSION

The SAP is defined as the task of assigning groups of items (or products) to storage locations for predefined periods, without exceeding the capacities of the locations, such that the total distance items travel is minimized. The SAP can be used to assign groups of items to storage areas during planned outages at electric power plant, assign groups of products to storage areas in a manufacturing environment, or assign cargo (or containers) to storage areas in warehouses (or storage yards). Two LP models are presented for the SAP. The first model is a more efficient model, and the second model is a transportation model with side constraints. Nevertheless, both models can be used to solve large-size problems optimally. For future research, larger-size problems will be solved. Also, reallocating groups of items to different storage area during the planning horizon may be considered in the proposed SAP, as in **Kim and Park (2003)**.

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MILLENNIALS AND TAX COMPLIANCE: PERCEPTIONS AND COMPLEXITY

EXTENDED ABSTRACT

The most recent report by the Internal Revenue Service (IRS) estimates the United States (US) average annual gross tax gap is in excess of $450 billion dollars. The majority of the estimate, $387 billion dollars, or roughly 85%, is due to underreporting of income. Underreporting of income is not only defined as understating or reporting less revenues or income, but also overstating deductions, tax credits, exemptions, and expenses. Both of those options, and especially a combination of the two, allow for a lower taxable income, which leads to underreporting and expanding the tax gap.

This paper serves to review the impact millennials will have on the tax gap, specifically due to the underreporting of their income. Underreporting of income is not only defined as understating or reporting less revenues or income, but also overstating deductions, tax credits, exemptions, and expenses. Prior research has focused on certain aspects of the underreporting of income, such as tax rates, income levels, tax aggressiveness, and the use of tax preparers. While that research is certainly useful, the impact of the millennial generation can have a major impact on the tax gap and is an area that needs researching. This research will add to the literature on underreporting of income as there is little to no research on the underreporting of income specifically by millennials. Measuring their perceptions and understanding of the tax code for tax compliance is the main purpose. Millennials are less likely to use tax preparers according to Barral, so millennials are left to interpret the code for themselves. They will lack the knowledge and guidance that can be provided by tax professionals. “Many Millennials don't go to CPAs for tax compliance or advice because they have a do-it-yourself attitude or because the idea of paying a CPA to prepare their taxes can be intimidating for them” (Barral, 2017). Since millennials are more apt to prepare their own taxes, understanding their perceptions and understanding of the tax code related to tax compliance are important to document.

BACKGROUND

I intend to conduct an experiment to see if millennials are more or less apt to properly report all of their income (whether intentionally or unintentionally), given a variety of income sources, such as tips, gifts from relatives, side jobs, etc. I intend to measure this aspect because an article by Hill, referencing a study by Finder.com, mentioned that one out of every four Americans now have a “side gig”, which earn an “estimated $214.6 billion” per year that goes unreported to the IRS. The types of jobs listed were “dog walking/pet sitting, selling crafts or goodies, house cleaning, babysitting, tutoring, handyman work, gardening and more, often for undeclared cash. More than one in three millennials have a side hustle — the highest of any of the generations studied” (Hill, 2017). Our current tax system in the US is a self-reporting system, so those who receive cash or second-hand payments can choose whether or not to report the cash they receive.

The tax code is also overly complex, so the understanding (or lack of) of the tax code can lead to underreporting. According to an article posted by in the *Washington Examiner* by Jason Russell, the number of pages in the federal tax code is 74,608 (Russell, 2016). Due to the complexity, many may not understand the tax code and may make true and honest mistakes.

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Modeling to Predict the Probability of a Drafted Non-pitcher Playing on a Major League Team

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ABSTRACT

This paper describes the process used for building a binary logistic regression model for predicting the probability of playing on a major league team for a baseball player drafted in the annual major league draft who is not a pitcher. A drafted player typically begins by playing for a team in one of six different levels of minor leagues with the hope of working his way up to playing on a major league team. Since a player will either play or not play for a major league team, binary logistic regression accomplishes the goal of predicting the probability of playing for a major league using the available predictor data for each player. We address two major missing data difficulties in building the model. First is selecting the appropriate data to model a process that produces definitive outcome results that arrive at varied times due to professional baseball careers not having a fixed time. Hence, binary outcome data are not available for all players. Second is dealing with data that have large amounts of missing data for the performance variables for the different minor league levels. The information in these variables will serve as predictors in the logistic model. The missing data are due to players not playing in all of the different levels of the minor leagues.

INTRODUCTION

American professional baseball can be divided into two Groups:

- Major League Baseball (MLB) which is the highest professional level and its teams compete to ultimately play in the World Series to decide the championship team.
- Minor League Baseball (MiLB) teams play in leagues that are considered to be below MLB. This paper uses only the six better known leagues.

Each year Major League Baseball holds a draft of amateur baseball players. Each Major League team has relationships with one or more Minor League teams that are often referred as the farm system for the MLB team. Drafted players are assigned to a team that is at an appropriate level in the team's system. Players who perform well in minor leagues can be called up to play for a major league team.

This paper uses a data set named "Drafted Minor League Hitters, 1992-2006" that Paul Rossman [3] posted on a Journal of Statistics Education website. The data set has 6318 rows of data on players drafted between 1992 and 2006 who are not pitchers.

The variables in this data set can be divided in to two groups:

- Descriptive characteristics for each player up through being assigned to a team in the drafting club's system, see Table 1.
- The player's performance data in the six different minor leagues and whether the player played in Major League Baseball, see Tables 2, 3 & 3.

The data set has 6318 rows of data for the descriptive characteristics. However, most of the players do not play in all of the six minor leagues so there are a lot of missing values in the player performance data at the individual league level.

Table 1
Descriptive Characteristic Variables up through Team Assignment

Year when drafted
Round drafted
Overall pick
Name
Position
Organization
School
Age when drafted
Birth Date
Bats
Throws
Education Type
Drafted Before
Minor-League Level Started At

The six levels of Minor League Baseball for this data set are listed below from the lowest level to the highest and these are the possible values for the variable Minor-League Level Started At:

1. **Rookie**: (Lowest Level) Consists of players right out of high school or college. The players get adapted to the rigors of full season baseball.
2. **Short-Season**: Similar to the Rookie level consisting of newly drafted players with a shorter season that starts in June to allow drafted college players to finish their college seasons.
3. **Low-A**: Class A teams with players right out of Rookie / Short-Season.
4. **High-A**: Class A Advanced
5. **Double-A**: Higher-level above Class A.
6. **Triple-A**: (Highest Level) The main purpose is to prepare baseball players for the Major Leagues.

Table 2
Starting Levels for Drafted Players

Starting Level	Count	Percent	% playing MLB	# played at this level
blank	1	0.02%	100.00%	
Rookie	3709	58.71%	9.36%	3917
Short-Season	2277	36.04%	12.60%	3516
Low-A	232	3.67%	28.45%	3909
High-A	87	1.38%	50.57%	3488
Double-A	10	0.16%	90.00%	2351
Triple-A	1	0.02%	100.00%	1484
Majors	1	0.02%	100.00%	1982
Grand Total	6318	100.00%	11.97%	

As indicated in Table 2, about 95% of the drafted players start in a Rookie or Short-Season league. It is obvious that players starting in class A or above have a much better chance of playing in MLB, but they only make up about 5% of the drafted players. The column on the right in Table 2 has the number of players who played at each of the six levels. None of the players played in all six of the different minor leagues. This means that variables measuring the number of games played and number of plate appearances in Table 3 will all have some missing values. Only 12% of the drafted players in this data set were recorded as appeared in Major League Baseball. However, the data set variable "If the player appeared in the Major Leagues" has three possible values: No, Yes, and Active. No definitions were provided for these values, so we are assuming that

No means the player finished their minor league career without appearing in the Major Leagues,
Yes means the player appeared in the Major Leagues, and
Active means that the player is still active in the minors without appearing in the Major Leagues.

As we consider building a model to predict whether a drafted player will play in the Major Leagues, we have to understand that players who are still active in the minor leagues could still appear in the Major Leagues during their professional baseball career.

The variables in Table 3 will provide measures for how well each player performed in the minor leagues. Ideally, one would like to have data on how well each player performed defensively and offensively while they were in the minor leagues. However, the data set does not have numbers for defensive errors committed nor any statistics directly relating to batting performance in the minor leagues. Hence, we are restricted to using the available data. The number of games the player played in should be an indicator of how well the player was performing. Better players should play in more games. The number of plate appearances will definitely depend on how many games the player played in the league. Better hitters would also be expected to have more plate appearances. To attempt to remove the effect of number of games from the number

of plate appearances, we chose to create a new variable called At-bats per Game. The number of plate appearances is divided by the number of games played to calculate the value for this variable. In the analysis part of the paper we will attempt to determine the best way to deal with the missing values to be able to use the meaningful values for the variables when using them as predictors in a logistic regression model to predict whether the player will play in the majors.

Table 3
Data Set Variables for Player Performance in the Individual Leagues

If the player appeared in Rookie Leagues
Number of games played in Rookie Leagues
Number of plate appearances in Rookie Leagues
If the player appeared in Short-Season-A
Number of games played in Short-Season-A
Number of plate appearances in Short-Season-A
If the player appeared in Low-A
Number of games played in Low-A
Number of plate appearances in Low-A
If the player appeared in High-A
Number of games played in High-A
Number of plate appearances in High-A
If the player appeared in Double-A
Number of games played in Double-A
Number of plate appearances in Double-A
If the player appeared in Triple-A
Number of games played in Triple-A
Number of plate appearances in Triple-A
If the player appeared in the Major Leagues
Number of seasons spent in the minor leagues

Table 4 has calculated variables that were also part of the original data set. We were not able to obtain any report on the modeling work of Paul Rossman, but we believe that he created some or all of these variables in an attempt to handle the issue of missing values when building a prediction model. Since each of these variables are calculated using a total of at least two other variables then a value of zero can be entered if none of the variables used to calculate the total has recorded data for the player. For example, Table 2 indicates that all but 332 players started in either the Rookie or Short-Season league. This means that 332 out of the 6318 players would have zero values for the totals for the two variables for Short-Season and Rookie. As more variables are included in the total, the number of zeros for the calculated variable would decrease. It should also be noted that the first two variables in Table 4 measuring totals for the minor leagues and the two variables with totals for Triple-A and lower levels are measuring the same thing and have the same values.

Table 4
Data Set Variables Calculated from Player Performance in the Individual Leagues

Total number of games played in the minor leagues
Total number of plate appearances in the minor leagues
Total games played in Short-Season and lower levels
Total plate appearances in Short-Season and lower levels
Total games played in Low-A and lower levels
Total plate appearances in Low-A and lower levels
Total games played in High-A and lower levels
Total plate appearances in High-A and lower levels
Total games played in Double-A and lower levels
Total plate appearances in Double-A and lower levels
Total games played in Triple-A and lower levels
Total plate appearances in Triple-A and lower levels
Average plate appearances per game

BUILDING THE LOGISTIC REGRESSION MODEL

This section addresses building binary logistic regression models to predict whether a drafted non-pitcher will play in the major leagues during his professional career. We will discuss the details of and assessment for our developed models using three sets of predictors:

1. The descriptive characteristic variables up through team assignment in Table 1
2. Performance variables from Table 4 and six calculated dummy variables for playing in each of the six minor leagues
3. Additional variables we define to deal with the missing values and to provide better measures of performance at each minor league level.

Selection of Appropriate Data for Building the Logistic Regression Model

As indicated previously, the data set variable "If the player appeared in the Major Leagues" has three possible values: No, Yes, and Active. Our modeling process assumes that
No means the player finished their minor league career without appearing in the Major Leagues,
Yes means the player appeared in the Major Leagues, and
Active means that the player is still active in the minor without appearing in the Major Leagues.
These data are for a process that is happening over time. Hence, it is important to examine these data over time to determine what data will be most representative of this process. The selected data can be used to build the binary logistic model to predict the probability of playing on a major league team during the professional career of a drafted player. Table 5 is a contingency table for player outcomes by draft year. The table shows a clear increase in number of players active in the minors as the draft year increases. Correspondingly, the number with a Yes for appearing in the major leagues is much smaller for the later years. Zero players from the 2006 draft and only nine players from the 2005 draft played major league baseball because they have

not had adequate time to reach the major leagues. The data for these years are not representative of the process and certainly should not be included in the model building data.

Table 5
Player Outcomes for Player Appeared in the Major Leagues by Draft Year

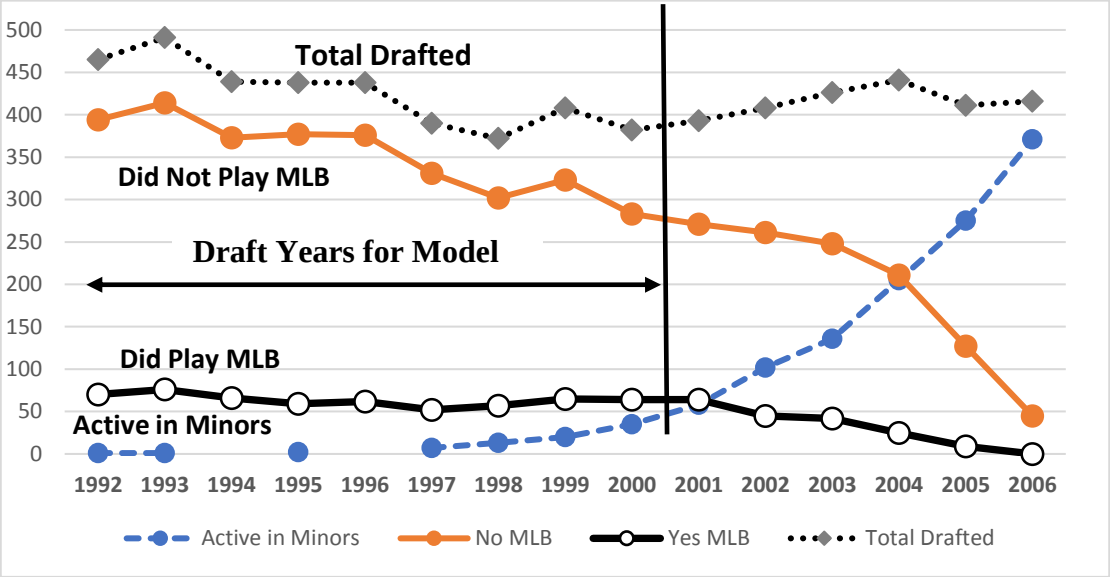
Draft Years	Active in Minors	No MLB	Yes MLB	Total Drafted	Cumulative Total	Cumulative Non-active	Yes MBL given Not Active
1992	1	394	70	465	465	464	15.1%
1993	1	414	76	491	956	954	15.5%
1994		373	66	439	1395	1393	15.0%
1995	2	377	59	438	1833	1829	13.5%
1996		376	62	438	2271	2267	14.2%
1997	7	331	52	390	2661	2650	13.6%
1998	13	302	57	372	3033	3009	15.9%
1999	20	323	65	408	3441	3397	16.8%
2000	35	283	64	382	**3823**	**3744**	18.4%
2001	58	271	64	393	4216	4079	19.1%
2002	102	261	45	408	4624	4385	14.7%
2003	136	248	42	426	5050	4675	14.5%
2004	205	211	25	441	5491	4911	10.6%
2005	275	127	9	411	5902	5047	6.6%
2006	371	45	0	416	6318	5092	0.0%
Total	1226	4336	756	6318			

Figure 1 visualizes how the numbers for the three outcome values for the variable measuring playing in MLB changed over time. Based on studying Table 5 and Figure 1, we decided to exclude the data for the draft years of 2001 and above. We observed three things that supported selecting this cut-off point for including data in the modeling data set:

1. The pattern for the number of players who did not play MLB mirrored the pattern for the number of total players drafted prior to 2001.
2. The number of players active in the minor leagues remained clearly below the number who did play MLB prior to 2001.
3. The line for the number of players who did play MLB remains relatively flat through 2001.

The Cumulative Total value for the 2000 draft in Table 5shows that this set has data on 3823 players. To obtain binary outcome data, the 79 active in the minors players through the year 2000 were removed since it is not known whether they will or will not end their careers having appeared in the major leagues. This gives a data set with 3744 observations for building our binary logistic regression models. Of these, 571 (15.25%) appeared in the major leagues and 3173 (84.75%) did not play for a major league team during their professional baseball careers.

Figure 1
Player Outcomes for Player Appeared in the Major Leagues Plotted by Draft Year



Model using Descriptive Characteristics Known at the Time of Initial Team Assignment
The predictor variables considered for building this model come from those listed in Table 1. There are four quantitative variables: Year when drafted, Round drafted, Overall pick, and Age when drafted. Year when drafted was removed from consideration as a predictor, since it was used to select the data for modeling and about 15% of the players drafted between 1992 and 2001 were recorded as played in the majors showing little variation from year to year. Of the remaining variables, we choose to not attempt to include: Name (player's name); Organization (name of the drafting organization/team, 30 different possible values); School (name of the college or high school for the player); or Birth Date (we do not believe that it adds any additional information over that provided by Age). Table 6 has the results from performing a Fit Y by X analysis using JMP software to test for a significant relation between a player playing in the majors and each of the variables considered as potential predictors in a logistic regression model. Table 6 shows a statistically significant relationship between playing in the major leagues and each of the variables, except Education Type.

Table 6
Testing for a Relationship between each Variable and Playing in the Major Leagues

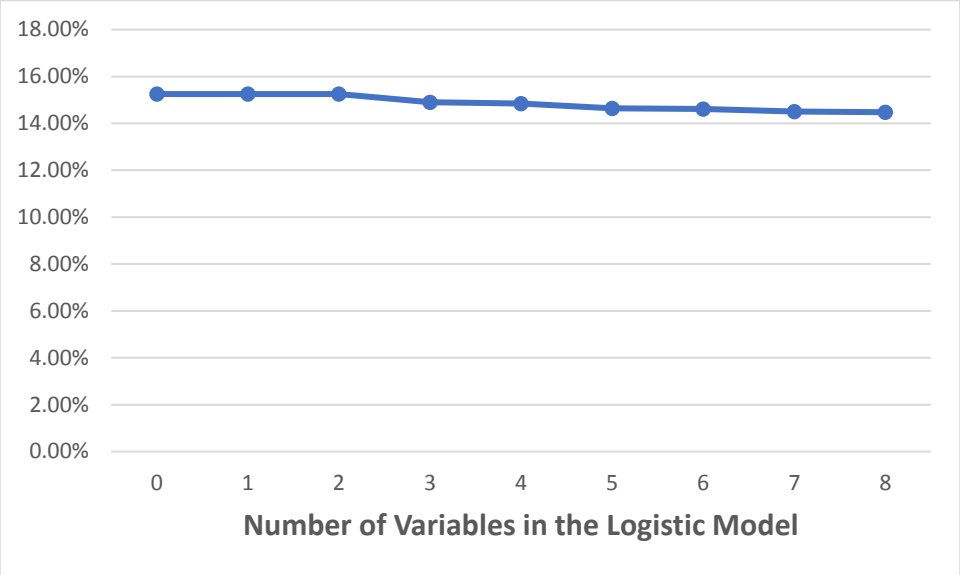
Variable	Variable Type	JMP p-value Pearson χ^2	JMP p-value Logistic
Round drafted	Quantitative		<.0001
Overall pick	Quantitative		<.0001
Age when drafted	Quantitative		<.0001
Position	Categorical	.0068	
Bats	Categorical	<.0001	
Throws	Categorical	0.0001	
Education Type	Categorical	.1682	
Drafted Before	Categorical	<.0001	
Minor-League Level Started At	Categorical	<.0001	

To incorporate the categorical variables into the logistic model as predictors, dummy/indicator variables are created. The six categories recorded for the variable Position are Catcher, First Base, Second Base, Shortstop, Third Base and Outfield. Five dummy variables are created for Position. The categories for the variable Bats are Right, Left, and Switch, which can be modeled with two dummy variables. The categories for the variable Throws are Right and Left, which can be modeled with a single dummy variable. The categories for the variable Education Type are College, High School and a few values of None, so a dummy variable named College is created to have the value of 1 for College and have the value 0 otherwise. A dummy variable named Yes is created for the variable Drafted Before to have the value of 1 if the player had been drafted before and have the value 0 if he had not been drafted before. As shown in Table 2, eight different values were recorded for the variable Minor-League Level Started At. For the 13 players with the categories of blank, Triple-A and Majors, 100% of them played in the major leagues meaning that there is no reason to differentiate among these categories. Also, Table 2 shows that the percentages making it to the major leagues are essentially the same for Rookie and Short-Season, so these two may be left together when creating dummy variables. Hence, three dummy variables will be created named Low-A, High-A and Started above High-A.

Model Results using Table 1 Variable Information

Using the quantitative variables in Table 6 and the dummy variables described above as predictor variables, logistic regression models were created to predict the probability of a drafted player becoming a player in the major leagues. Using stepwise logistic regression, the most significant single variable was Overall pick. The logistic regression with that variable alone had the same misclassification rate (571/3744 = 15.25%) as a default prediction of predicting that all players would not play MLB. We attempted numerous models but none showed any real improvement over the default of predicting that no players would play MLB. A model with 8 statistically significant variables had 14.4% as its misclassification rate. Figure 2 shows how little the misclassification rate declines as variables are added to the binary logistic regression model using a stepwise procedure.

Figure 2
Misclassification Rate for Number of Table 1 Variables in the Logistic Model



Model Results using Table 3 Variables to Measure Minor League Performance

A stepwise procedure was used to model using the variables Rossman had created in the published data set and listed in Table 3 above. Figure 3 shows how the misclassification rate declines as variables are added to the logistic regression model using a stepwise procedure. There is a clear drop in the misclassification rate when the second variable is added to the model and there is another slight drop when the fourth variable is added.

Figure 3
Misclassification Rate for Number of Table 3 Variables in the Logistic Model

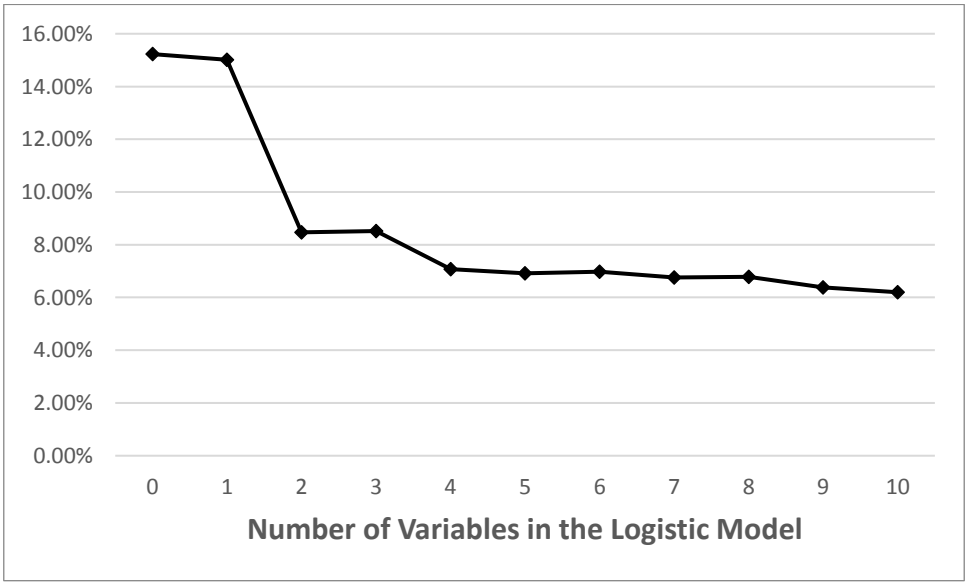


Table 7
Model Results for Predicting Yes for Playing MLB using Table 3 Predictors

Term	2 variable logistic model	
	Coefficient	Significance
Intercept (Constant)	-23.254	2.438E-82
player appeared in Triple-A	3.351	1.089E-105
plate appearances per game in Minor Leagues	5.088	6.174E-65
% misclassified	8.47%	

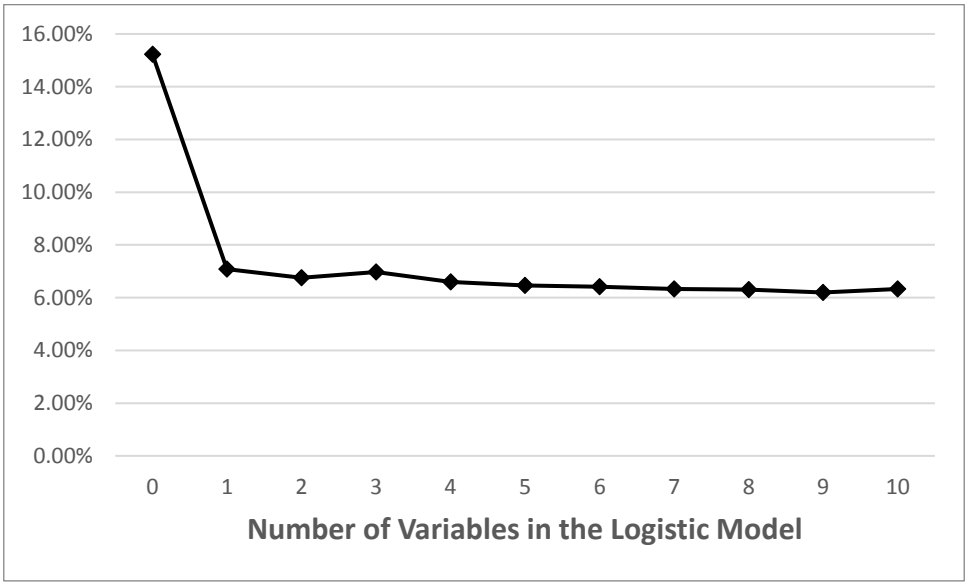
We have chosen the above model in Table 7 to be the best model using Rossman's variables listed in Table 3. The model is predicting Yes the player played MLB. We believe that it makes sense that both of the coefficients should be positive for the dummy variable indicating that the player played in a Triple-A league and for the average number of plate appearances per game in the minor leagues.

Model Results using Our Variables to Measure Minor League Performance

To deal with the missing values we propose standardizing each of the performance variables for each of the minor leagues. As described previously, we also calculate the average number of plate appearances per game for each individual league. The standardized value for each player who played in that minor league would represent how much that player's performance was above or below the average for all of the players who played in that league. This would provide a standardized or z-score value for each player who played in the league. Rather than having a missing value for players who did not play in the league, a value of zero is assigned to the player since his performance did not vary above or below the average for the league. Using our standardizing approach for variables measuring performance at a specific minor league level will eliminate the problem of missing values for the minor league performance measurements.

Using the above defined z-score performance variables for each of the six minor leagues; a stepwise procedure was used to build a binary logistic model to predict a player playing MLB. Figure 4 shows the misclassification rate as function of the number of variables added to the logistic regression model using a stepwise procedure. There is a clear immediate drop with only one predictor variable being in the model. That variable was the z-score for the average number of plate appearances per game in the Triple-A league. The variable coefficient was a positive 6.741 and its significance was 9.5587E-149. The misclassification rate for this model was 7.08%. If one used the four-variable model for Rossman's Table 3 variables then the misclassification rate would also be 7.08%. Our method for dealing with the missing values in the variables rather using cumulative totals allowed us to build a logistic regression model that had a lower or equal misclassification rate than the model using Rossman's variables and we had only one predictor variable rather than two or four.

Figure 4
Misclassification Rate for Number of Our Z-score Variables in the Logistic Model



SUMMARY

We discussed building a logistic regression model using a set of existing data. The objective was to build a model for a process that does not produce an outcome in a specified time period and one with multiple input variables that have many missing values. The discussion addressed selecting a set of data that would be representative of the process being modeled. We also used a z-score method to transform data in a way that allowed imputing a value of zero for all missing values for performance measurements. We were able to use our z-score method to impute data values and then use these data to create a model that had a lower misclassification rate and one fewer predictor variable than we could obtain using the variables in the original data set. Table 8 summarizes the results of the respective models.

Table 8
Summary of Misclassification Rates for the Models

Model	% misclassified
No variables	15.25%
Model after draft	14.4%
Model with Rossman variables	8.47%
Model with our variables	7.08%.

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Title: Planning and Implementation of a Security Awareness Training Program: A Case Study of an Engineering Consulting Organization

Track: Information Technology/DSS/Cybersecurity

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Security is "concerned with protecting the confidentiality, integrity, and availability" of both information and information systems" (WAPA, 2018, p.7). The "primary purpose of security awareness [training] is to influence the adoption of secure behaviours" by employees so that information and systems remain safe (Bada & Sasse, 2014, pg. 5). It is not enough for employees to just be aware. Theories such as the Theory of Reasoned Action, Theory of Planned Behavior, and Protection Motivation Theory have shown that attitudes and intentions must be changed in order for behavior to be transformed (Bada & Sasse, 2014). SAT must prompt users to act on security threats to protect company information and systems. Although numerous studies have been conducted on security awareness training, questions still remain about the best way to implement such programs (Bada & Sasse, 2014). The purpose of this study is to further investigate these issues through the creation of a SAT for a company.

This case study will examine the implementation process of an Engineering Consulting Organization's (ECO) security awareness training (SAT) program. The Engineering Consulting Organization is headquartered in the southeastern United States and has six branch offices in the U.S. It has provided consulting for architectural and engineering projects in medical, educational, military, and government agencies. Examples of what the firm offers include: project management, mechanical systems design, architectural design, fire protection, surveys and studies, industrial control, communications/telecommunications, and electrical system design. Government projects, in particular, need additional security because they involve Controlled Unclassified Information. Due to the ECO's recent application and acceptance for government projects, compliance with NIST (National Institute of Standards and Technology) standard 800-171 for Awareness and Training became necessary. NIST 800-171 applies to this ECO since the company handles Controlled Unclassified Information for government projects. In this case, the ECO realized the need for SAT, but also was prompted to act based on compliance with regulation.

The firm strives to utilize state of the art technology as a foundation for its services. Quality, efficiency, and dependability are components of its value to customers, and information technology provides a critical role. They utilize information technology to create complex computer-aided design (CAD) drawings for their clients, and need the capability to share these large files among their branch offices. The ECO also applies information technology to general processes such as billing, invoicing, time tracking, payment processing, communication (email, etc.), and presenting their designs to clients.

Technological solutions can prevent some security threats. However, "users of a system can be viewed as the weakest link in securing systems" (Toth, 2017, pg. 30). According to the NIST 800-171 standard, SAT will raise user awareness of risks and threats, develop security-enhancing skills, protect system resources, encourage users to report security risks, and enable users to participate in and assist in building security programs (Toth, 2017). Ultimately, the goal is to develop an environment so that users practice security-protective behaviors innately (Manke & Winkler, 2012). The ECO strives to implement training so that users are aware of how their "actions may impact the security of a system" (Toth, 2017, pg. 30).

There are a number of factors to consider when developing SAT. One problem with employee security awareness is that IT professionals often assume that end users have a foundational skill set and common knowledge of security risks and threats (Manke & Winkler, 2012). SAT often does not align to business risks and therefore the "correct skills are not deployed" (Bada & Sasse, 2014, pg. 10). Some companies struggle to encourage employees to take security training seriously due to lack of enthusiasm since training often isn't presented in a way that is pertinent to the user and because other training and work requirements steal employee attention (Alshaikh, Maynard, Ahmad, & Chang, 2018). The training should also consider employee motivations because those will affect their internalization of training (Tsohou, Karyda, & Kokolakis, 2015). Employee perceptions about efficacy, social pressure, vulnerability, and safety need to be addressed (Tsohou, Karyda, & Kokolakis, 2015). Fear-mongering as an influence technique is not generally successful (Manke & Winkler, 2012; Bada & Sasse, 2014).

Studies show that learning from SAT can decay quickly (Zhang, 2018). Security awareness training should be holistic and reinforced. It can provide information via learning modules, a website, posters, blogs, newsletters, lunch presentations, speakers, and holding a security week (Manke & Winkler, 2012). This enables learning to be strengthened in a variety of ways and allows for new current events and threats to be communicated. Although SAT should be comprehensive, content covered at one time should be reduced to avoid cognitive overload (Alshaikh, et al., 2018). The goal is to shift culture so that security-protective behaviors are firmly entrenched in employee behavior.

How do companies measure the effectiveness of a training program? This has been a challenging and "elusive goal" (Croasdell, Elste, & Hill, 2018; Alshaikh, et al, 2018, pg. 5093). One issue is that many companies do not have metrics to assess the effectiveness of a security awareness program (Manke & Winkler, 2012). Smaller firms especially have less funding and fewer resources and may find SAT to be more challenging. And no matter what the size of the company, downtime due to security breaches can be costly. Another important factor is that the loss of reputation for disclosure of such breaches may not be calculable. In the case of this ECO, they could lose their government business if they are not compliant with SAT protocol. Companies need to know how much to spend on security and whether there is an appropriate return on investment (Sonnenreich, Albanese, & Stout, 2018). Sonnenreich, et al (2018) proposed a method to calculate return on investment, including quantifying risk exposure, risk

mitigated, and solution cost. Gathering pre and post training metrics and surveying employees can also provide whether learning occurred. Security training is not just the sole responsibility of the IT department. Other departments such as Legal, HR, and Marketing should be involved (Manke & Winkler, 2012). Overall, it seems that a combination of techniques to measure effectiveness should be created by the company to better understand its progress (Alshaikh, et al., 2018).

This is a work-in-progress case study and involves a participatory approach. The authors, from academia and industry, will partner with the ECO to develop a SAT program. We will examine the SAT process, including the ECO's threat environment, security awareness needs, type of appropriate training, and compliance with the NIST standard. The result of this work will be the analysis of the SAT process, customizable SAT modules, and an investigation of techniques to determine effectiveness of SAT. Perspectives from industry and academia will be combined to ensure a comprehensive approach.

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SERVICE EXCELLENCE: FIVE YEARS OF FEEL THE TEAL AT CCU

Panel Submitted to: Innovative Educational Practice

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ABSTRACT

While most companies have recognized the importance of customer service and its role in brand loyalty, service quality has been slower to take hold in higher education than in other industries. The evolution of the "student" has come a long way with many viewpoints suggesting that people who attend universities are not students, but rather customers. This paper aims to investigate the factors that impact the service quality perception of students, faculty, and staff in higher education. This topic explores the idea of better aligning the administration's and students' needs and desires as well as the impact it has on student retention rates and student satisfaction. Then, we will explore our own universities version of service excellence in higher education called “Feel the Teal.” We examine characteristics such as SERVQUAL and incentives for participation that promote an atmosphere of service excellence throughout the CCU campus. This study explores the cultural shift and dedication of the entire faculty/staff and administration that must be present for service excellence to have such an affect.

STUDENT PERCEPTION OF FEEL THE TEAL

As a whole, the Feel the Teal initiative at Coastal Carolina University has been established to provide service excellence at the school. The FTT initiative involves putting in an effort to provide meaningful experiences and interactions with students. However, some students may perceive the school and its Feel the Teal program in different ways. Therefore, the school must come up with a variety of ways to make all students feel cared about. Our commitment to service excellence will allow students to receive quality service at the school regardless of differing experiences and perceptions.

RETENTION

Retention is one of the focal points of the Feel the Teal initiative. With merely five percent of Coastal's budget coming from the state, it is necessary to retain students so revenue from tuition is not unexpectedly lost (DeStefano, 2017). Thus, Feel the Teal is geared towards improving retention rates. Various factors that can influence retention, such as campus environment, educational value, and student centeredness (Elliott & Healy, 2001). While completing this research study, it was our objectives to uncover which variables have the most significant impact on retention, as well as how retention can be improved related to this initiative.

BRAND IMAGE

A university’s brand image, or reputation, is comprised of a multitude of factors. For instance, successful athletic programs have been shown to increase a university’s exposure and reputation (Goff, 2000). Yet, the most significant variable that impacts brand image is service quality. A university’s image is typically formed based on individual experiences and interactions with the organization (Alessandri, Kinsey & Yang,

2008). Thus, by providing students with positive and meaningful experiences, Coastal can improve its reputation.

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Students Success in Academics and the Work Place: The Important Role of Basic Life Skills

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ABSTRACT

In this paper/session presenters, along with the audience will explore the relationship between student readiness, academic success, faculty expectations, and needed life skills. Life skills will be defined by several different resources as well as the authors. There will be some overlap when needed life skills are ranked as well as the perceived relevance for student and academic success in higher education. The student's classroom experiences and how on the job experiences are correlated when it comes to the levels of success and the role of life skills will be discussed. Neil Kokemuller (seattlepi.com) stated: "Success in college is based on a student's life skills as much as it is based on intellect or academic ability … Students who start college with a solid foundation in key life skills may do better in classes and enjoy their overall experience more."

Life skills may incorporate some of the same things that many academicians refer to as "soft skills" but they can easily be defined as a separate group of needed and desired skills for students, faculty, and employers. Life Skills are abilities introduced and initially developed outside of the classroom. What students learn within the classroom enhances and help define the individual's ability to integrate these skills into their overall daily life and actions. Some of the literature list the following as life skills, soft skills, and nonacademic skills; Character, Social & Emotional, Noncognitive Traits & Habits, Growth Mindset, 21st Century Skills, Grit, Knowledge, Intellectual/ Professional/Technical Abilities, Wisdom, Organization, Time Management, Prioritization, Concentration, Motivation, Responsibility, and Independent Decision-Making. Added to this list would be Integrity, Ethical Practice, and Respectful Polite Behavior.

INTRODUCTION

Every year we start the semester with expectations of what it will be like. We are excited about the learning process. At the end of the semester we are somewhat frustrated about the students we did not reach as well as certain behaviors that may have been exhibited in the classroom. Instead of complaining that these students are different from a decade ago, we need to identify some commonality between academic output and behavior among these students. This session will focus on students enrolled in analytical courses i.e., statistics, analytics, computer-based applications, business calculus, etc.

As a faculty member teaching calculus, statistics, analytics, or any other analytical/numerically based course; certain life skills are expected in the students for whom we have the responsibility of trying to educate. Just as maturity requires levels of complex life experiences, the ability to navigate the coursework introduced in analytical/numerically or technology-based courses depends on a student's ability to have maturity in certain academic and life skills. The numerical age of the student does not imply the level of maturity or the ability to master many of the skills listed above. Many of the classes we teach in our curriculum require elements of these skills for successful completion. These courses require students to understand and accept that they must invest in the time required to master the course objectives.

As faculty, what are we doing in our classes to reinforce and assess these skills accurately? Are we clear in our expectations when it comes to students and their level of life skills? Are we unfairly incorporating life skills inefficiency when we are assessing student achievement? Given the importance of these "Life Skills" are we as faculty misleading students with a false sense of accomplishment when we grade on a curve, accommodate excuses, behavior, and give multiple opportunities outside of an agreed upon deadline?

The session leaders will use their time in the session to conduct a conversation/dialogue with those in the audience about differences and commonalities in current views and practices when it comes to students and life. We will share as practitioners and interactively explore some of the issues discussed above including:

- Student skills perception vs reality
- Faculty role in student perception
- True faculty assessment of student readiness and preparedness
- Cost of "Life Skills" deficiency

All faculty, especially new/junior faculty may use this session to question senior/seasoned faculty to garner advice. Faculty charged with working on assessment criteria may use this as an opportunity to make comparisons or garner ideas that they can apply to their individual programs.

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TEN MISCUES FOR STUDENTS TO AVOID IN WRITTEN COMMUNICATION ASSIGNMENTS

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A B S T R A C T

Students encounter a plethora of potholes on the road to the successful completion of written communication assignments. Several miscues, however, are often made by even the best students. Ten such miscues (in no priority ordering) are presented in this paper to serve as a starting point for alerting students to some of the more frequently-encountered trouble spots to be avoided in completing their assignments. These miscues include the following:

#1. Spell-checking does not equal proofreading.
#2. Accurately use apostrophes.
#3. Minimize unnecessary words.
#4. Avoid the masculine.
#5. Double-check pronoun – antecedent agreement.
#6. Choose correct plurals and possessives.
#7. Correctly distinguish between its versus it's.
#8. Put parentheses and quotation marks in the proper places.
#9. Correctly use commas and hyphens.
#10. Correctly choose between similarly-sounding words.

TEN TRAPS TO AVOID WHEN CHOOSING A TEXTBOOK FOR MULTIPLE-SECTION COURSES

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INTRODUCTION

Many departments are similar to the Accounting Department at Appalachian State University which offers a variety of courses, with some of them (such as accounting systems, individual income tax, or cost accounting) usually being taught by only one professor per semester. Selection of a textbook in the single-professor courses usually involves having the professor who teaches the course choose a textbook and then consult with other potential teachers of the course to see if there are any strong objections. The final decision is then communicated to the chairperson of the department. However, when there are several sections of a course – such as principles of accounting I and II (which can have 15 or more sections each at ASU) – the selection of a textbook becomes more complex. When choosing a textbook for such multiple-section courses, there are many traps or pitfalls to avoid. Ten such traps (in no priority ordering) are identified in the following sections as a starting point for a department to use when picking a textbook that will simultaneously serve several professors.

TRAPS TO AVOID

#1. Disclose real or perceived conflicts of interest.

The selection of a textbook for a multiple-section course usually involves the selection of a committee to ultimately choose a textbook or to at least recommend a textbook to the entire faculty or to the chairperson of the department. It is not unusual for one or more members of the committee to have a connection with one of the books under consideration – perhaps he or she wrote or co-authored one of the books, or attended a seminar paid for by the publisher of one of the books, or received remuneration for reviewing a chapter in one of the books, or some other obvious or not-so-obvious possible conflict of interest. Generally, even if a person has a conflict of interest, that person should still be allowed equal representation on the committee and should be allowed to defend or promote the book he or she thinks is best – it is just that the conflict of interest should be disclosed. Large or small, it is best to objectively address and disclose these conflicts as soon as the textbook selection committee is formed. To delay, especially until right before the decision is made (or worse – until right after the decision is made) can cause friction and create ill-will.

#2. Don't vote.

Voting is often the best way to solve a dilemma. However, choosing a textbook is often not the time to invoke this democratic mainstay. Voting creates winners and losers – and all have to use the book chosen. If a vote must be taken, it is best to narrow the choice to two books before voting so that at least the majority of the people voting will end up with a first choice and the rest will at least have their second choice. If the vote is among three or more books, it is possible to end up with a book that is not the first choice of anyone on the committee. How could this happen? Consider the following example (based on a situation that actually occurred): There were five people on the textbook selection committee (P1 to P5) and the choice had been narrowed to four textbooks (T1 to T4). A suggestion was then made to vote by

rank ordering the books, with the first choice getting four votes, the second choice getting three, third choice two, and last choice one vote. The "winner" would be the textbook with the most votes. The outcome was as follows:

	Person 1	Person 2	Person 3	Person 4	Person 5	Total
T1	4	4	1	1	2	12
T2	3	3	2	3	3	14
T3	2	1	4	4	1	12
T4	1	2	3	2	4	12

Which textbook "won"? Textbook T2. Which people "won"? No one. And since, unbelievably, no one got his or her first choice, there were nothing but complaints. Everyone kept pointing out why the book selected was flawed and why the department would have been much better off with that person's first choice. So, if a vote must be taken, structure the vote with few enough books so that there will at least be a majority of "winners" instead of 100 percent losers. Better yet, whenever possible, avoid voting altogether.

#3. Don't choose away from a book.

Sometimes the book currently being used is so bad that a committee member will say something like, "I don't care which book we choose as long as I don't have to teach the one we're using now anymore." The assumption is, of course, that there cannot possibly be anything worse than what is now being used. Such a selection process can belatedly uncover the shocking fact that the pervious textbook was not the worst one available after all – the new selection, unfortunately, is even worse.

#4. Double-check in a new book what the current book does well.

The urge is irresistible to quickly check in a new book anything that the old book did poorly. This is good – but only a start. It is too easy to take for granted the things the current book does well. Accordingly, all topics need to be checked carefully – with equal enthusiasm and focus.

#5. Make sure the book does not cover topics by presenting them for the first time in the problems at the end of the chapter.

When considering a textbook for adoption, the main focus is usually on the material in the chapters with only a passing review of the problems at the end of the chapters. Some unpleasant surprises, however, can sometimes lurk in the problems. For example, a detailed explanation or complete analysis of a topic might be omitted in the chapter, but a question based on the omitted material suddenly appears in a problem. This is very confusing to the students and frustrating to the professor since the topic now has to be taught in order to work the problem, but there is no textbook topic support material. Accordingly, it is prudent to not only check the material covered in the chapters, but also to check the material covered in the problems at the end of the chapters.

#6. Check on the service of the book company representatives.

When adopting a textbook, especially for a "big" adoption for a course with a large number of students, the book company representatives are usually readily available while the decision is being made – and are usually overanxious to make a presentation on the textbook and all it has to offer. The book representatives sometimes even provide donuts, bagels, or other courtesy items for the faculty. However, the real question is how responsive are the book company representatives of the textbook that is chosen

after the textbook is adopted. With multiple-section courses, there is usually a need for a large number of solutions manuals, overhead transparencies, and other ancillary materials. How quickly will the book company representatives respond to requests for materials by the teachers of the course? When possible, check with colleagues in other departments within the university or at other schools that have the same book company representatives and see what kind of representative support has been available to them.

#7. Don't choose a first (or revised) edition without extra close scrutiny.

Textbook publishing companies know there is an aversion to adopting a first edition of a textbook by many educators. Accordingly, the first edition sometimes can consist of only a few copies of the book, which is soon followed by a "revised" edition. Even with the "revised" edition, there are often more mistakes than intended and the textbook can prove to be more disappointing than anticipated. Accordingly, extra close scrutiny is warranted if a first or revised edition is among those books being considered. One recent first edition examined by the textbook selection committee at ASU came with a two-page letter noting corrections, and the book company representative had a timetable for completion of ancillary materials over the next several months. The book was good – but not good enough to take the known risks of the found mistakes and the unknown risks of mistakes yet to be discovered plus the uncertainty of exactly when the ancillary materials might readily be available. Besides, if it proves to be an exceptionally good book, the department will be looking for a new book again about the time the second edition is published.

#8. Write down all the final understandings reached by the committee.

Often the committee that makes the decision in favor of a certain textbook has also decided on either a formal or informal curriculum agenda that the selected textbook will help accomplish. For clarity for the current committee, but more importantly, for people not involved in the decision who may end up teaching the course – such as a part-time lecturer who is hired at the last minute – these understandings and objectives of the committee should be written down. These written guidelines should contain not only the textbook information, but also any relevant items relating to the course that should be disclosed – such as whether common exams (if used) are to be returned to the students or maintained by the professor, as well as topics, if any, that will be covered outside the textbook, and other such items.

#9. Select the textbook as early as feasible.

Too often, even though the textbook committee is formed almost a year in advance – at the beginning of the fall semester to consider a new textbook for the following academic year – the decision is not made until the bookstore's final textbook adoption date, usually sometime after spring break. It is often difficult to finalize a decision until there is some external deadline push to do so. However, with a multiple-section course, there are often items other than the selection of a textbook to be considered, such as chapter coverage and topic sequencing in the textbook chosen, as well as additional topics outside the textbook to be included, and other such items. The sooner the decision on the selection of a textbook can be made, the sooner the focus can shift to the final format for the entire course. Does this mean that the format is textbook driven? Certainly not. But it does mean, for example, that if one of the topics to be covered is financial statement analysis and there is a chapter on financial statement analysis, it will be covered differently than if there is not a chapter on that topic.

#10. Remember that there is no perfect textbook.

Regardless of what the book company representatives say, there is no perfect textbook (unless you happen to be the author). However, this should be reassuring to the faculty. Each textbook will have its own problems. The textbooks to avoid, of course, are the ones with so many problems that they detract from the message being taught. But, when choosing a textbook, remember that the hunt for the perfect textbook will end in vain. The goal, therefore, is to get the best textbook, not the perfect textbook.

SUMMARY AND CONCLUSIONS

A committee assigned the task of choosing a textbook for a multiple-section course is usually made up of several faculty members, each with his or her own professional view of exactly what the best textbook should contain. These views will often differ, and narrowing the field of choices to one textbook can sometimes prove to be contentious. The ten traps to avoid that are mentioned in this paper should help to minimize the negatives of the selection process and help to focus and speed the decision to a mutually satisfactory conclusion.

The Beveridge Curve in the Recovery from the Great Recession: Estimates for the U.S., the South Census Region, and South Carolina

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Abstract

This work estimates the Beveridge Curve (the relationship between job vacancies and the unemployment rate) in the pre-and post-Great Recession time periods at three geographic levels: The United States, the South Census Region, and the State of South Carolina. The data for South Carolina are monthly collected from the Bureau of Labor Statistics unemployment series and online advertised jobs data provided by the South Carolina Department of Employment and Workforce. The data for the US and the South Census region are from the official unemployment series and the JOLTS (Job Openings and Turnover Survey), also from the BLS. The estimations document rightward shifts in the recovery phase at all three levels. Though the data do not support a shift back to the earlier curve for the US as a whole, there is evidence of a shift back toward the "original" curve prior the current recovery for the South Census Region and the State of South Carolina.

The Current State of Economic Development and Supply Chain Infrastructure in Henry County Georgia

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In a decentralized government system, local economies and infrastructures are affected by local policymakers and local governments. County level policymakers have a lot of influence on the well-being of the population living there and businesses functioning in those counties. Fortunately, recent IT, internet, database, and computer developments which made the collection, analysis, and distribution of big data and local level data a possibility, have made it possible for researchers to focus on the local level data and help decision-makers in setting better and more effective policies to benefit their communities. Businesses and households both could benefit from these locally focused researches. Small universities and colleges with limited resources are generally not able to acquire access to the national level data sets and do not have access to nor can influence the national and international level policy makers (and even if they do, they would not be able to compete with the large land-grant universities on a level field). Researchers in the small colleges and universities, however, have comparative advantages in focusing on the local economy and can easily conduct researches focusing on local economies since a lot of the local agencies with access to local data are able to provide them with access to this data in exchange for their expert advice. With this in mind, we are conducting a research to investigate the current state of economic development and supply chain infrastructure in Henry county, Georgia. We will look at the major economic indicators such as employment, unemployment rate, inflation rate, as well as other socio-economic indicators and look at the important transportation infrastructures in Henry county and a few neighboring counties. Given the close proximity to the Atlanta International Airport -the busiest airport in the world-, Port of Savannah -one of the major ports in the US-, and easy access to the railroads, Atlanta and the surrounding counties have always been a natural home for the supply chain companies. While currently this research is in the early stages of collecting, summarizing and analyzing the existing publicly available data, in the next phase of this project we will use the collected information to suggest specific policies to the local government to improve the current state of the economy in this region.

The Development of A Rubric To Grade Students' Written Communication Assignments: A QEP Outcome From A SACS Accreditation Visit

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ABSTRACT

We present the long and arduous process of developing a rubric to grade students' written communication assignments. This effort was one University's Quality Enhancement Project (QEP) undertaken as a result of a Southern Association of Colleges and Schools (SACS) accreditation visit. The initial draft of the rubric was developed by University Academic Research staff and pertained more to Science and Engineering fields. Subsequently a review committee representing all disciplines revised the rubric for use by all disciplines. The University Academic Research staff and faculty committee did an extensive marketing campaign to convince faculty to adopt the rubric. We finish the paper by noting its use in one academic discipline and by the University Academic Research staff in Assessment of Learning programs.

The Future of Business School Curriculum

Abstract

In the past few years business schools have added business intelligence, big data and data analytics courses. The need for these courses is obvious, but could we have anticipated the need for these courses and I introduced them sooner? 10 years ago it could not pick up the computer related magazine without reading an article on one of these topics. Today, the same is true for artificial intelligence. Should we be adding the use of artificial intelligence to our curriculums?

Introduction

Business intelligence, big data, data warehousing, data mining, data analytics, data scientists, and the list goes on terms that are used to describe the analysis of an organization's historical data to improve the firm's operation. Be this for predictive modeling, efficiency improvements, discovering unknown relationships internal and external data.

Business schools are rushing to add these courses to their curriculum.

History of business intelligence and business analytics, etc.

Future trends

Introduce Moore's Law and the effects of exponential technological development.

Artificial intelligence overview.

Current AI applications and business

IBM's Watson

Integrating artificial intelligence into the business school curriculum

The full capabilities and applications of artificial intelligence is the great unknown. Artificial intelligences applications and uses in all business disciplines.

Accounting

AI is automatically detect and code information and in unstructured formats so it could be considered and analyzed.

Finance

Artificial intelligence systems are already used by companies buying and selling stocks. Soon it will be evaluating credit worthiness of individuals and organizations, making credit bureaus and Dun & Bradstreet reports worthless.

Management

AI can suggest ways to motivate workers. Make recommendations on benefit offerings.

Marketing

AI suggests additional products to a customer. Allow true customization for the customer's experience. Automate much of the evaluation and decision process in purchasing.

Recommendations and conclusions

This section of paper will suggest ways artificial intelligence concepts can be incorporated into the business school curriculum.

The Future of Digital Assistants: Consumer Willingness to Invite Alexa and other Smart Devices in Their Home

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ABSTRACT

This research explores the various types of Intelligent Assistants becoming available to the home use consumer. It explores the issues surrounding the use of and attitudes towards personal digital assistants in the consumer home (e.g. Alexa, Google Home). An electronic survey distributed via campus email. It contained demographic and scaled items to measure perceived usefulness of a digital assistant, privacy concerns and technology involvement. Findings indicate that current users of digital assistants have found them to be useful while non-users are yet to be convinced. Privacy is a concern for all respondents with little difference found between demographic or user groups. The discussion includes approaches that could be used to change consumer negative attitudes.

Keywords

Intelligent Assistants, Intelligent Agents, Internet of Things, Digital voice assistants, Alexa, Google Home, privacy

Introduction

The Internet of Things invasion has begun. The Smart home is a reality in many devices are being introduced to retrofit all homes and make them smart. These devices include smart thermostats, security systems, (that included: smart door locks, motion detectors, video cameras, firearms, carbon monoxide detectors, we detectors, and other systems), music streaming devices, smart light bulbs, smart electrical receptacles, sprinkler controls, coffee makers, smart cookers, just to name a few. Most all major Internet companies (Apple, Amazon, Google, Microsoft) are making big investments in developing these products. Most other large conglomerates are offering products (LG, Honeywell, Phillips, Logitech, just to name a few). Additionally, there are many more smaller companies specializing in smart devices (Nest, iHome, Ring, Greeni, Hive and many more).(Lagace, 2018)

Smart speakers in January 2018 are in an estimated 39 million households, an increase of 128% from a year earlier. Replacing radios, phones, TVs etc. these devices will be in our autos, TVs and even at work in the future. Top tasks include playing music, answering questions, getting the weather, telling a joke and controlling other home devices (NPM, 2017) (Perez, 2018).

Privacy Issues and Concerns

What did I say? These devices monitor sounds, listening for a specific "wake word" to begin recording. Your recorded utterances are stored on the company's server. It is this recording and storing that is the cause of most privacy concerns (Review, 2017). In a world where fears of the complete loss personal privacy are held my many, these devices are truly Orwellian evoking images of "big brother is watching all we say" (Orwell, 1949). "Google has acknowledged an issue with a limited number of its brand new web-connected speakers that listened—too much—to what their owners were saying" (DARROW, 2017).

Method

An electronic survey using Survey Monkey was distributed via campus email to all email addresses at a regional university. The survey was constructed to obtain demographic information and using a 5 point Likert scales to measure attitudes and behaviors with regard to technology in general and digital assistants in particular.

Several scale items were adaptations of items from the Technology Readiness scale (Lin, 2006) (Lin L. a., 2007) (Walczuch R., 2007).

- I usually use the latest technology available
- It is difficult to learn a new technology
- I am often asked for my advice when it comes to technology
- Technology generally doesn't interest me
- I would rather talk to a person than to a machine

Other scale items were developed to address privacy concerns. For example:

- I am concerned about the amount of private information collected by technologies today
- Law enforcement should be able to access data collected by a digital voice assistant without a warrant
- I am not concerned about my privacy when using a digital voice assistant

Additional items were used to measure consumer perceptions of usefulness when using a digital assistant such as:

- Using a digital voice assistant in my home would make my life easier
- I feel the benefits of using a digital voice assistant outweigh the costs
- A digital voice assistant would help keep me organized

Results

A sample size of 389 was obtained through the emailed survey. Only 12% or 49 indicated they were currently using a digital voice assistant in their home. Seventy-two percent of the sample is female and 40% are non-students.

When analyzing for differences in means for scale items, current user experience with a digital assistant led to significantly different means for several items, generally dealing with perceptions of usefulness. Users are more likely to agree to the usefulness of activities such as

- recording, both audio and video
- performing Internet searches
- making adjustments in lights & climate control

Very few differences existed between the mean levels of agreement of male and female respondents. Women were less likely to agree to opinion leadership in technology, audio recording capabilities and shared data leading to better customer service. Men had a higher level of disagreement with collected data being obtained w/o a warrant.

Privacy is an issue for all respondents. Most respondents agreed with being concerned with the level of personal information collected and the recording of conversations. Respondents felt that information collected by the digital assistant should remain private and not available to law enforcement without a warrant. Some significant differences were found between users and non-users, gender and age groups in the privacy scale items but all privacy means were grouped towards either agreement or disagreement, depending on the direction of the scale item. See Table 1 for comparisons of item means between male and female respondents.

Table 1: Male and female item means*

Scale Item	Overall Mean	Female Mean	Male Mean	Sig.
I usually use the latest technology available	2.84	2.81	3.00	.141
It is difficult to learn a new technology	3.41	3.38	3.56	.159
I am often asked for my advice when it comes to technology	2.83	2.90	2.59	.034
Technology generally doesn't interest me	3.65	3.57	3.88	.014
I am concerned about the amount of personal information collected by technologies today	1.85	1.86	1.84	.862
Using a digital voice assistant in my home would make my life easier	3.32	3.33	3.28	.664
I would rather talk to a person than to a machine	1.93	1.93	1.99	.619
I would find it very beneficial to use a digital assistant for everyday tasks around the home like adjusting the thermostat or lights	3.10	3.07	3.16	.527
A digital voice assistant would keep me organized	3.28	3.30	3.22	.554
The ability to ask the digital voice assistant to [perform an internet search is an important feature	2.94	2.93	2.97	.774
I like the idea of remotely viewing my home using the camera function of a digital voice assistant	2.39	2.38	2.39	.912
I like the fact the digital voice assistants are able to automatically audio record conversations in my home	4.16	4.24	3.95	.022
The information collected by digital voice assistants in my home should remain private	1.25	1.24	1.25	.873
When information collected by digital voice assistants is shared with other organizations, customers receive better service	3.80	3.90	3.55	.008
Law enforcement should be able to access the data collected by a digital voice assistant without a warrant	4.28	4.22	4.52	.026

I feel the benefits of using a digital voice assistant outweigh any of the costs	3.76	3.80	3.69	.348
I am not concerned about my privacy when using a digital voice assistant	4.08	4.15	3.90	.080

*1 = Strongly Agree and 5 = Strongly Disagree

While there were a few item means with significant differences between age groups (e.g. technology use and opinion leadership), most age groups responded rather consistently to the privacy aspects of using a digital voice assistant. Across all age groups they were concerned with privacy in general, as well as obtaining collected information without a warrant, automatic recording, and other issues.

The questionnaire also included an open-ended question to obtain a more complete view of the negative attributes or circumstances thought of when using a digital assistant in the home. Two hundred and five respondents elected to provide a comment. Several respondents provided concerns regarding functionality. They noted the assistants might be difficult to implement with the necessity and cost in upgrades for connectivity in the home. They were concerned that commands may be misunderstood resulting in the wrong actions and orders being placed incorrectly. Others noted that the use of an assistant was related to laziness. A few respondents mentioned potential problems with accents and voice recognition. A much larger portion of the respondents, over half (111) of the comments, referred to concerns regarding privacy and security in the home. Issues noted were the potential for hacking, for conversations being recorded, family members spying on each other, personal information being compromised, and government/law enforcement intrusion.

Discussion

The results of this study show that the users of in-home digital assistants are lot more likely to be of one gender or another, of one age than another or any other demographic grouping. All are concerned with the sharing and/or recording and accessibility of their personal and private information. These findings are repeated in the responses to open ended questions where respondents indicated not only a concern for the security and misuse of the private information, but also for the usefulness of the device and its perceived ability to change behavior (e.g. “I’ll become lazy.”)

Smart speakers are going to continue to invade our lives. NPR and Edison research findings indicate one in six Americans have one in their home (NPM, 2017). This technology has deep implications for individual privacy rights, which current laws do not adequately address. While they continue to improve the quality of our lives by being intelligent assistance, they also open us to invasion of personal privacy. The decision to use depends on whether the advantages outweigh the threats. Our research indicates many people are concerned and have chosen not to purchase this technology.

Study limitations include a sample with a majority of student respondents, approximately 60%. While students may be more technological savvy and wiling to use, they may not have the resources, financial or otherwise for the need or ability to purchase and use a digital assistant. The survey used did not ascertain home ownership or other characteristics of residence. Renting versus home ownership, roommates, still at home, etc. may also impact the usage and ownership of a digital assistant.

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The Generalized Assignment Problem: A Lagrangean-Based Branch and Bound Algorithm

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ABSTRACT

The generalized assignment problem (GAP) is described as finding a minimum-cost assignment of tasks to agents such that each task is assigned to exactly one agent and such that each agent's resource capacity is not violated. Hard GAP instances may be defined to be those that take more than one hour of CPU time to prove optimality.

Tremendous strides have been made in the capability of "off the shelf" solver software, such as GUROBI and CPLEX, to solve general integer linear programs (ILP) to optimality. However, certain classes of ILPs remain difficult to solve to optimality in a reasonable amount of time. Some instances of the GAP exhibit this behavior. While good feasible solutions (those with a small gap between the value of the best feasible solution and a global lower bound) are found relatively quickly, the issue remains in proving optimality in a reasonable amount of time. GUROBI and CPLEX both use linear programming (LP) as their relaxation solver. Variable selection for branching is confined to the set of variables that assume a fractional value in the LP relaxation. In our algorithm we utilize a Lagrangean relaxation where all solution variables assume an integer value, but where the multiple-choice constraints for the tasks may be violated. Branching selection focuses on the violated multiple-choice constraints. The Lagrangean relaxation devolves into a set of independent 0-1 knapsack problems which are solved to optimality with the minknap solver of Pisinger (1997).

Initial global lower and upper bounds on the GAP are obtained from a column generation approach that utilizes a sophisticated "triple" dual stabilization technique in combination with a diversified diving heuristic due to Sadykov, Vanderbeck, Pessoa (2015). These lower and upper bounds are then used to generate a parametric list of penalties for the problem variables. We also generate a parametric list of lower bounds for the resource usage of each agent. Then as improved upper bounds are found, we are able to efficiently introduce tighter constraints for the GAP "on the fly" which reduces the feasible search space.

We utilize a test set of 140 GAP problems ranging in size from 2250 to 8000 binary variables. A "plain vanilla" implementation of GUROBI 7.5.1 is unable to solve 139 of the problems to optimality with an individual CPU time limit of 75 minutes. Computational algorithmic results are presented.

THE ILLUSION OF CONTROL AND OVERCONFIDENCE AS AN OBSTACLE TO LEARNING

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ABSTRACT

Illusion of control, in its purest definition, refers to the tendency of people to develop a belief that their actions and decisions affect the outcome of an event over which they demonstrably have no control. The classic illusion of control belief develops over gambling and games of chance ruled by probabilities. However, there are many other situations in which an illusion of control may distort a decision-maker's thinking. When decision-makers reduce problems to mathematical terms, they reduce decision-making to numbers. This may produce a false impression of precision in the inputs and outputs of the decision itself. This gives decision makers an illusion of control over situations that are much more fluid, fuzzy and subject to uncertainty than they seem to be. Students, particularly those who suffer from a resistance to learning may, on the other hand, transfer that resistance to a rejection of mathematically produced answers on the basis that they are unfamiliar with the techniques and that intuition and, perhaps even prior experience, dogmatic belief, and the desire to reject learning something new, will produce superior answers in the long run.

Introduction

The Illusion of Control, first named by psychologist Ellen Langer, was initially applied to gambling and to superstitious beliefs. It is described most often as a tendency for people to overestimate their control over outcomes of events over which they have no influence. Since that time, the concept of illusory control has been examined in a wide variety of circumstances and contexts. For example, most recently, Borges and Janissek-Muniz examine the effect of illusion of control on managers' environmental scanning and its effect on decision-making. The illusion of control is usually classified as one of the positive illusions, along with illusory superiority and optimism bias.

Motivation has often been advanced as the key to understanding the illusion of control where it arises. Psychologists have examined the importance to the individual of control over one's life, over one's environment, as well as control over achievement and competence. The illusion of control has been seen sometimes as an aid to mental health in those contexts where it can promote a positive self-image. However, when the illusion of control is classified as a cognitive distortion for gamblers, it can be associated with well-identified motivations for gambling and for the behavior classified as problem gambling.

The illusion of control leads to overconfidence in a variety of situations. Overconfidence, though, may not be based simply on an illusion of control, or motivations for an activity, but rather on other, more persistent, factors, including basic personality traits. Illusion of control may be associated with the Core Self-Evaluation (CSE) trait, which includes Locus of Control, Neuroticism, Self-Efficacy and Self-Esteem. If illusion of control flows from personality traits under the influence of specific environments or situations,

then the approach to addressing problems associated with the illusion of control might be radically different from simply addressing overconfidence caused by other motivations. This is particularly important a point for two reasons. First, illusion of control shows persistence in the face of objective evidence as to falsity of the sense of control. Secondly, in decision-makers in general, and students particularly, the persistence of the illusion, its immunity to rational evidence, and its continued effect on decision-making, may carry over from studies to managerial career work.

Managers deal with actions, behaviors, decisions and outcomes in practical applications of leadership, organization, control and planning. Motivations, attitudes, beliefs and personality normally become important only in view of observed behavior. However, most effective managers grope for an understanding of motivation and attitudes to shape managerial response to behavior, either to encourage its continued manifestation or to discourage undesired behaviors. To that extent, scientific research into the antecedents of motivation and behavior, especially as it affects predictions of effective rewards and reaction to rewards offered, is important to managers as well. Work behavior is that behavior manifested on the job and covers a wide variety of areas in that arena. There is behavior in teams, relationships maintained by subordinates with their supervisors and managers, with peers and newly assigned personnel, with changes of work procedure or organization or changes in technology. There is also behavior associated with personal characteristics of attendance, tidiness, conscientiousness on the job, reaction to rules and regulations, attitude toward people of the opposite sex on the job, people of other races or cultures on the job, and so forth. Of course, the behavior that a person demonstrates on the job, because of the work environment, may differ from behavior in other environments. This is a demonstrated fact of human behavior in general and represents the social nature of the human species. For instance, one's behavior in a formal church setting might differ quite a bit from one's behavior under other, less formal environmental conditions.

University Students as Decision-Makers

Students are decision-makers. The challenges of their decisions may seem relatively trivial compared to that of a member of a top management team executive of some large corporation, but they are momentous to the individual and they represent practice, as well, for larger decisions "off the playing field". For example, students make decisions as to how much to study and how to study, when to complete assigned tasks, how many academic hours to take per semester and, very importantly, how many hours to work to support themselves. Having a sense of control promotes in the student good striving toward goals but can lead to poor decision-making. The illusion of control is associated with insensitivity to feedback, impedes learning, and lends decisions a movement toward greater objective risk. It promotes literally and figuratively "magical thinking".

A student, for example, is facing a 40-question multiple choice exam with four distractors per question. If the student confidently and accurately assesses his or her knowledge at about 50% of the material covered, he or she would expect to answer 20 questions correctly without any problem. In order to get a grade of C on the exam then, they might evaluate that they must get at least 8 of the remaining 20 questions correct. This might lead the overconfident student to determine that a C is certain and to then forgo studying the night before the exam. It might not be possible to convince the student that there is only about a 10% chance of getting 8 of the remaining questions right on pure chance.

Much subtler is the problem of convincing students of the correctness of management science optimization solutions, or of the soundness of statistical probabilities based on expected values and relationships such as linear regression and statistical hypothesis-testing. Most students will accept the task of learning the

procedures and the logic behind the calculations – at least for the purpose of passing the courses – but there may be as many as 6% of students who actively resist the solutions derived, even if they demonstrate competence at the calculations required.

Students develop expectations of how much study time is normal for a course, and the expected grade they will attain in the course. They make decisions about learning statistical concepts and they decide what kind of study strategy will be most useful. Almost always, overconfident students will develop an expectation of learning style they prefer and react to the teaching style presented to them. These are the sort of decisions which can persist in the face of evidence suggesting other approaches when overconfidence interferes with feedback.

Student Dogma

It is rare to encounter a student who has not formed a strong opinion as to "what type of learner" he or she is, and the most effective learning style for them. Implicit in that is the idea that the teaching style ought to match the learning style, and further, if it does not, the instructor is ineffective. Despite the popularity of the concept among students and some educators, the scientific evidence supporting superior performance for matching of learning styles to teaching styles is very thin. Many students are likewise familiar with the "Learning Pyramid" (Dale, 1946) which is often cited as demonstrating how poor lecturing and reading are as methods of learning because of low retention rates. This sometimes becomes an excuse for not attending class, not taking notes, or not completing reading assignments. Because "active learning" is interpreted as Discussion, Practice and Teaching Others in the pyramid, students often express a preference for these methods. Overconfidence in one's own ability to draw on social interaction to learn material may represent an illusion of control in an area of preferred activity.

The seeming resistance to learning that teachers at all levels encounter among students may be rooted in basic personality characteristics rather than in superficial or transient conflicts invoked by situational conditions. Because of a natural focus on the situation at hand, the interpersonal nature of learning and teaching, and a desire to find factors which can be controlled with immediate effects, there is a tendency to ignore deeper issues of personality and to examine present environmental conditions. However, there are some great difficulties with this basic approach. What is student behavior may, in fact, manifest itself in terms of worker behavior later in a person's career. Having focused on conditions of classroom, so-called learning styles, interpersonal conflicts with an unliked teacher, or subject, for example, the root factors involved in the behavior, its motivations and the way effective leadership may address prescriptively undesired behaviors and outcomes, may be less effective.

Methods

Background

Illusion of Control studies have been based on laboratory experiments, observational field studies and quite often on self-report of real-world behavior. There has been some theoretical development in the field as well, but there is considerable room for much further development and certainly room for much more supporting evidence for findings so far established. The overarching goal of this stream of research is to ultimately produce a model of decision-makers' behavior to predict the influence of the illusion of control on individual and organizational decision-making. More modestly, this present study seeks to establish the possible existence of illusion of control amongst university students in business schools where decision-

making as an applied science is examined. As such, the first step is to examine student behavior and attempt to associate that behavior, both self-reported and observed, with a possible illusion of control manifestation.

Situations where illusion of control is observed show some common characteristics: the situations are familiar to the subjects; the outcomes desired are known; systems that emphasize "success" feedback and deemphasize "failure"; situations that are attached to a strong emotional need to control the outcome; stressful, competitive situations; situations that are heavily chance-oriented; situations that allow practice runs, predictions before the trials are run, and where the subject makes his or her own choice; situations in which most of the correct answers occur at the beginning of the trial; and situations that allow the subject to transfer responsibility to another, "luckier" person.

Langer established the importance to the illusion of control to what she named, "skill cues" – that is, factors that tended to convince a subject of the possibility of control over a chance situation. Such cues are having a choice, competition with others, familiarity with the activity, and involvement in decision-making.

It may be possible to establish, therefore, situations which are not clearly and unambiguously subject to random or chance outcomes, but that still lend themselves to influence from the illusion of control over outcomes that are in some way outside the control of the subject. Those situations which encompass the basic characteristics that encourage illusion of control and are at least in part subject to chance or factors beyond one's control may be candidates for study.

Also, situations involving "magical thinking" are candidates for study, where magical thinking is defined as observation of a phenomenon with no rational explanation as to its cause. Beliefs based on false or misleading evidence or without evidence at all, might represent a situation in which the illusion of control might manifest itself.

For the first, exploratory examination of student behavior in the situation of a semester-long course in basic statistics, a self-report of suggestions for improving the course was filled out upon completing the course. 30 students completed the course and 21 students filled out the evaluations. Of the 21 evaluations, there were 14 generally negative notations under "what was wrong with the course." Fully 7 of the 14 negative observations were coded as objecting to the lecture style of instruction. "Not lecture", "course too fast-paced", "instructor talks at us", "never felt engaged", were some of the free-form observations. Other comments were related to the form of instruction in that there were complaints that not enough demonstration problems were done in class, or the examples demonstrated were not like the problems on the exam. On the other hand, students in Likert scale ratings generally agreed that the instructor was well-prepared, explained things clearly, with clear goals and objectives and answered questions appropriately.

One student specifically complained that the instruction was poor and the only reason they passed the course was by forcing themselves to study 6 hours a week. That represents two hours of reading and working practice problems for every 50-minute class session.

Further refinement of the survey instrument can establish the eight characteristics of situations that encourage illusion of control as it applies to the semester-long class. Students obviously feel a strong need to assert control over the environment, to control the pace of instruction and the amount of material presented in the semester and they underestimate their control over outcomes when they really have control.

Pilot studies will associate those who demonstrate illusion of control characteristics with certain personality traits, such as an internal locus of control, similarities in neuroticism, self-efficacy and self-esteem. Situations in which personality traits are matched to poor decision-making processes in environments that are believed to encourage illusion of control beliefs can then be used to eliminate in at least some instances,

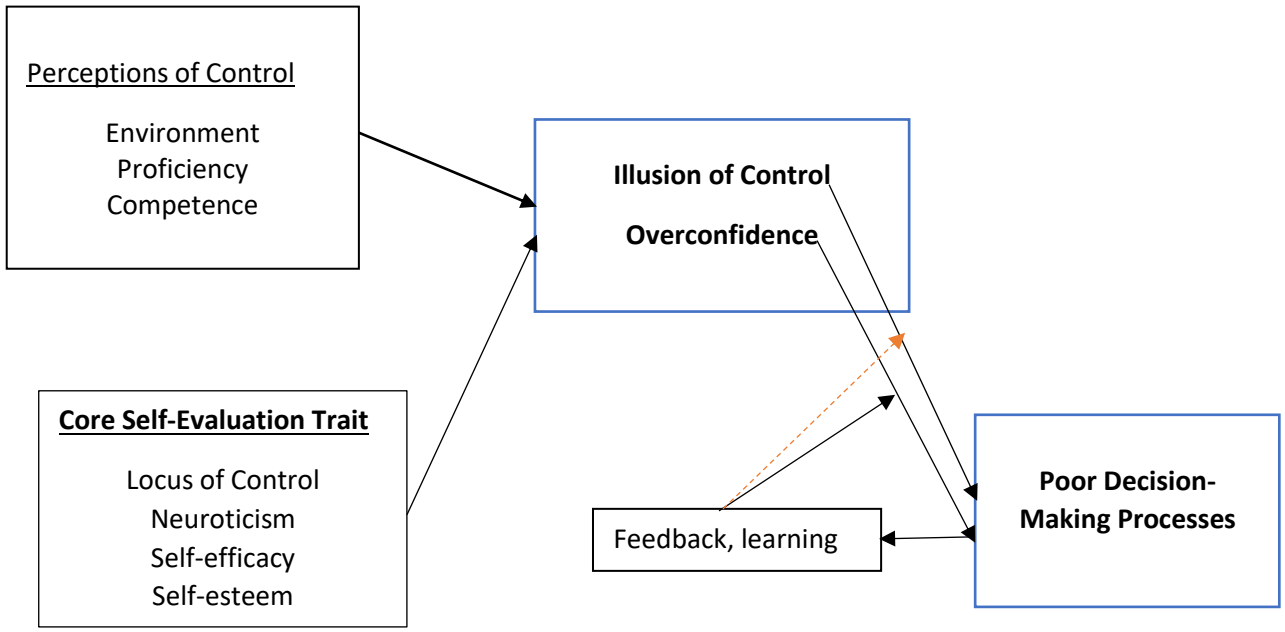
those decisions that are motivated by overconfidence related to other causes than illusion of control. The goal is to establish the magnitude of true illusion of control and of overconfidence not related to illusion of control.

Research Model

The research model providing the structure for this study is illustrated in figure 1. Both illusion of control and overconfidence are perceived as connected to poor decision-making processes. However, it is posited that overconfidence is moderated by learning and feedback, whereas illusion of control is much less likely to be influenced by feedback. Although both overconfidence and illusion of control are thought to be founded in some basic personality characteristics, such as locus of control, illusion of control may be more deeply rooted in the Core Self-Evaluation (CSE) trait. That is, locus of control interacting with neuroticism, self-efficacy, and self-esteem are thought to produce the persistent nature of illusion of control. The nature of that connection with the CSE trait and of the interactions are not yet established.

Illusion of control is state of mind produced by personality traits of a person manifesting themselves in specific kinds of situations. Those situations are familiar to the subject, the outcome desired is known, the feedback from results to decision-making process is attenuated as to failure, leaving an increased influence of the success feedback, and there is a strong emotional need to control the outcome. The situations likewise are stressful and competitive, and illusion of control is enhanced by practice runs, predictions of results before the trial, and when subjects make their choices in execution. These are the "skill cues" of Langer.

Figure 1



Hypotheses

i. Persons tending to Illusion of Control syndrome have identifiable personality characteristics.
ii. Illusion of Control tendencies are relatively stable and are not easily influenced by failure of results in any instance.
iii. Illusion of Control tendencies are associated with internal locus of control personality characteristics.
iv. Illusion of Control syndrome interferes with the learning of statistical techniques and with evaluation of statistical results.

Discussion

Key to testing the link between certain personality characteristics is to correlate personality measures with observed behavior in situations considered conducive to expression of illusion of control and to self-reports indicating a tendency to illusion of control behavior. Observed or self-reported behavior of interest would include overconfidence in expected performance, resistance to negative feedback, reliance on luck or chance for outcomes important to the subject, an overreliance on intuition or guessing, a tendency to ignore formally calculated probabilities or expert estimates of outcomes. Students might exhibit this behavior in connection with decisions of how much to study in preparation for exams, whether to attend lectures, estimates of what grades they will obtain in the course of study and what effort will be required to obtain that grade.

Once the connection is established between personality traits, such as Core Self-Evaluation traits, and resistance to negative feedback demonstrated, the hypothesis concerning stability of the illusion of control syndrome may be established. Ideally, longitudinal studies of subjects once they have graduated from college and entered the work force could confirm the persistence of the personality traits and the manifested illusion of control. There remain questions concerning exactly how self-evaluation traits are related to the tendency to illusion of control. Although it might logically be inferred that a strong internal locus of control would tend to relate to the illusion of control, this hypothesis must be tested, particularly as very little research into personality traits and personality "types" has shown a straightforward linear relationship.

Since learning is a complex process involving change in the learner, it is supposed that unrealistic estimates of effort, emphasis on motivations other than learning and self-editing of feedback information will interfere with that learning. In particular, the learning of statistics which require an understanding of rational

evaluations of probability and of the accuracy of statistical techniques, would suffer for a person exhibiting a tendency to illusion of control.

Summary

The pilot study described here points the direction of the identification of situations and processes that present an opportunity to students to develop bias based on an illusion of control or overconfidence. Refinement of questions, more detailed answers soliciting student opinions and consideration of questions while the situations are fresh in mind, rather than after the course is finished, may provide more exact data with a much larger sample of the population of interest.

Answers to these questions could lead to more effective techniques for addressing the needs of students who tend to find themselves overestimating their chances of good performance and underestimating the level of effort required to reach desired goals. In addition, students who understand this aspect of their personalities may better be able to contribute to organizational decision processes, understanding where overconfidence may be harmful and where it may serve to check overly pessimistic evaluations of environments and situations.

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The Impact of Real Options on the Value of Perfect Information

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Risk is typically considered to be present when there is a non-zero probability of a loss or negative outcome. However, in decision making under uncertainty, "risk" can still exist even if all possible outcomes are positive, because of the probability of not making a choice that maximizes the terminal outcome. The issue under investigation in this paper is the amount that an individual would be willing to pay for information that removes the probability of making an incorrect choice, EVPI, but more specifically, the role of real options in generating alternatives that increase EVPI.

Standard NPV analyses has long been recognized as incomplete in the sense that it understates the actual value that can be added to the firm. If there is only one investment alternative available, an analyst is restricted to the computed metrics, including exposure to total risk (standard deviation), without the ability to increase expected returns or mitigate risks. The development of real options or alternatives can add value to the investment but should also decrease the exposure to risk.

The term "real option" was to our knowledge first suggested by Myers (1974, 1977) in the context of the characteristics of numerous corporate assets. Real option values take the same functional form as a financial option with terminal payoff values of $Max(S - X, 0)$ for a call option and $Max(X - S, 0)$ for a put option where S is the market value of the underlying asset (the investment opportunity) and X is the strike price or cost of the investment project.

Financial options can be written on virtually any security that trades and sometimes even on those that don't, such as the volatility index on the S&P 500, the VIX. As such, the trading volume for financial options is often large and only rarely does the exercise of an option result in the purchase (call option) or sale (put option) of the underlying asset. In contrast, real options do not require an underlying asset and don't trade; The lack of trading makes valuation difficult. Moreover, real options can be *created* by managers and are often related to flexibility in carrying out projects.

In this analysis we emphasize the importance of generating alternatives for new investments and those that have already been undertaken. Firms may have the ability to expand, contract, abandon, delay, etc. existing projects but these options can be addressed before an investment is undertaken. In the numerical example that follows, if the firm has only one alternative to production the decision to accept the

project is positive. But, when the firm has an option to delay or stagger production so that there is a revelation regarding the state of nature, the value increases and the risk decreases. In addition, without another alternative, the expected value of perfect information cannot be computed.

Before proceeding with a review of EVPI, we note that much of the literature on EVPI appears in medical journals as decision makers weigh the cost of future testing. The option to "wait" is not likely as applicable in medical decision making as it would be in, say, oil drilling.

Review of EVPI

The functional form of EVPI begins with the definition of expected monetary value (EMV). Given a payoff matrix R_{ij} where i is a row index defining an individual's choice and j is a column index describing a random variable (discrete in this case) with probability p_j of occurrence. The expected monetary value is

$$EMV = \max_i \sum_j p_j R_{ij} \quad (1)$$

Where $\sum_j p_j R_{ij}$ is the expected payoff for decision or action i.

Equation (1) is risk-neutral decision making. On the spectrum of decision making under uncertainty, with risk seeking at upper limit extreme and risk avoidance at the lower, equation (1) falls somewhere to the right of risk aversion. Consider equation (1) in comparison to equation (2).

$$(EV|PI) = \sum_j p_j \left(\max_i R_{ij}\right) \quad (2)$$

The acquisition of information is clearly a move towards risk aversion as individuals seek to mitigate the probability of making an incorrect choice. In equation (1) the maximization argument is applied *a priori* whereas in equation (2) it is applied *ex post*. The order of maximization adds to the expected value; this quantity is shown in (3).

$$EVPI = (EV|PI) - EMV \quad (3)$$

The quantity shown in (3) is the maximum amount that a firm or individual would be willing to pay for perfect information.

A Numerical Example

This example was found in "Capital Budgeting and Long-Term Financing Decisions" by (Seitz and Ellison,*Dryden*, 1999, p 396-7).

> Harvey Publishing Company, a small publisher in Columbus is considering a new book. Typesetting and related costs to prepare for production are $10,000. It will cost $2.00 per copy to produce the book. If additional copies are needed at a later time, the set-up cost will be $5,000 and the cost per copy will again be $2.00. The book will sell for $14.00 a copy. Royalties, commissions, shipping costs, etc. will be $4 a copy. If the book gets good reviews, it can be expected to sell 5,000 copies a year for 3 years. If it gets bad reviews, sales will be 2,000 copies in the first year and will then cease. There is a .3 probability of a favorable review. Sally Harvey, president, faces a choice between ordering an immediate production run of 15,000 copies or a production run of 5,000 copies followed by an additional production run at the end of the first year if the book is successful. All production runs must be in increments of 5,000 copies. Harvey uses a 10 percent required return for evaluating new investments. She will pay no taxes because of prior losses, and her capital is very limited. Use decision tree analysis to recommend a production schedule and decide whether to publish the book.

When completing the analysis we assume that the second production is not available and must be generated as a real option by management. This serves to advance the narrative of the importance of real options and the expected value of perfect information.

Print 15k Books Today – Row One of the Payoff Matrix

For this investment proposal there are two possible outcomes, good review and bad review, with probabilities 0.3 and 0.7. Regardless of the outcome (or state of nature), the firm will incur the cost of setup and printing the books. For this case, take an optimistic view in spite of the probability of a good review and print all of the books at time 0. That is, the initial investment cost is,

$$CF_0 = 10{,}000 + (2)(15{,}000) = \$40{,}000$$

Good Review:

$OCF_{1-3} = (5k)(14-4) = \$50{,}000$ (Operating cash flows years 1-3)

Therefore, the net present value is

$$NPV_{GR} = \frac{50{,}000}{(1.1)^1} + \frac{50{,}000}{(1.1)^2} + \frac{50{,}000}{(1.1)^3} - 40{,}000 = \$84{,}342$$

Bad Review:

$OCF_1 = (2k)(14-4) = \$20{,}000$ (Operating cash flow year 1 only)

and the NPV is

$$NPV_{BR} = \frac{20{,}000}{(1.1)^1} - 40{,}000 = -\$21{,}818$$

The expected NPV is $E(NPV) = (.3)(84{,}342) + (.7)(-21{,}818) = \$10{,}030.$

The Option to Stagger Production (Wait) – Row Two of the Payoff Matrix

In the numerical example we are solving, the flexibility to produce 5,000 books today is an *option* to (i) wait or (ii) delay/stagger production. The value in this option lies in the realization of the outcome. At $t = 0$ the manager knows only the probabilities of good and bad reviews. At $t = 1$ the manager has *perfect* information but it only available through the passage of time.

The initial investment cost is

$CF_0 = 10{,}000 + (5k)(2) = \$25{,}000$

Good Review:

$OCF_{1-3} = (5k)(14 - 4) = \$50{,}000$ (Operating cash flows years 1-3)

$CF_1 = 5{,}000 + (10k)(2) = -\$25{,}000$ (Cost of second production run)

The net present value is

$$NPV_{GR} = \frac{25{,}000}{(1.1)^1} + \frac{50{,}000}{(1.1)^2} + \frac{50{,}000}{(1.1)^3} - 20{,}000 = \$81{,}615$$

Bad Review:

$OCF_1 = (2k)(14 - 4) = \$20{,}000$ (Operating cash flow in year 1 only)

The net present value is

$$NPV_{BR} = \frac{20{,}000}{(1.1)^1} - 20{,}000 = -\$1{,}818$$

The expected NPV is $E(NPV) = (.3)(81{,}615) + (.7)(-1{,}818) = \$23{,}212.$

Expected Monetary Value

The expected monetary value is

$$EMV = Max(10030, 23212) = \$23{,}212$$

This quantity appears in the finance literature as a real option adjusted net present value. That is,

$$NPV^* = NPV + Real\ Options \Rightarrow \$23{,}212 = \$10{,}030 + Real\ Options \qquad (4)$$

The perspective of finance theory is that $13,182 is added to the project through the real or managerial option.

Expected Value of Perfect Information

The payoff matrix R_{ij} noted earlier is,

	State of Nature	
Decision Alternatives	**Good Review (.3)**	**Bad Review (.7)**
Method I	84,343	81,615
Method II	-21,818	-1,818

From (2) $(EV|PI) = \sum_j p_j \left(\max_i R_{ij}\right) = (.3)(84{,}343) + (.7)(-1{,}818) = \$24{,}030$

And from (3) $EVPI = \$24{,}030 - \$23{,}212 = \$818$

Discussion

In the case where a firm or individual has only one option a decision is made on the expected outcome. In the example we used, the decision is based on the $E(NPV) = \$10{,}030 > 0$; otherwise, the decision is to reject the investment. We then analyzed the case where production can be staggered. This option adds $13,182 to the NPV and changes the expected monetary value to $23,212. The final analysis is to find the expected value of perfect information, $818. This is the maximum amount that an individual would be willing to pay for information that allows for a correct choice given an observed state of nature. For a cost of information in the range $[0, 818]$, the project has an expected value in the range $[23212, 24030]$.

The range of project value has occurred in two steps. First, an alternative or alternatives (real option(s)) with positive value must be generated by managers if they do not exist. This allows for maximizing among competing and mutually exclusive alternatives to find the expected monetary value. Second, for any cost of information less than the EVPI, more value can be added to the investment.

The thrust of this analysis is to demonstrate the importance of firm flexibility that allows managers to develop alternatives with positive value (real call and put options). In some cases, EVPI analysis may not be applicable due to the lack of alternatives.

Summary

EVPI analysis typically starts with alternatives being well defined. We emphasize the importance of exhausting all alternatives and including them in the computations. This process can increase returns and be useful in attenuating exposure to risk.

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The New AACSB Business and Accounting Accreditation Standards

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ABSTRACT

A Workshop for All Business School Faculty

This panel consisting of a currently serving Chair and a recently "Retired" Chair, whom together have over 20 years of experience as chairs and whom have successfully lead their departments through three successful AACSB Peer Review Visits. The one Chair has just concluded a three-year term on the Accounting Accreditation Committee and has served on 15 peer review teams.

The standard changes focus on the AACSB Business Standards revisions before moving on to the more dramatic changes to the Accounting Accreditation Standards that include: Changing the status of Accounting Accreditation as supplemental to Business School Accreditation; strategic planning; assurance of learning; faculty sufficiency; the integration of IT and Data analytics into the curriculum; and student placement and success.

This session is meant for all business school faculty since their involvement in a PRT visit is essential for successfully maintaining accreditation. Some faculty still do not understand the Assurance of Learning (AOL) standards.

This session is meant to be interactive with active audience participation.

The Next Step: Recommendations from Journal Editors and Reviewers

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ABSTRACT

A panel of journal editors will discuss how to mature your conference presentations and papers into a published article in a peer-reviewed journal.

The Relationship between Foreign Direct Investment and Economic Growth in Developing Caribbean Countries from 1990 – 2015

Abstract

Foreign direct investment (FDI) is a popular financial tool in especially developing countries to stimulate their economic growth. Caribbean developing countries in particular have been receiving one of the world's highest FDI inflows relative to GDP; however, these countries have a rather small economic growth despite such high FDI inflows over the last 25 years. In order to investigate the reason for this paradigm relationship between FDI and economic growth in Caribbean developing countries the focus of this study was on different factors (political, educational, financial) and their relationship to FDI and therefore, economic growth. Moreover, it was studied why possible differences in economic growth exist between the investigated Caribbean developing countries.

This study investigated in detail the relationship between FDI and economic growth in 10 Caribbean developing countries for the time period of 1990-2015 using a correlational quantitative approach. Furthermore, panel data analysis was used to numerical quantify what the relationship between FDI and economic growth was in the investigated Caribbean countries during 1990-2015 and what possible factors had the most influence on this relationship.
Results show that there was a weak negative relationship between FDI and economic growth for the investigated Caribbean developing countries from 1990 to 2015. Among the different political (political rights, civil liberties), educational (secondary school enrollment), and financial (growth, imports and exports, inflation, FDI) factors, only GDP per capita, exports, and human rights showed a weak positive correlation to FDI and therefore economic growth. There was no significant relationship observed between inflation and FDI, and political factors and FDI.

Key Words: Foreign Direct Investment (FDI), Economic Factors, Political Factors, Socio-Economic Factors. International Fiscal Policy

Introduction

Developing countries, in general, strive for economic growth despite facing many political, economic, educational and socio-geographic obstacles. However, in the last two decades, the Foreign Direct Investment (FDI) has become the dominant financial tool in order to increase the economic growth in developing countries (Feeny, Iamsiraroj, & McGillivray, 2014; UNCTAD, 1999, 2006, 2014). The main recipient for FDI inflows has been Asian developing countries, although other regions such as Africa, Latin America, and the Caribbean have been recipients (De Groot & Pérez Ludeña, 2014; ECLAC, 2015; UNCTAD, 2006). Developing countries in Asia and Latin America and the Caribbean predominantly benefitted from FDI that originated from developed

countries, whereas African countries saw an increase in FDI in 2013 mainly coming from other African developing countries (UNCTAD, 2014). Moreover, the inflow of FDI into developing countries has been largely depending on the world economy showing a decline in FDI inflows towards developing countries from 2008-2012 due to the financial crisis in 2008 and an increase in FDI inflows in 2013 due to recovering world markets (UNCTAD, 2014). Developing countries with a limited economic sector and FDI inflows from predominantly developed countries showed the strongest decline in FDI inflows from developed countries after the world financial crisis in 2008 (UNCTAD, 2014). Among those developing countries were predominantly Caribbean countries (De Groot & Pérez Ludeña, 2014; ECLAC, 2015).

Despite the increase of FDI inflows into developing countries in recent years, the relationship between FDI and economic growth in developing countries has been highly discussed in literature with ambiguous results (Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2010; Azman-Saini, Baharumsha, & Law, 2010; Borenzstein, De Gregorio & Lee, 1998; Feeny, Iamsiraroj, & McGillivray, 2014; Oladipo, 2013; Sooreea-Bhemul & Sooreea, 2012). There are many factors (i.e., political, educational, financial, socio-geographic) influencing the relationship of FDI and economic growth of developing countries. Studies have shown that the relationship between FDI and political (i.e., governance; Bannaga, Gangi, Abdrazak, & Al-Fahkry, 2013), educational (i.e., human capital; Borenzstein et al., 1998; Gui-Diby, 2014), and geographic factors (Bartels, Napolitano, & Tissi, 2014; Feeny et al., 2014) vary for the developing countries receiving FDI.

Background

There have been numerous studies on the relationship between FDI and economic growth in developing countries over the last decades (Alfaro et al., 2010; Azman-Saini et al., 2010; Borenzstein et al., 1998; Feeny et al., 2014; Gui-Diby, 2014; Oladipo, 2013; Sooreea-Bhemul & Sooreea, 2012; Williams, 2015; UNCTAD, 2014, 2015). Although, the results have been ambiguous, those studies and research reports indicated that developing countries have different economic growth due to FDI input. A special interest has been on developing countries that received high FDI relative to the gross domestic product (GDP) but had still a rather low economic growth (Bartels et al., 2014; De Groot & Pérez Ludeña, 2014; ECLAC, 2015; Feeny et al., 2014; Gui-Diby, 2014). Most literature have been dealing especially with African developing countries and their low economic growth despite high FDIs (Bartels et al., 2014; Gui-Diby, 2014) and reasons for that poor relationship have been described in detail in literature ranging from political instability to high corruption to low education to name the most prominent causes for low economic growth in developing African countries despite high FDIs. However, little focus has been on developing countries of small size with limited natural resources, but political stability and similar educational systems such as Pacific Island countries or the Caribbean. In a recent study of Feeny et al. (2014), focus has been on Pacific Island countries and their lack in establishing a successful economy despite receiving one of the highest global FDIs relative to GDP. This kind of study has been of particular interest regarding to research investigating the relationship of FDI and economic growth in developing countries because it showed that this relationship is different for smaller, political stable developing island countries than for African, Asian, or Latin and South

American developing countries.

Caribbean developing countries are another set of island developing countries that have been facing similar difficulties in establishing economic growth despite high FDIs relative to GDP (De Groot & Pérez Ludeña, 2014; ECLAC, 2015; Thomas & Serju, 2009; Williams, 2015). However, studies on these particular developing countries have been sparse and the relationship between FDI and economic growth has either been (1) restricted to one particular developing Caribbean country (Thomas & Serju, 2009), (2) limited to factual reports rather than investigating the relationship with empirical methods (De Groot & Pérez Ludeña, 2014; ECLAC, 2015; UNCTAD, 1999, 2006, 2014) or (3) limited to political or educational factors solely (Williams, 2015). Therefore, a detailed empirical study investigating several factors (political, educational, financial) influencing the relationship between FDI and economic growth in developing Caribbean countries was needed to understand the complex relationship between FDI and economic growth better and which factors actually had the most impact on FDI and economic growth in Caribbean developing countries. Moreover, such a study provided outcomes that could be the basis for future guidelines for political leaders in such countries to improve FDI and economic growth in theses Caribbean developing countries.

Purpose of the Study

This study aimed to investigate the relationship of FDI and economic growth in Caribbean developing countries for the time period of 1990-2009. Particular focus was on: (1) which factors (political, educational, financial) controlled FDI and therefore, economic growth, most in the different Caribbean developing countries; and (2) why possible differences in economic growth existed between the investigated Caribbean developing countries. Additionally, possible reasons for differences in this relationship among the studied countries over the time period of 1990-2009 were investigated. During this particular time period, Caribbean developing countries went through political and economic changes that may had an influence on the relationship between FDI and economic growth. Moreover, the data were most complete for this time period and it is very common in research to do panel data analysis over a 20 year time span to see possible changes with time. This study involved the Caribbean developing countries Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago. Some of the largest economies in the Caribbean region, Cuba, Dominican Republic and Haiti were not included because of their very different historical circumstances and economic structure (e.g., communistic regime in Cuba; dictatorship in Haiti and Dominican Republic over the investigated time span *vs* democratic and/or constitutional monarchy in other investigated Caribbean countries; De Groot and Pérez Ludeña, 2014).

Panel data analysis was applied to clearly identify the relationship of FDI and economic growth in the region and possible reasons were given regarding the nature of this relationship. Economic, school attainment, and geo-political data were accessed from the world development indicator database (The World Bank, 2014a, b), the statistic database of the United Nations Conference for Trade and Development (UNCTAD, 2015), and from Freedom House (2015) over the last 20 years for the countries of

interest. This extensive dataset allowed the researcher to identify (1) what factors predominantly controlled FDI, (2) how FDI related to economic growth in the study area over the studied time period (1990-2009), and (3) why there were possible differences in the relationship of FDI to economic growth between the investigated countries.

Therefore, this study aimed to investigate the relationship of FDI and economic growth in Caribbean developing countries for the time period of 1990-2009. Particular focus was on: (1) which factors (political, educational, financial) controlled FDI and therefore, economic growth, most in the different Caribbean developing countries, and (2) why possible differences in economic growth existed between the investigated Caribbean developing countries.

Research Questions

The following research questions were the focus of this study with the purpose of investigating the relationship between FDI and economic growth in developing Caribbean countries:

Q1. What was the relationship between the different factors (e.g., political, educational, financial) and FDI regarding the economic growth in developing Caribbean countries?

Q2. Were there differences in the economic growth between the investigated Caribbean developing countries?

Q3. What factors in particular have led to differences in economic growth between the studied developing Caribbean countries?

Q4. Were there any temporal changes within the investigated relationships for the different investigated countries and if yes, why?

Hypotheses

The proposed study addressed four research questions as stated above. Three of the questions were qualitative, whereas the first one was quantitative. There was an element of causality in this case, and this was to indicate the manner in which political, educational, and financial factors related to the inflow of FDI. The inflow of FDI has been closely associated with economic growth of the countries in the Caribbean region. Therefore, the researcher's initial thinking was that there was a relationship between these factors and the inflow of FDI. The initial thinking (or proposition) formed the basis of the alternative hypothesis (Poletiek, 2013). For this study, the alternative hypothesis became:

H_a. There was a relationship between political, educational, and financial factors, the inflow of FDI, and economic growth at statistical significance of $p < 0.05$.

Researchers such as De Groot and Pérez Ludeña (2014), Mintz, (2014), and ECLAC (2015) have stated that the inflow of FDI is influenced by the status of the economy in the developed countries. They argued that between 1990 and 2009, there was clear evidence that the inflow increased when the developed markets were performing better and declined when this was not the case. Thomas and Serju (2009) argued that, in fact, the inflow of FDI did not affect the economic status of a country in a significant manner. Oladipo (2013) disputed this and stated that it did have an influence. This

showed there has not been a consensus on this matter, and hence the need to reconcile these thoughts has been timely. It was valuable to supplement the review of literature with the collection and analysis of primary data, and hence, the test of hypothesis.

A null hypothesis nullifies the alternative hypothesis; i.e. the data is sought with the view of trying to disprove the alternative hypothesis. Since this data is the one whose analysis facilitates the understanding of the situation on the ground, it means that what is actually tested is the null hypothesis (Poletiek, 2013). In this case, the null hypothesis was formulated as follows:

H_0. There was no relationship between political, educational, and financial factors, the inflow of FDI, and economic growth at statistical significance of $p < 0.05$.

Based on the null hypothesis, the data being collected were meant to show that there was no relationship amongst these factors at $p < 0.005$. If there was enough data to show that such a relationship was lacking, the null hypothesis would have been accepted. However, it would have been rejected if the opposite were the case. Since the test involved more than two variables, and because it was likely to test their mean effects, the hypothesis being proposed was tested through the analysis of variance also referred as ANOVA (Wilcox, 2012).

Nature of the Study

This study was a correlational quantitative study. Quantitative research is favored over qualitative research because this study intended to contribute to the existing theory of FDI using empirical data and redefined the theory of FDI regarding the relationship of different factors to FDI and therefore economic growth in developing Caribbean countries. A qualitative approach would have worked if the intention were to create a new theory from the empirical data or observations (grounded theory), which has not been the case. Since the scope of this study was rather on the Caribbean region than on one country, a case study would be inappropriate as a research design as well.

In any case, the results from different countries most likely differ and, indeed, this was why it has been determined to be important to create new research questions focused on why there were differences in the relationships between countries. In actual fact, case studies addressing FDI in developing countries have been rather rare (Oetzel, 2005) due to the outlined disadvantages. Empirical studies are much more preferred to investigate relationships, and this has been the case with works completed by Borenzstein et al., 1998; Gui-Diby, 2014; and Suyanto et al., 2010.

Although the correlational quantitative study design was favored over other research designs, the major drawback of this design has been that cause-effect relationships cannot be established. In fact, even in situations where there are strong associations between variables, researchers cannot just assume that a variable causes the others (Hopkins, 2000). However, empirical data and the analysis of such data allowed for the investigation of relationships between independent and dependent variables. Independent variables in this study were exports and imports; GDP per capita; inflation; the Freedom house index (Freedom, 2015) measuring political rights and civil liberties; human capital; and FDI, while economic growth was the dependent variable. The relationship between these variables was expressed numerically using panel data analysis.

Significance of the Study

The financial tool FDI has been used in all developing countries for many decades, however with mixed results regarding the economic growth in these developing countries as shown by numerous studies including Alfaro et al. (2010), Azman-Saini et al. (2013) or reports from UNCTAD (1999, 2006, 2014). Despite intensive studies in the field of FDI in developing countries, research on the relationship between FDI and economic growth in small, political stable developing island countries have been rather rare; although such developing countries often have less success in establishing economic growth despite high FDI relative to GDP (De Groot & Pérez Ludeña, 2014; Feeny et al., 2014; Thomas & Serju, 2009; Williams, 2015) and the reasons for that are still not fully understood. Therefore, this study aimed to investigate which factors influenced FDI in developing Caribbean countries contribute most and therefore economic growth, and which factors had the least effect. Moreover, this study aimed to address why there were differences in the investigated relationship between the different investigated Caribbean developing countries in order to provide further insight how FDI could be used more efficiently in small developing countries and what guidelines could be drawn for policy makers in such countries to provide a stronger economic growth.

Literature Review

Various aspects relating to FDI and international business literature were considered for review. The first part of the literature review provided a detailed study and review of the impacts of FDI on the economic growth of the developing countries. The existing literature demonstrated that a positive relationship exists between FDI and economic development (Bartels, Napolitano & Tissi, 2014). Therefore, the explanations for the relationship were the main focus.

Among the aspects considered when dealing with FDI included the determinants known to control the success of FDI and therefore economic growth especially in developing countries. The importance of the determinants was to help understanding the reasons why FDI in given regions has been successful but not in others. Moreover, the impact levels of the controlling determinants differ among the regions of the world including developing countries (Roodman, 2015; Sooreea-Bhemul & Sooreea, 2012). Therefore, an implication that the role FDI has been playing in the economic growth of developing nations needed to be investigated on a separate platform so as to understand the existing relationship between the economic growth of developing countries and FDI and provide the guidelines for the policy makers (Aghion & Howitt, 2009; International Monetary Fund, 2013; Roodman, 2009), which was done in the second part of this literature review.

The third part held special attention to the trends in global FDI, and the area of focus was FDI in developing Caribbean countries. Despite the fact that the literature in this area is scarcer compared to other areas such developing Asian or African countries, the existing literature provided nonetheless insight why Caribbean developing nations in particular have differences in the economic success compared to other states (UNCTAD, 2006).

The choice of the reviewed literature was by two criteria. The first criteria were on the peer-reviewed articles as well as articles in the last about five years that gave a description of new developments in the area of research. The second criteria were on the peer-reviewed articles and the reports that have major impacts in the respective area and were independent on publication age (Sader, 2000). Peer-reviewed articles were searched via the EbscoHost website at NorthCentral University and using Google Scholar to further identify papers of interest.

Factors Controlling FDI and the Economic Growth in Developing Countries

The concept of FDI. Foreign direct investment is a worldwide category of investment whereby, the enterprise resident in one state known as the direct investor makes an acquisition of an interest amounting to about 10% in a given resident enterprise known as the direct investment enterprise (UNCTAD, 2014). Foreign direct investment infers that the foreign investor can make an investment in the existing company or otherwise can establish a new organization (Sader, 2000).

The classification of FDI can, at least, be subdivided into about two categories. As Sooreea-Bhemul & Sooreea (2012) postulated, the first category may relate to the capital as well as other resources movements athwart borders and may adopt a narrow definition of FDI since it is concerned with the financial control over firms. The second category with a wider definition makes an inclusion of various types of titles, assets or even the contractual rights. The UNCTAD (2006) made a proposition that FDI has a long-term connection between the investor country and the host country acting as the country of the investment. As such, FDI as an investment makes a reflection of the goals of making an establishment of a long-lasting interest by the direct investor in a single investor in a direct investment firm that is a resident in a given economy as compared to being a direct investor (Sun, 2006; Thomas & Serju, 2009).

According to Samuel (2013), there have been various types and forms of FDI. The FDIs with an association with the developing states includes the investment in the natural resources sector, and FDI essential role is the production of the needed raw materials in developing nations and the exporting of the produced raw materials for the external market consumption (Stehrer & Woerz, 2009; Wells & Wint, 2000; Williams, 2015). The second form is one in which the local markets becomes FDI targets. In cases such as these, given obstacles are due to the government more so on the imports. The result of such is that the local production obtains feasibility as compared to exporting the foreign products to such markets (Petras & Veltmeyer, 2007; The World Bank, 2015b).

The third form of FDI is one where quality performance is sought after, and it applies to some firms in the industrialized nations that move their businesses to the less developed with an aim of reducing the cost of production hence increasing profits. The fourth form as described by Samuel (2013) is one in which some of FDI descriptions can be a strategic investment. In Samuel's (2013) study, it has been clear that this form of FDI is in a stage that is quite advanced, and the multinational companies (MNCs) search for the skills through investing in the relevant states. Examples of such are like the airline booking centers in the Caribbean and the computer programming in India (Reiter & Steensma, 2010).

Determinant factors of FDI and the economic growth in developing countries. The relationship linking FDI and the economic growth of the developing countries raises a lot of debate in the available literature. Some of the studies either support such as (Feeny et al., 2014) or some deny such as (Azman-Saini et al., 2010) the positive impact brought about by FDI on the economic growth increase in developing nations. The studies have discussed and outlined several factors that have an influence on the success of FDI with regards to the developing nation's economic growth. The controlling factors discussed are geographical, educational or even political in their nature (Samuel, 2013).

In a study by Bannaga et al. (2013), it was evident that out the six indicators of governance, which are the stability of a government, voice, the absence of any violence, accountability and stability politically, four of them had a statistically measurable association with the inflows of FDI into the countries of the Arabs. In addition to that, the GDP sizes, as well as the liberalization of trade, were positively and in a significant way connected to the inflows of FDI and in addition to the growth of the economy of the studied countries that were of the Arab states (Reinert et al., 2010).

Nonetheless, the surprising fact was that some of the governance factors, such as the rule of law and the corruption control, had zero connection with FDI in the research by Bannaga et al. (2013). The findings were connected well with the findings of Bartels et al. (2014), which evidenced a shift with the regard to the countries in charge of supplying FDI and those developing countries that received FDI (Samuel, 2013). At around 2010, MNCs in China had become chiefly the suppliers of FDI although, in the previous times, MNCs of Europe and North America were the regional investors. The investments by the predominant Chinese investors in the states that had less integrity and higher levels of corruption had made them have an increase in FDI (Alfaro et al., 2010).

As such, Bartels et al. (2014) postulated a strong shift amid the two shifts because the MNCs of China had a higher interest in their investments outcomes as compared to the political environments of the hosting developing state. The shifts even demonstrated a short–period growth in the economy of the countries in the sub-Sahara due to the increased FDI. Contrasting that study, Barassi and Zhou (2012) indicated that corruption had a negative connection and effect on FDI and as such to the developing states economic growth. Therefore, it is evident that political factors are not unambiguously associated with FDI and the economic growth in the developing countries. The application of the ethics in business to the host developing state and the country of origin of MNCs may have had an influence on the expected outcome of FDI concerning the economic growth in the developing nations.

Studies carried out by Williams (2015), and Cheng and Chung (2012) demonstrated that the developing nations of the Latin American and Caribbean (LAC) differ to non-Latin-America and Caribbean nations regarding some controlling factors such as government debt, good governance as well as infrastructure. The studies showed that the government debt in LAC countries had little or no significance on FDI inflows to the states that are non-Latin-American and Caribbean (Sather, 2013).

On the other hand, the infrastructure also had zero significance effect on the attraction of FDI for the non-LAC but the LAC states, there was sufficient significance.

According to Williams (2015), the executive constraints had a discouraging effect on the inflows of FDI into the states that were non-LAC. Nonetheless, the good governance encourages the inflow of FDI into the LAC states in a similar manner like the Arab states (Bannaga et al., 2013).

In the argument by Williams (2015), these contrasting trends of LAC to non-LAC countries regarding FDI inflows were the result of the various sectors in which FDI is directed to such as the natural resources. Although the study did not demonstrate further research, he gave an explanation for the encouragement of FDI inflow from the good governance in the LAC states compared to the non-LAC states which is due to the favorable policies of the LAC nations that attracted FDI for a time around 1980. This aspect came to an agreement with the study by Agosin & Machodo (2007).

The factors of political nature and the issue of human capital related to the set skills and workforce in the developing countries related to FDI outcome in the developing states were investigated by Borensztein et al. (1998) and Böckem & Tuschke (2010). These studies positioned that when the school attainment was expressed as a human capital, there was a positive interconnection with FDI and therefore, the economic growth in the developing states. Nonetheless, studies of these researchers were only limited to the developing nations with relatively middle and high GDPs. In contrast, those developing nations with relatively low GDP did not have a significant direct relation to FDI as a result of the workforce that is limited (The Korea Herald, 2013).

Gui-Diby (2014) demonstrated zero connection amid the human capital and FDI in the developing states, whereas Feeny et al. (2014) demonstrated a connection though limited between FDI in the developing nations and human capital. The relationship existing between the human capital and FDI in the Pacific and the developing nations can be connected to the crowding out of the employment as well as the domestic investment by FDI in the countries of the Pacific Island whose results was the decrease of the workforce that was skilled. The second factor was the relative low GDP more so in the developing nations of Africa and therefore, the partial connection of the human capital and FDI (Feeny et al., 2014; Oladipo, 2013).

In addition to the way income related to FDI to the investments domestically, the human capital and FDI can also be controlled on the basis of how we measure the human capital. Some literature in business expresses the human capital as the attainment one gets from the learning institutions (Feeny et al., 2014). However, the researcher Hanushek (2013) had a different argument. His position was that an attainment achieved in the school settings is not a quality definition. The reason is that quality in school best expresses how a given workforce possesses particular skills and is educated to enable them to deliver in given challenging work conditions that are foreign based. Nonetheless, the exact measures for the quality of school work are possibly absent or even unavailable from the literature of the developing nations. Additionally, they could be very difficult to be expressed by the World Bank (2014b) parameters.

Geographical determinants refer specifically to the geographic location of countries receiving FDI; however, they are of less importance regarding the relationship of FDI and economic growth, especially for developing countries (Gui-Diby, 2014). Nevertheless, Feeny et al., (2014) indicated that for the nations in the Pacific Islands, the

long distances, as well as the remote locations to the main markets, acted as a hindrance to the inflows of FDI's. Upon combining the political determinants with the geographical determinants, FDI attains a stronger connection with the geographic location of the developing nation that is receiving. The reason is that most of the MNE's reach their decisions by the places to base their investments primarily on the given region political stability (Cheng & Chung, 2012; Böckem & Tuschke, 2010).

Apart from the determining factors such as political, education and the geographic location, the important additional determinant is the GDP. The GDP refers to the income in the given host developing state whose expression is as gross domestic product. The GDP as demonstrated in a study by Feeny et al., (2014) and Gui- Diby, (2014) are essential in the connection of FDI and the economic growth of the developing nations. The states with the high incomes in the factual aspect have higher positive connection with FDI as compared to low-GDP developing nations.

The major factors and determinants that either encourage or discourage the inflow of FDI into the developing nations include those of financial in nature, geographical, political and the educational factors. Nonetheless, the levels to which all these factors connect to FDI is varied from one developing state to the other. The detailed research of each determinant on FDI is of the essence for the provision of the connection existing amid them and the economic growth in the developing nations. As an eventuality, they provide guidelines to the policy makers on the ways for attracting FDI and encouraging the economic growth (Gui-Diby, 2014).

Impact of FDI in developing countries. The universal direct venture flows have stirred rigorous debate as well as studies on FDI in the host economies and countries. The general recognition is that FDI can intrinsically bring benefits to the domestic companies. Dae-Bong (2009) stated that in addition to the increased income as well as output, the host country may enjoy other benefits. The benefits may be such as superior managerial as well as scientific technology, steered up competition in the host countries and economies, increased domestic investments as well as the bridged gap in the host country's foreign exchange (Hashai & Asmussen, 2007).

In a study by Stehrer & Woerz (2009), concerning the impact of FDI on the host economy, they studied the effects FDI has on the host state output growth. In the collected sample of the time of 1981-2000, there was an indication of a positive connection between FDI and the productivity as well as the output and exports. The findings were that the attracting FDI enhanced the output growth. In addition to the study, further findings by Ewing & Yang (2009) made an assessment of FDI impact with a special attention to the manufacturing sector. The assessment of the economic growth used a dataset comprising of about 48 states in the United States in 1977-2001. From the findings of the research, they made a conclusion that FDI promoted the growth though it was evident that the growth was not uniform throughout the sectors and studied regions in the United States. In the findings, the human capital variables exerted positive coefficient (Hanushek, 2013).

The link between FDI and the economic growth as studied by Azman- Saini et al. (2010) revealed that those nations that promoted greater freedom in the economic activities significantly gained from the multinational corporation's presence. The reason

was that there existed positive term of interaction. In addition to that, the study showed that on the relationship existing between the international trade, poverty and growth as well as FDI, FDI and the trade demonstrated an effect on the wellness of persons. The effects were positive in a way through making an increase in their incomes, and it decreased poverty (Hanushek, 2013; Dae-Bong, 2009). Therefore, the literature demonstrates the possible benefits that come as a result of increased FDI in any country and more in the developing countries.

Trends in global FDI. In a broader sense, the composition of FDI is the flow of the capital, the expertise as well as technology in the given host economy. In a formal definition by Stehrer & Woerz (2009), FDI refers to the investment made with an intention of acquiring a long and lasting interest in companies whose operations are outside the investor's economy. The international companies, researchers, and countries with an interest in FDI have on an increasing note recognized the crucial aspects of the foreign capital to growth (Ewing & Yang, 2009). The dynamism experienced liberalization, the age of the privatization and globalization, the importance of FDI has become evident as an international capital flow. In recognition of the importance of investing without any borders, the World Bank (2015a, b) has put greater concern on the issue regarding trade and capitalized on the discussion of the importance of the foreign capitals flows to the developing host nation economy. As World Bank claims, only a few countries have become successful in the absence of the open trade.

In general, there exists a wide general agreement supporting how crucial it is to have openness leading to FDI inflow and outflows. Nonetheless, there is a debate on the advantage of the openness. The motivation of the debate is the recent crises in the economy in several of the South East Asia countries. According to World Bank (2015b), the quick, as well as massive movements that took place in the countries on the subject, carried the larger blame for the experienced crises. However, most of the observers understand and differentiate the fact that FDI is long term, and it is almost irreversible. Therefore, have an understanding of the importance of openness to the economic growth, larger numbers of nations have had no choice but to adopt more liberal policies that support the foreign capital flows. The resultant aspect was the increase in FDI inflow to about 3% in 2001 of GDP from the former 0.1% in 1970 (Thomas & Serju, 2009).

Globally, following a season of declining trend, the universal FDI exceeded the $648 billion mark at around 2004, which was about 2% increase from the previous year. The increase led to FDI in 2004 to rise and hit the $9 trillion mark. Moreover, in the developing nations, FDI had a 40% increase to about $ 233 billion and FDI in the developed states had a14% decline. Therefore, the developing nations share worldwide in FDI inflows gained about 36% of the universal share that was quoted as among the highest since 1997 (UNCTAD, 2014). Of importance to note from the study by UNCTAD, FDI trend that upward did not have an even distribution amongst the developing nations. As such, as Africa FDI trend remained constant, the Asian and the Oceanic nations saw a noteworthy trend upwards at the period when the study was conducted. Similarly, the upward FDI inflow trend in the 2003-2004 too was experienced in the South East Europe and the Latin America (UNICTAD, 20014).

In explaining the increases in this trend of the flow of FDI in the developing nations, several factors were considered. Among them was the inclusion of the forceful

pressures of competition in most of the industries of the source states, high prices for several of the goods that were a stimulation of FDI to the natural resources of rich nations and the expectations for the economic growth, which were high. UNCTAD (2014) makes an identification of a variety of essential factors that led to the gush in FDI universal flows. The factors among them were the increased trend in the privatization and the financial integration as well as the globalization of production (Böckem & Tuschke, 2010).

In around the period of 2004, the World Bank showed that the Oceania, as well as the Asian nations, was the biggest receivers as well as sources of FDI. In addition, to the large receivers were the Latin America and the Caribbean nations, which made a significant registration of FDI inflows upsurge around 2004. The levels reached a 44% increase from the previous year. As UNICTAD (2015) found out that, FDI inflows into the developing nations are expected to increase (Barassi & Zhou, 2012; The World Bank, 2014b).

The factors for the increment are the corporate restructuring; the projected complimentary economic growths, as well as the continued pursuit of the new markets by the companies, from the source economies. The final part of the review of the literature in the paper will lay its focus on FDI in the Caribbean. The reason is that FDI in the Caribbean region differs from the rest of the developing nations (De Groot & Pérez Ludeña, 2014; The World Bank, 2014b; Williams, 2015).

FDI in the Caribbean

According to a research study completed by De Groot and Pérez Ludeña (2014), it is evident that the developing nations in the Caribbean have been having a relatively high inflow of FDIs. Indeed, this might be considered to be way above the average figures, which are attained by the developing nations globally. Nonetheless, the Caribbean as well as pacific island nations have been having slow growth rates, and this shows that FDIs alone might not be the only boost that keep economies going. For instance, in the study by Thomas and Serju (2009), it was clearly demonstrated that Jamaica has not benefited remarkably as a result of FDI inflows.

However, the prevailing situation may be as a result of a couple of factors, and these include political instability as well as low levels of education. There are also legal challenges, and this is demonstrated by the fact that the judicial system is not strong enough to deal with corruption and other malpractices in high public offices. This has an implication of leaving the financially endowed but corrupt private investors off the hook (Alfaro et al., 2010).

In the study completed by Oladipo (2013), a positive relationship connecting the FDI inflows and the economic growth has been demonstrated, and this is with respect to the developing nations in the Caribbean. Nevertheless, the study did not make quantifications of this connection because of these nationals have varying political systems. Indeed, it is evident that their societies are diverse, and there are a host of factors, which are not common to all of them. When it comes to FDIs, there are those, which focus on the service industry while others prefer to invest in such traditional avenues as infrastructure and manufacturing (ECLAC, 2015; Samuel, 2013; De Groot &

Perez Ludeña, 2014). The study also demonstrated that the financial crisis of 2008 affected the Caribbean countries in a significant manner, and the recovery from that crisis was slow. Indeed, some of the impacts of that period are still being felt to this day.

It is imperative to appreciate that most investors seeking a foothold in the Caribbean go for the tourism industry. This industry tends to fluctuate, and this is because people travel for leisure: they only travel after they have fulfilled other necessities as much as possible (Goodspeed, Jorge, & Li, 2011). The contributions of the government have been slow. For instance, it is noteworthy that the infrastructural development has not kept the pace; and since this is one of the areas where foreign investors may not venture directly, they are simply forced to accommodate the challenges (Contessi, Pierangelo, & Johanna, 2013).

There are other investors who focus on those economies where there are abundant natural resources. Investments based on natural resources are relatively stable. This is because some of the commodities are necessities, and they have to be availed into the world market whether there is a financial crisis or not. This is unlike tourism where people can choose not to spend, and instead save the little that they have (Feeny et al., 2014; UNCTAD, 2015). The type of the industry is one of the most important factors, which the investors consider when making inroads. Indeed, it is common to find investors avoiding certain industries, which they deem high-risk ventures, even when the said routes promise high returns. A significant number of investors focus on the stability of their favored industry, much as they endeavor to maximize the gains in the short-term (Samuel, 2013).

Conclusion

Caribbean developing countries show differences regarding determinants of FDI inflow compared to other developing countries. Furthermore, Caribbean developing countries, are much more sensitive to fluctuations in the world's financial market due to their limited economic sectors, which is predominantly tourism and less natural resources. However, studies have not been focused on differences in the relationship of FDI and economic growth between the different Caribbean countries and rather treated them as one entirety despite economic, political and financial differences between the different Caribbean countries.

Methods

The purpose of this quantitative study was the identification and description of the relationship between FDI and the economic growth of Caribbean developing countries and why there are differences in this relationship among the different investigated Caribbean developing countries over the time period of 1990-2015. During this particular time period Caribbean developing countries went through political and economic changes that may has influence on the relationship between FDI and economic growth. Moreover, the data are most complete for this time period. This study involved Antigua and

Barbuda, Bahamas, Barbados, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago. However, some of the largest economies in the Caribbean region, Cuba, Dominican Republic and Haiti were not included because of their very different historical circumstances and economic structure (e.g., communistic regime in Cuba; dictatorship in Haiti and Dominican Republic over the investigated time span *vs* democratic and/or constitutional monarchy in other investigated Caribbean countries; De Groot and Pérez Ludeña, 2014).

Panel data analysis was applied to clearly identify the relationship of FDI and economic growth in the region and possible reasons were given regarding the nature of this relationship. Economic, school attainment, and geo-political data were accessed from the world development indicator database (The World Bank, 2014a, b), the statistical database of the United Nations Conference for Trade and Development (UNCTAD, 2015), and from Freedom House (2015) over the last 20 years for the countries of interest. This extensive dataset allowed the researcher to identify (1) what factors predominantly controlled FDI, (2) how FDI related to economic growth in the study area over the studied time period (1990-2015), and (3) why there were possible differences in the relationship of FDI to economic growth between the investigated countries.

Quantitative research was favored over qualitative research because this study intended to contribute to the existing theory of FDI using empirical data and redefining the theory regarding the relationship of different factors and FDI and FDI and economic growth in Caribbean developing countries.

Although the major drawback of this applied design is that cause-effect relationships cannot be established, it is favored due to the fact that empirical data and the analysis of such data allow for the investigation of relationships between independent and dependent variables. Independent variables in this study are exports and imports; GDP per capita; inflation; the Freedom house index (Freedom, 2015) measuring political rights and civil liberties; human capital; and FDI, while economic growth is the dependent variable. The relationship between these variables is expressed numerically.

Panel data analysis was used to analyze the collected data regarding their relationships, since in this study data from 1990-2015 for 10 developing Caribbean countries were analyzed. Panel data analysis was chosen because it is a statistic tool, which models time series regression for longitudinal data in which the same parameters are measured over time (Anderson & Hsiao, 1980). Moreover, panel data analysis allows identifying relationships between a large number of factors (independent variables) and the dependent variable over time (Anderson & Hsiao, 1980). Common practice is to use 5 years' intervals (Feeny et al., 2014). The general formula in panel data analysis is:

$$y_{i,t} = \alpha_0 + \alpha_1 x_{1,t} + \alpha_2 x_{2,t} + \ldots + \alpha_n x_{n,it} + \mu_i l_t \qquad \textbf{(Eq. 1)}$$

where *i* represents each Caribbean country, *t* is time, *y* is the dependent variable (growth), $x1_{, 2...n}$ are independent variables, $\alpha_{0, 1, 2...n}$ are constants, and μ represents the statistical error (Anderson & Hsiao, 1980). In panel data analysis, data can be processed using different estimations such as ordinary least square, weighted least squares, and generalized least squares. All three approaches are linear model estimations. Problem

with these models is often in the endogeneity of the results (Feeny et al., 2014) meaning one or more of the used, explanatory variables is correlated to the error term and can affect the results. Therefore, dynamic panel models are preferred, namely general method of moments (GMM). This estimation method is especially suitable for data with large variables over a small-time frame (here: average of each 5-year span between 1990-2009). Roodman (2009) pointed out that with GMM panel data models able to handle lagged dependent variables; unobserved fixed effects; endogenous independent regressors, as well as heteroskedasticity and autocorrelation across and within individuals or countries. For this study, linear panel analysis estimations and GMM are both applied in order to evaluate the best approach for the purpose of this study.

Population

The population of this study were all developing countries of this world. Developing countries are countries that have a gross national income per capita of less than US$ 12,746 (The World Bank, 2015). However, studies that incorporated almost the entire population usually did not fully establish relationships between variables but rather showed in general if FDI had an association with economic growth or not (Alfaro et al., 2010). Therefore, recent studies focused more on regions in which countries had similar political and economic environments such as Arabic countries (Bannaga et al., 2013), African countries (Gui-Duby, 2014), and Pacific Island countries (Feeny et al., 20014). Following this trend, the indented study focused on 10 countries in the Caribbean, which were Antigua and Barbuda, Bahamas, Barbados, Dominica, Grenada, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, and Trinidad and Tobago. These 10 countries are the samples size. The Dominican Republic, Haiti and Cuba were excluded, although they belong to the Caribbean, because of their different economic history (De Groot & & Pérez Ludeña, 2014).

Sample

The sample size was not determined via probabilistic selection approach and a supporting power analysis for statistical significance of responses because the countries were selected due to their geographic location, economic status, and political environment.

Since the purpose of this study relates to the relationship of FDI and economic growth in Caribbean developing countries and why economic growth has been low despite relatively high FDI inflows, the sample for this study was selected on these criteria (i.e. low economic growth, relatively high FDI inflow relative to GDP). Additionally, developing Caribbean countries with similar economic, political, and educational systems were chosen to identify possible differences over the selected time frame of 1990-2009. Therefore, countries like Cuba, Haiti, and the Dominican Republic were excluded. These countries have either a very different economic system (Cuba) making comparisons invalid or differ in their political system (Cuba, Haiti, Dominican Republic) significantly from the democratic and/or constitutional monarchy systems that are in place in the Caribbean countries chosen for this study. Additionally, financial, educational, and political data were very scarce and incomplete for Cuba, Haiti, and the Dominican Republic for the investigated time span making a statistical significant analysis impossible.

Materials/Instruments

In this quantitative correlational research, the relationship between FDI and economic growth in developing Caribbean countries was investigated. For this purpose, focus was on political, educational, and financial factors. Data used in this study were collected from several online databases including the World Development Indicator (WDI) databases of the World Bank (2014a, b), statistical data from the United Nations Conference for Trade and Development (UNCTAD, 2015), and from Freedom House (2015). All these databases are freely available from the Internet and open to every interested person with an Internet connection.

The data from the World Bank were collected by a collaborative effort of many partners that are listed in detail in The World Bank (2014b). Moreover, statistical offices from more than 200 countries and other institutions provided data as well. The content underwent close consultation with and substantial distribution from staff in the World Bank's networks, staff of the International Finance Corporation and the Multilateral Investment Guarantee Agency. Additional help, guidance, and data were received from numerous external partners that are listed in detail in The World Bank (2014b). Data used from UNCTAD were from various national and international sources and these data are carefully compiled, validated and processed by UNCTAD. Moreover, the statistics published by UNCTAD were in conformity with Principles Governing International Statistical Activities, to which formulation and reinforcement UNCTAD has significantly contributed (UNCTAD, 2015). Freedom House indices on political and civil rights were based on surveys and reports (Freedom House, 2015).

Data Collection, Processing, and Analysis

The design of this study followed closely the approach from Feeny et al. (2014, p. 333) and is described in the following: "Empirical studies examining economic growth have specified models to include measures of human capital, institutional factors, policy related factors, and conditional convergence in addition to domestic and foreign investment (recent examples include Azman-Saini et al., 2010; Basu and Guariglia, 2007; Li & Liu, 2005). The current study followed this approach in examining the relationship between FDI flows and economic growth in 10 Caribbean developing countries covering the period 1990-2009. Cross-country data were averaged over five-year periods, as it is standard practice.

The model was specified as follows:

i = 1, 2, ... n (**Eq. 2**)

where g_i is a real growth in GDP per capita, FDI_i is the percentage of FDI relative to GDP, and Z_i is a vector of control variables. Subscript *i* represents recipient country and t represents time. The vector of additional variables (Z_i) contains the initial level of GDP per capita (to capture convergence), the secondary school enrolment rate (as a measure of human capital), the ratios of imports and exports relative to GDP, the rate of inflation (logged), domestic investment, a measure of economic freedom and the coefficient of variation for the FDI variable. Data are sourced from the World Bank's World Development Indicators (WDI) online database (The World Bank, 2015) and UNCTAD (2014a). The exception is the economic freedom variable, which is obtained from the

Freedom House database (Freedom House, 2015)."

The data used in this study were collected for the time period of 1990-2009 for 10 developing Caribbean countries and include: GDP per capita, growth in GDP per capita, net FDI inflow, exports and imports of goods, secondary school enrollment, inflation, and political rights and civil liberties (see also Table 1). Data collected from the World Bank (2014a) were further described in Table A1 of the Appendix regarding source, aggregation method, statistical concept and methodology, and limitations and expectations.

This study investigated the relationship of FDI towards economic growth as function of political, educational, and financial factors in 10 developing Caribbean countries. Correlational quantitative research was used to investigate longitudinal developments within the studied relationship among developing Caribbean countries. As statistical tool, panel data analysis was applied to the archival data collected from three different online databases (Freedom House, 2015; The World Bank, 2014a; UNCTAD, 2015) and comprising the time interval 1990-2009.

Although this study did not incorporate any human subjects, ethical guidelines regarding data collection and processing were applied in order to provide reliable results.

Findings

Results for the variables growth, imports and exports, inflation, FDI net inflow, human capital, and freedom are described individually below for each of the 10 studied developing Caribbean countries.

Antigua and Barbuda.

Growth (GDP per capita, annual growth in %). From the data collected, it can be noted that the GDP growth of Antigua and Barbuda was in the range of +12 to -13 % over the investigated time span (Fig. 1) representing an overall low GDP, which implies that there is a low economic activity. In 1990, the GDP was 2.6 % implying that the economy of Antigua and Barbuda grew by 2.6%. But in 1991, there was economic decline after which the country entered into a recession. From 2002 to 2007, Antigua and Barbuda's GDP increased by 10.59%. In 2008 and 2009, the country has been in recession.

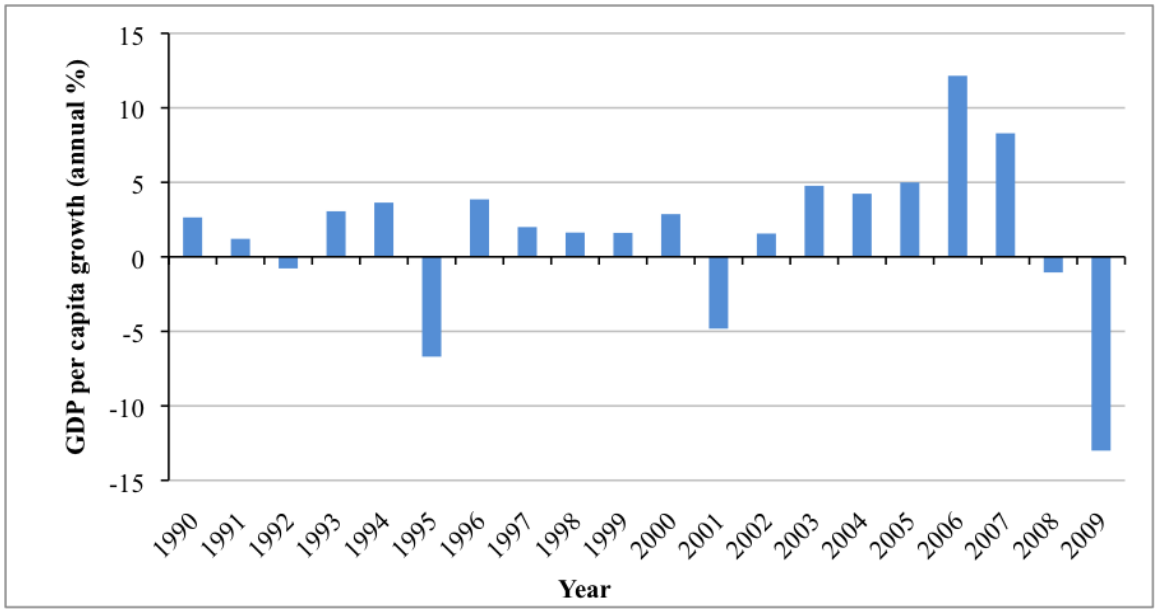

Figure 1. Economic growth of Antigua and Barbuda from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Figure 2 represents the quantity of imports and exports of Antigua and Barbuda from 1990 to 2009. It shows that there is continuous decrease in the quantity of exports from Antigua and Barbuda from the 1990s to 2009. In 1990, amount of exports was 88 % of GDP from Antigua and Barbuda but there has been steady drop in exports over the years until 46 % of GDP in 2009. Imports were slightly lower than exports only from 1990 to 1994. From 1995 on, import rates were higher than exports and were >10 % higher than exports in the late 2000s. However, imports similar to exports decreased from the mid 1990s on.

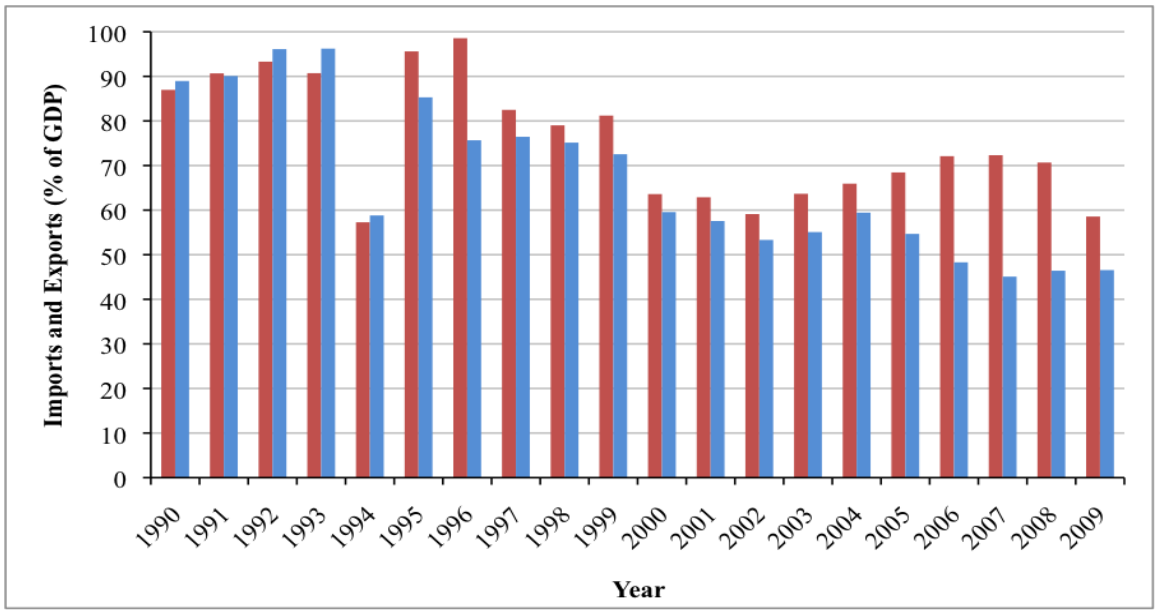

Figure 2. Imports and exports of Antigua and Barbuda relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Figure 3 shows the rate of inflation that remained steady below 4% for most of the period from the period 1990 to 2009 with the exceptions of the years 2000 and 2005. During these two years, the inflation rate increased to 14.4% and 4.6%, respectively, indicating that in 2000 and 2005 prices for goods and services were rising rapidly above the values common in other years. Only in 2003 was the inflation rate negative with -1.2 %.

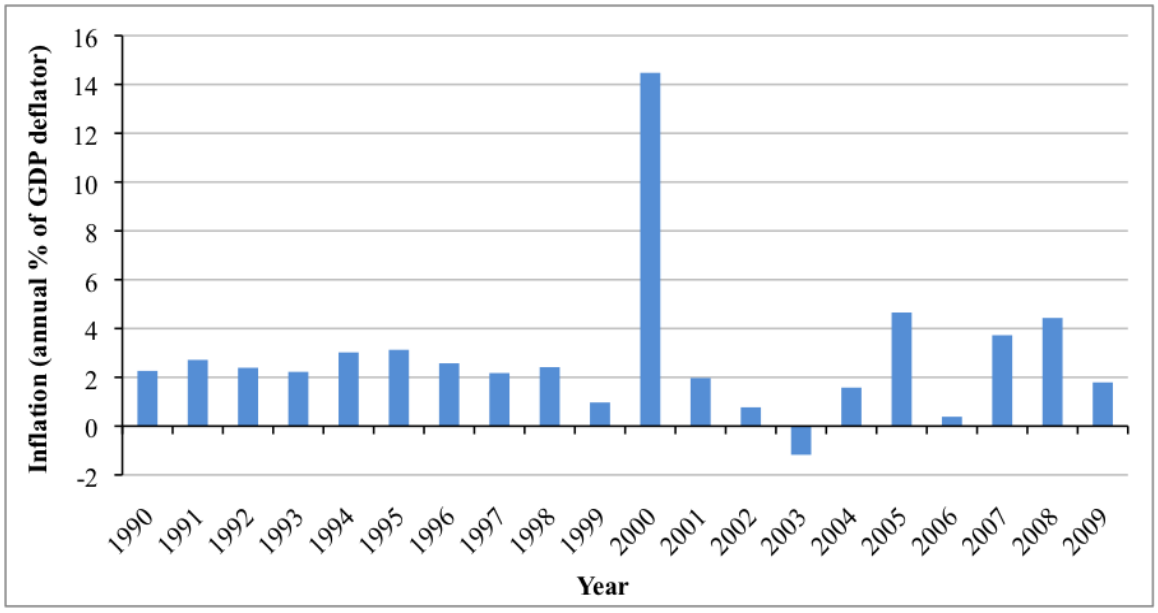

Figure 3. Annual inflation rate of Antigua and Barbuda from 1990 to 2009 expressed as %.

FDI. The FDI of Antigua and Barbuda portrayed a positive outlook for the country. From the period 1990 to 2009, the FDI has been above zero level with the highest FDI found between 2005 and 2007 as shown in Figure 4. This implies that the country has be receiving finances or capital from other countries to finance its projects. This in turn means that the country development will be accelerated. It was also observed during that period, the inflation rate reduced drastically to almost zero as shown in previous Figure 3. In addition, the GDP per capita growth posted the highest ever of 12.1% as compared to other periods. This is illustrated by the sudden rise in value as shown in Figure 1.

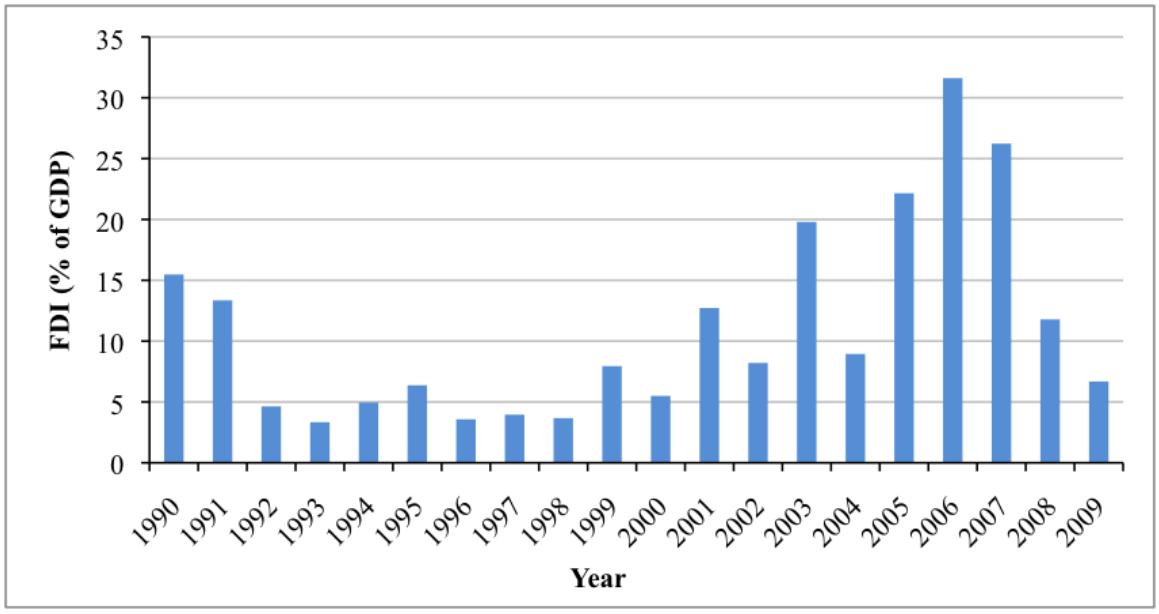

Figure 4. Foreign direct investment of Antigua and Barbuda from 1990 to 2009 based on the net inflows as a percent of GDP.

Human capital (secondary school enrollment). From the data obtained, it was noted that there was a long period in which there was no data available. Usually, the secondary school enrolment is collected once after 10 years, which also applies to other Caribbean countries selected. It was also noted that there are more males who are enrolled in secondary schools as compared to females. For example, in 2000 in Figure 5, the secondary school enrolment rate for male was about obtained 72 % while their female counterparts were 66 %. After 10 years, there was a dramatic increase in the females (85 %) who enrolled in secondary school. This was almost equal to the male enrollment rate (87 %). Due to the lack of yearly available data over the selected time span it was impossible to come up with a conclusive argument from the data.

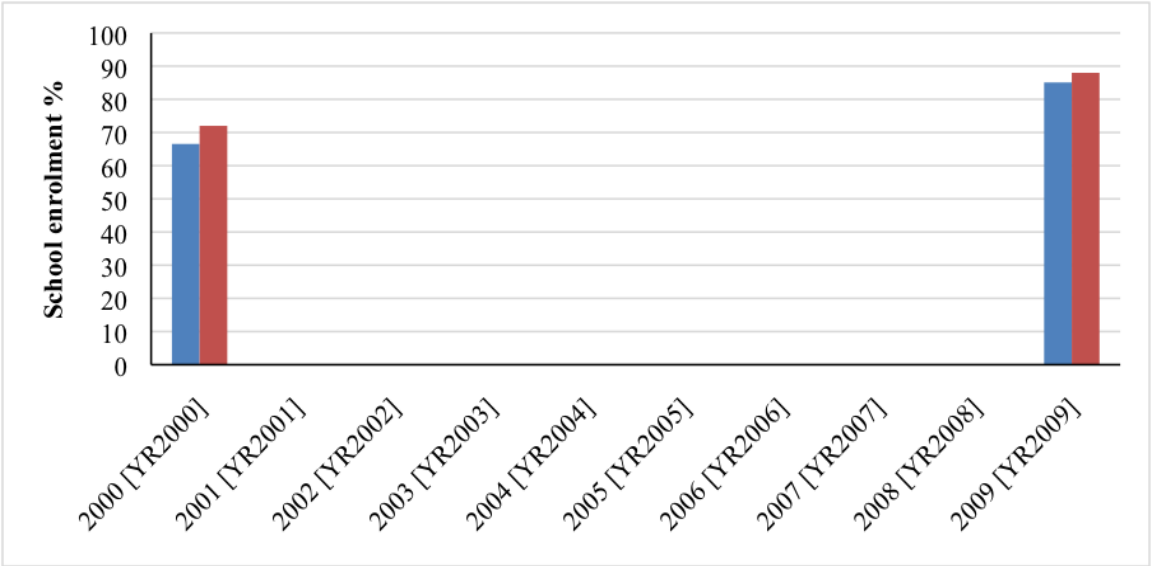

Figure 5. Secondary school enrollment rate for Antigua and Barbuda from 2000-2009. Data prior to 2000 and between 2001 and 2008 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). It can be observed that there was more political freedom in Antigua and Barbuda from 1990 to 2004 as compared to civil liberties as shown in Figure 6. After 2004, political rights equaled to the same low level as civil liberties (index 2).

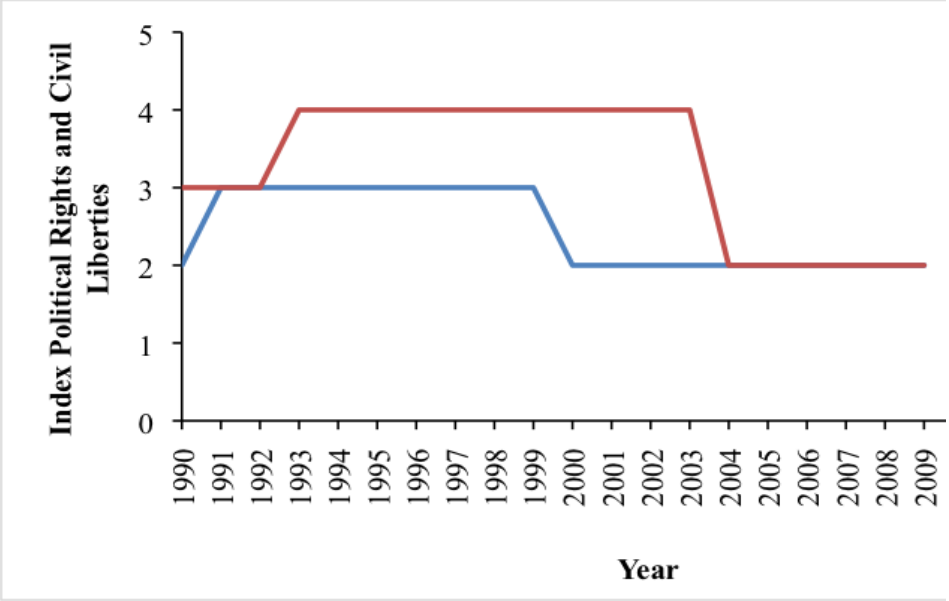

Figure 6. Politica1 rights and civil liberties of Antigua and Barbuda from 1990 to 2009. Red = political rights, blue = civil liberties.

The Bahamas.

Growth (GDP per capita, annual growth in %). During the period under study, the GDP per capita growth of the Bahamas reflected both rise and fall of the economy. From 1990 to 1993, the country was operating in recession with -5.9 % (Fig. 7). The economy started to recover from 1994 to 2002. At that period, the country's GDP per capita grew up to +5.8 % in 1999. Since 2003, the country has been for most of the time under recession with dominantly negative growth values relative to GDP per capita with a low of -5.9 % in 2009.

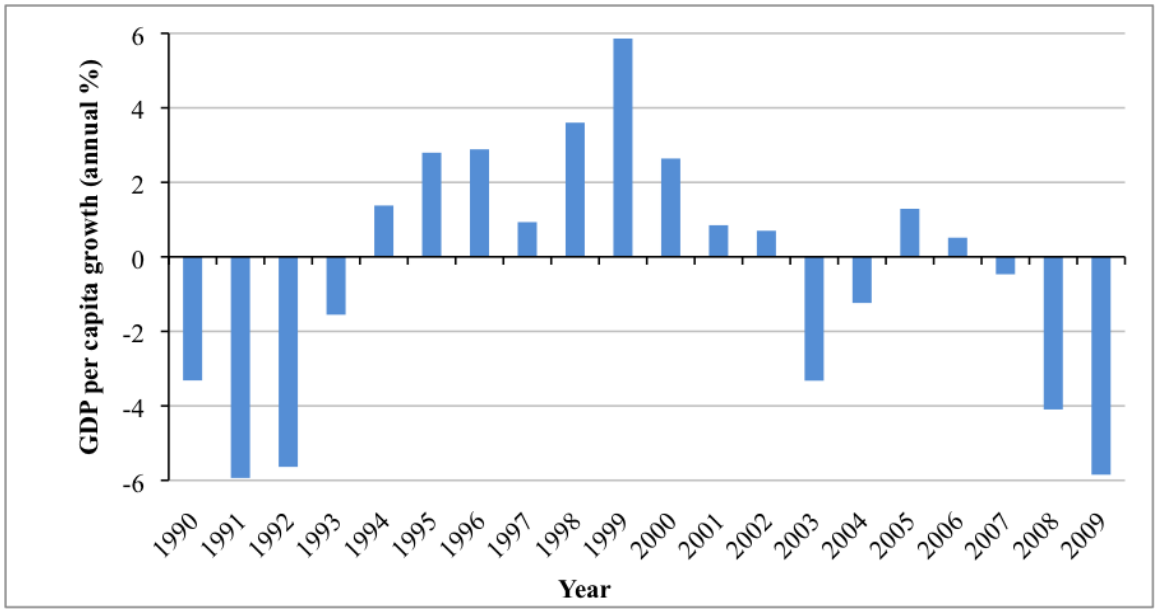

Figure 7. Economic growth of the Bahamas from 1990 to 2009 based on the annual % relative to GDP per capita

Imports and exports. In general, imports were larger than exports from 1990 to 2009 with the exception of 2002 to 2004. The exports from the Bahamas formed a significant part of the economic activities in the country since it accounted for commonly >40 % of the GDP from 1990 to 2009 (Fig. 8). The lowest recorded exports of goods and services were observed in 2001 and 2009, which were slightly below 40 % with 39.8 and 39.9 %, respectively. Similar to exports, imports were decreased in the late 1990s to early 2000s before slowly increasing again after 2003.

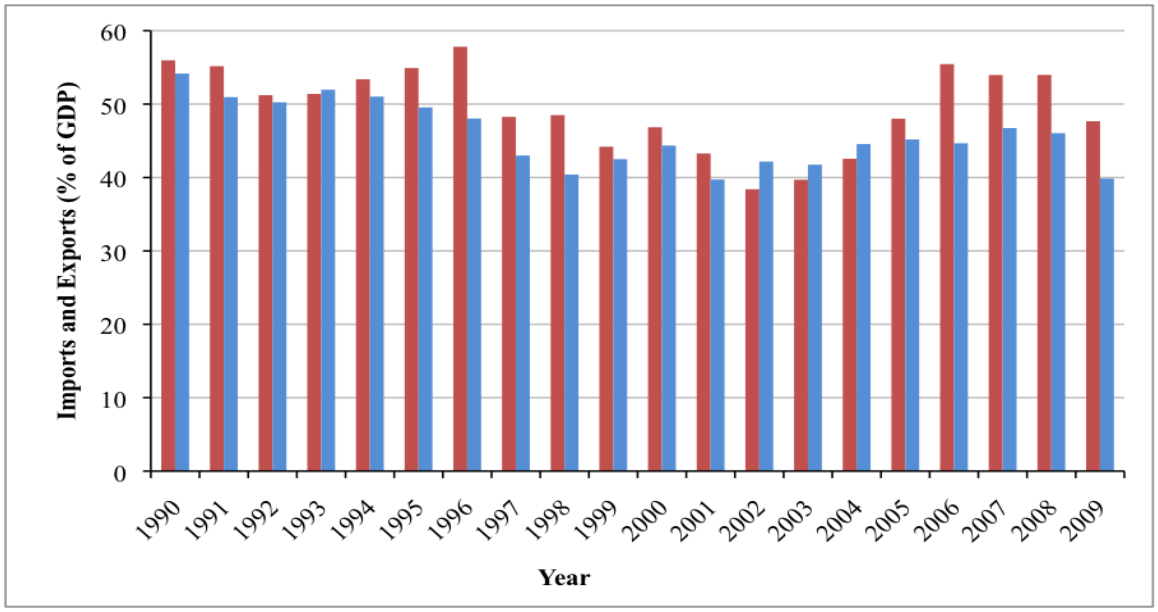

Figure 8. Imports and exports of the Bahamas relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. From 1990 to 2009, the inflation rate remained steady below 5% except during 1997 when it was 34.7% (Fig. 9). This implies that in 1997, the level of prices for goods and services were too high to afford. This also derailed the growth that the economy during the same by posting GDP of 0.9 % as shown in Figure 7. Negative inflation only occurred in 1993 and 2009 when inflation was -0.9 and -1.0 %, respectively.

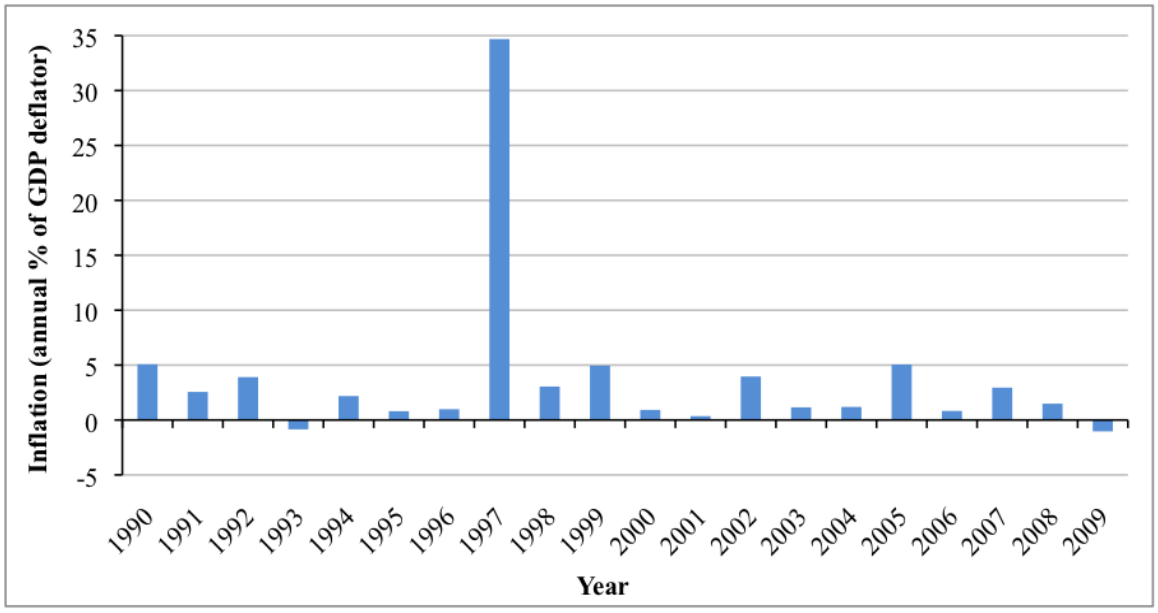

Figure 9. Annual inflation rate of the Bahamas from 1990 to 2009 expressed as %.

FDI. In 1990 and 1991, FDI inflows into the Bahamas were lower than the GDP of each of these two years resulting in negative values (Fig. 10). Inflows of FDI increased slowly since 1993 with positive values. From 1993 to 2000, FDI inflows fluctuated between 0.7 % (1994) and 4.2 % (1997). The FDI started to increase gradually from 1.6 % in 2001 up to 10.4 % in 2008 before decreasing to 8.5 % in 2009.

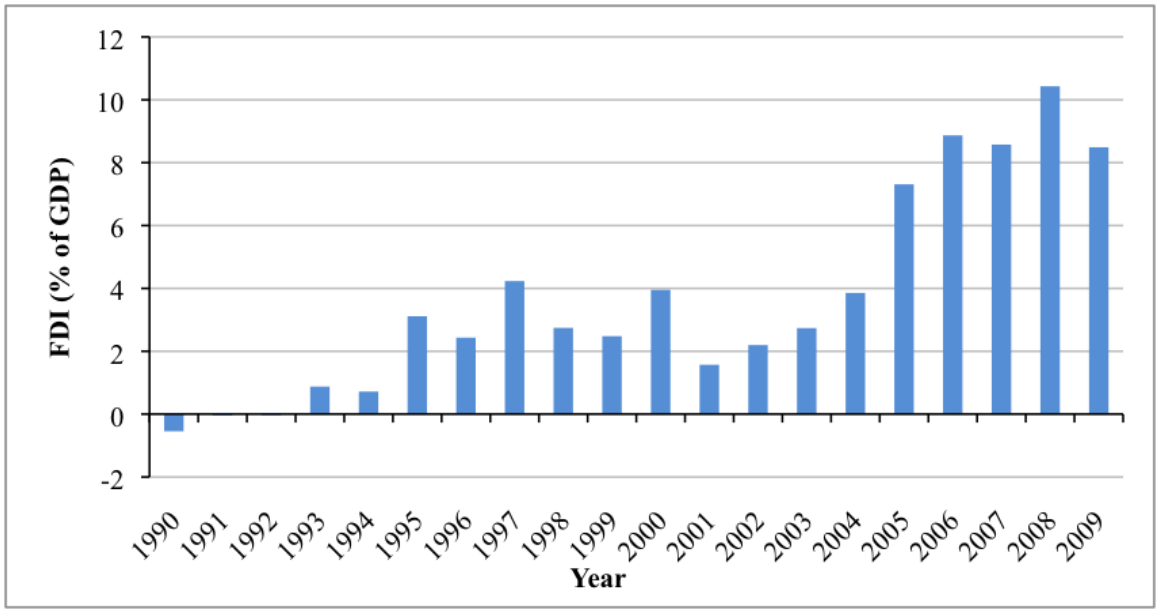

Figure 10. Foreign direct investment of the Bahamas from 1990 to 2009 based on the net inflows as a percent of GDP.

Human capital (secondary school enrollment). Generally, there was a high secondary school enrollment for both genders but the female enrolment into secondary school was slightly higher than their male counterparts in all throughout from 1990 to 2009 as shown in Figure 11.

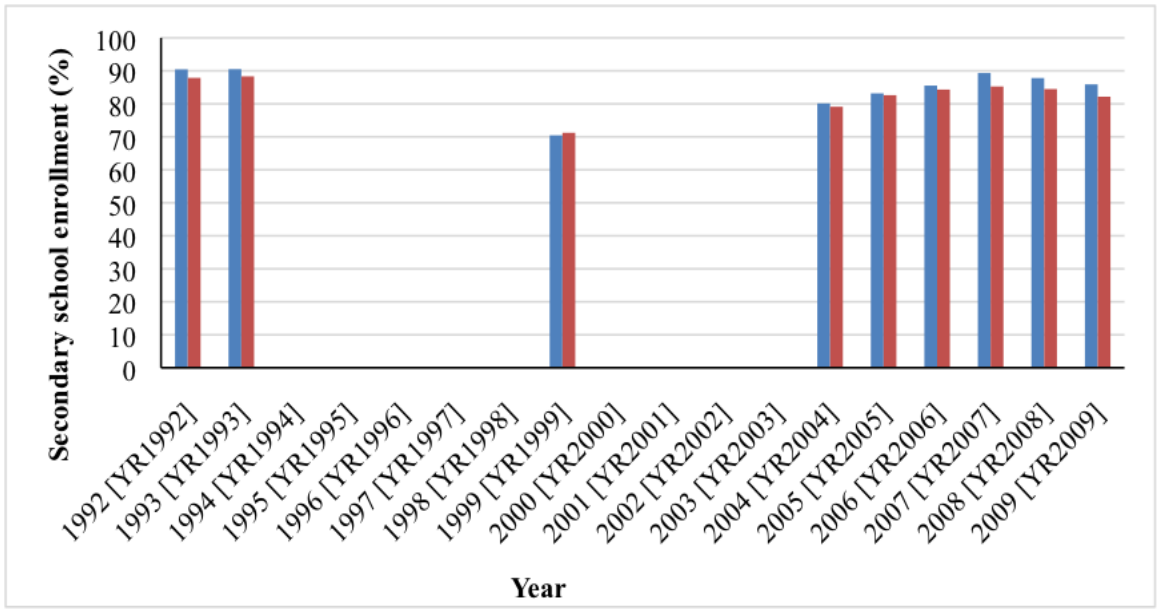

Figure 11. Secondary school enrollment rate for the Bahamas from 1992-2009. Data prior to 1992 and between 1994 to 2003 with the exception of 2003 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). In the Bahamas, it can be observed that there was more political freedom from 1990 to 1999 as compared to civil liberties (Fig.12). After 1999, similar to Antigua and Barbuda, freedom in the Bahamas leveled at a low index of 1.

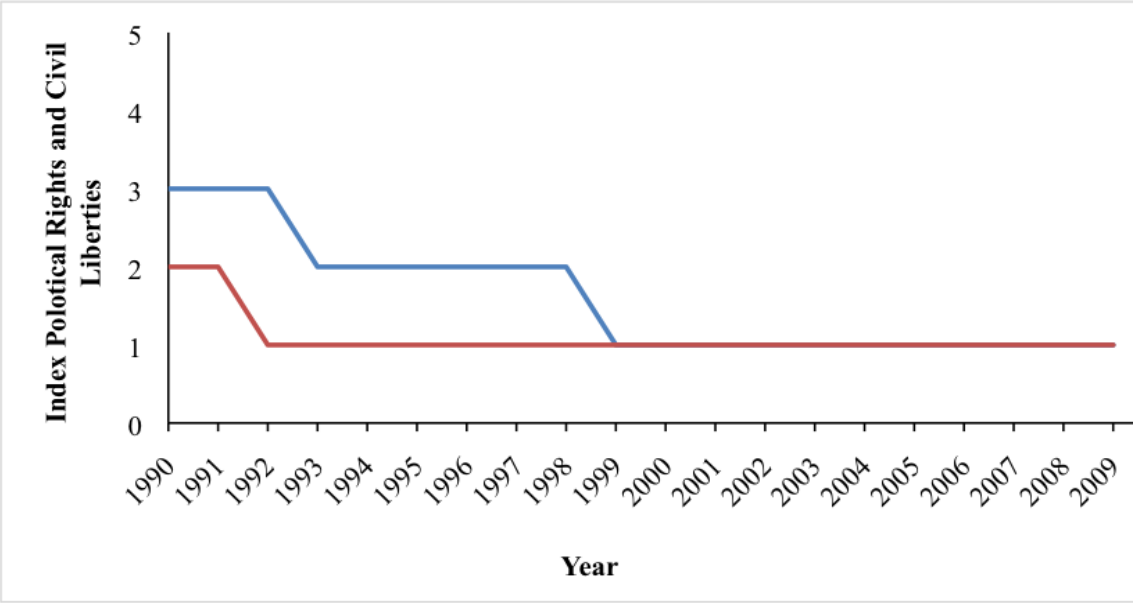

Figure 12. Politica1 rights and civil liberties of the Bahamas from 1990 to 2009; Red = political rights, blue = civil liberties.

Barbados.

Growth (GDP per capita, annual growth in %). From 1990 to 2009, the economy of Barbados remained under 5% while in some years, the country was in a recession such as 1990-1993, 2001, and 2009 as shown in Figure 13. This opposing trend shows that Barbados' economy has been highly fluctuating especially in the 1990s. From 1990 to 1992, the country was operating in recession with lowest negative growth of -5.9 %. The economy started to increase from 1993 to 1997 before declining. During 1997, the economy had grown by 4.3 %.

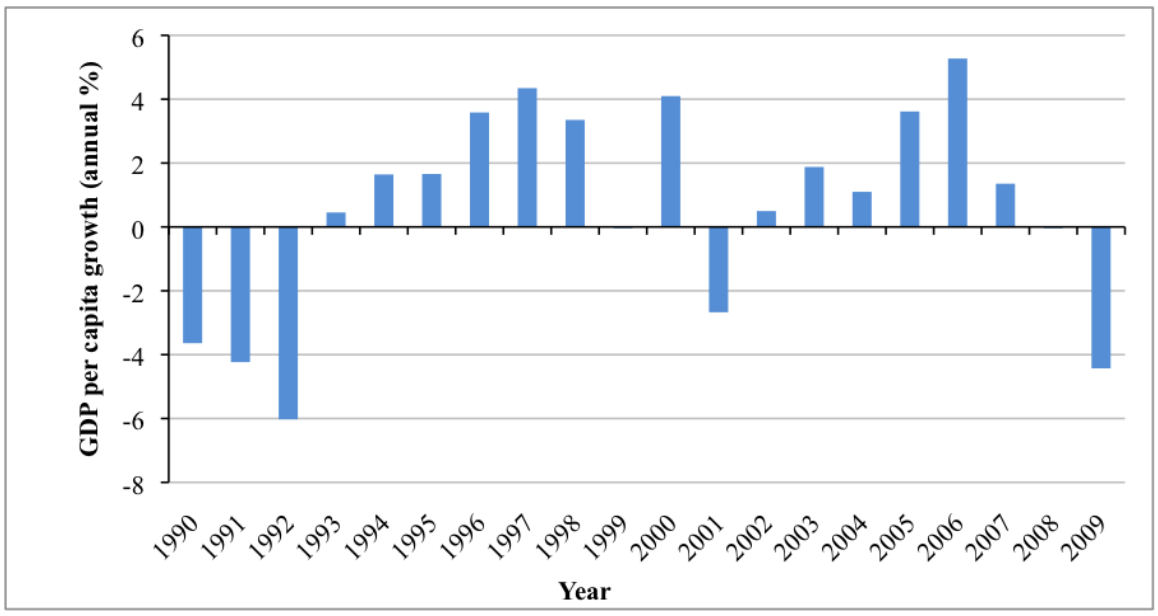

Figure 13. Economic growth of Barbados from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Exports were only higher than imports from 1990 to 1996 (Fig. 14). During this period, exports increased from 38.6 % (1991) to 47.0 % (1996). From 1997 to 2009, exports ranged between 38.2 and 45.6 %. Imports were lowest in 1992 with 43.7 % and increased up to 53.0 % in 2008 when they were almost 8 % higher than exports.

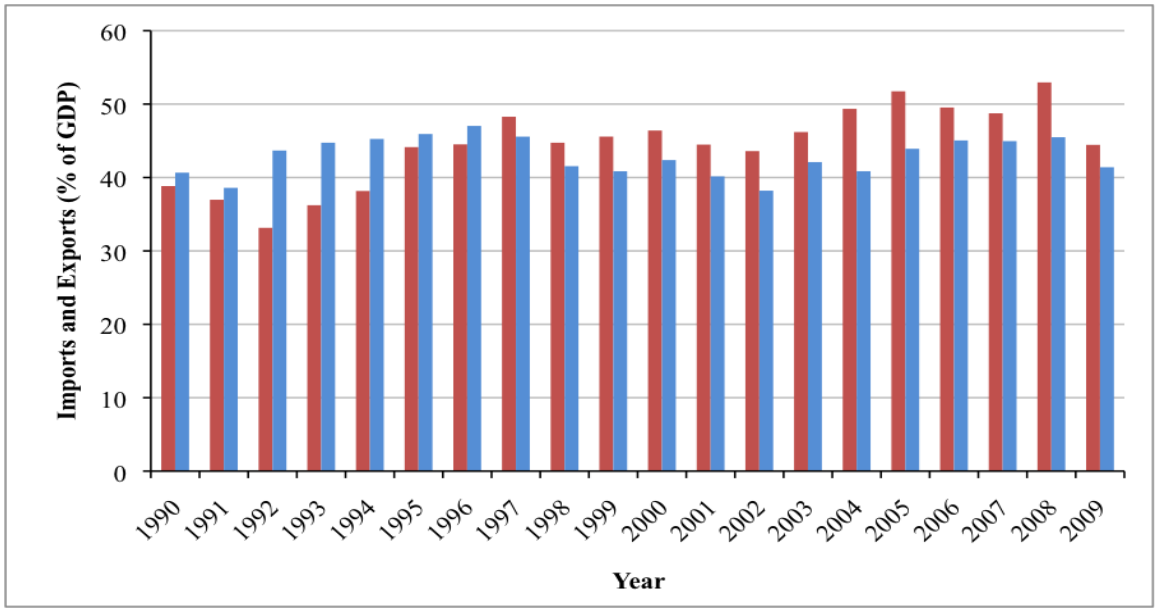

Figure 14. Imports and exports of Barbados relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Inflation in Barbados fluctuated over the investigated time period (Fig. 15). With the exception of 2000 when inflation was -1.3 %, values were positive and for most years >2 %. The highest inflation was reached in 1998 with 8.7 %.

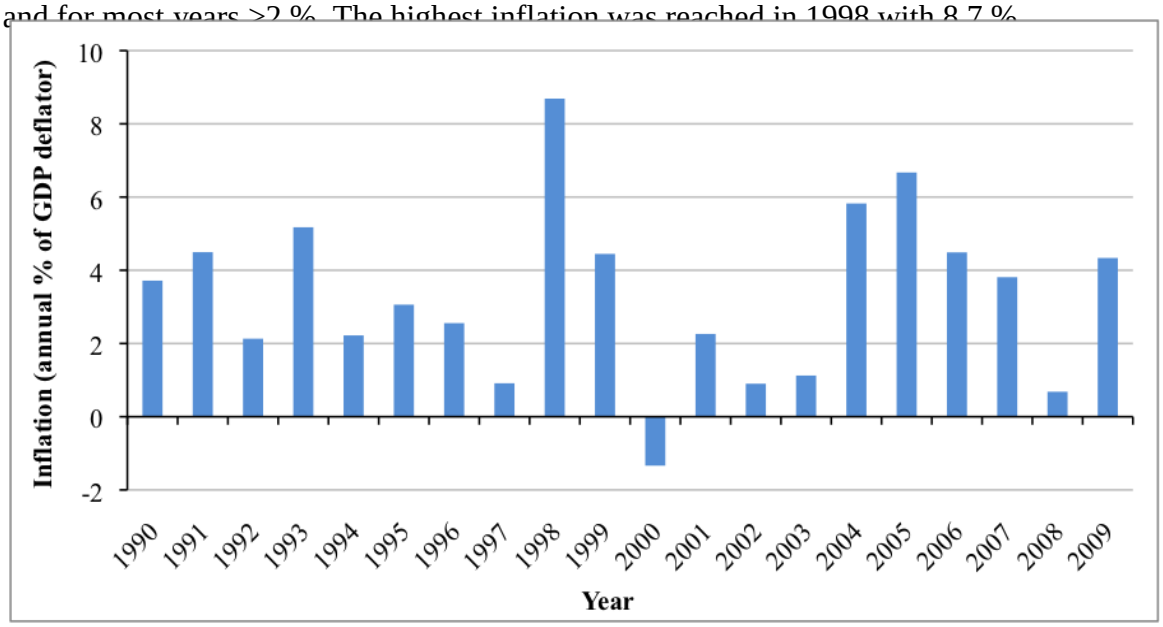

Figure 15. Annual inflation rate of Barbados from 1990 to 2009 expressed as %.

FDI. Inflows of FDI into Barbados were relatively low and < 2% 1990 to 2003 and were even negative in 2004 (-0.3 %) before FDIs strongly increased to 6.1 % in 2005 and reached their highest values in 2007 to 2009 with ≈10 %.

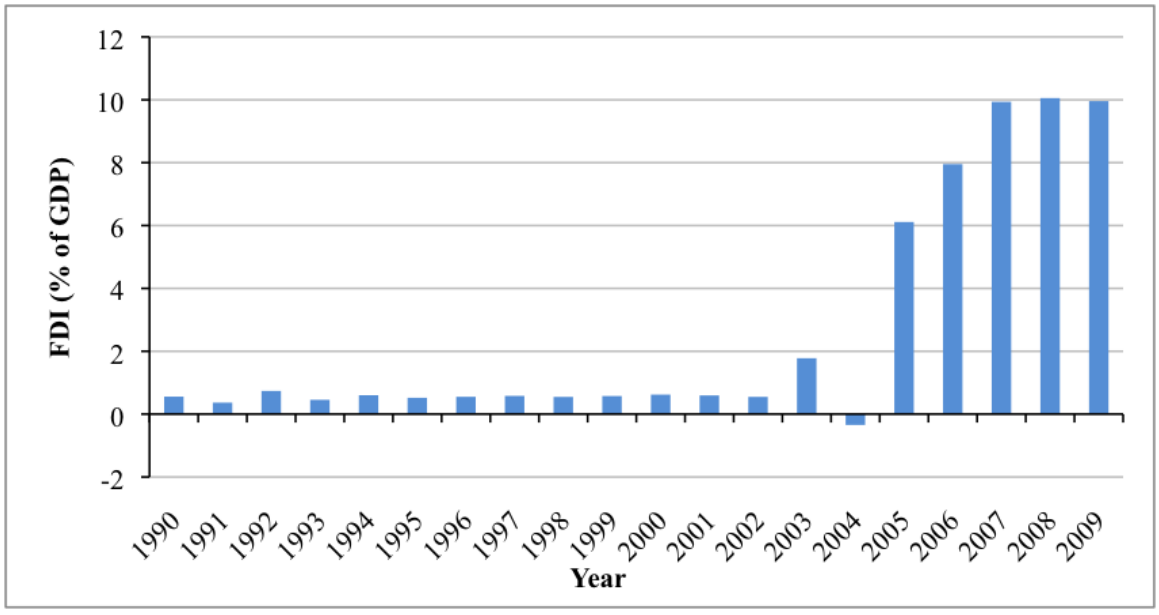

Figure 16. Foreign direct investment of Barbados from 1990 to 2009 based on the net inflows as a percent of GDP.

Human capital (secondary school enrollment). It can be noted that there was a high enrollment among both genders into secondary school. In 1990, the secondary school for male (83.97%) was slightly higher than their female counterparts (73.66%) as shown in Figure 17. For the available data from 1999 through to 2009, the female enrollment seems to be equal or slightly greater than the male secondary school enrollment.

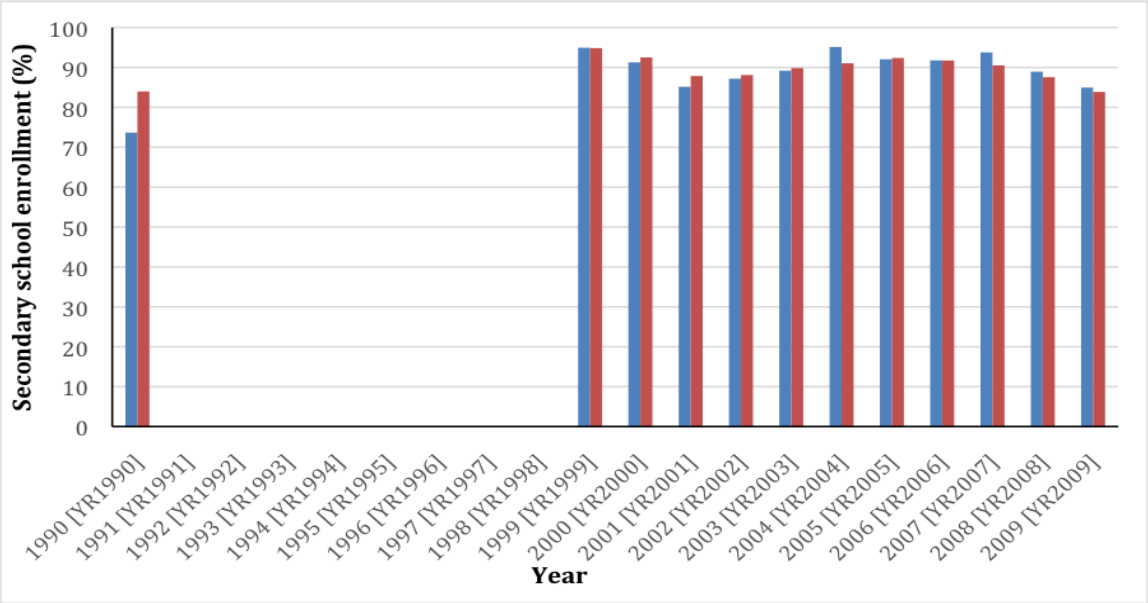

Figure 17. Secondary school enrollment rate for Barbados from 1990-2009. Data between 1992 to 1998 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). From 1990 to 2009, the civil liberties and political rights have remained equal with no changes at a constantly low index of 1 (Fig. 18).

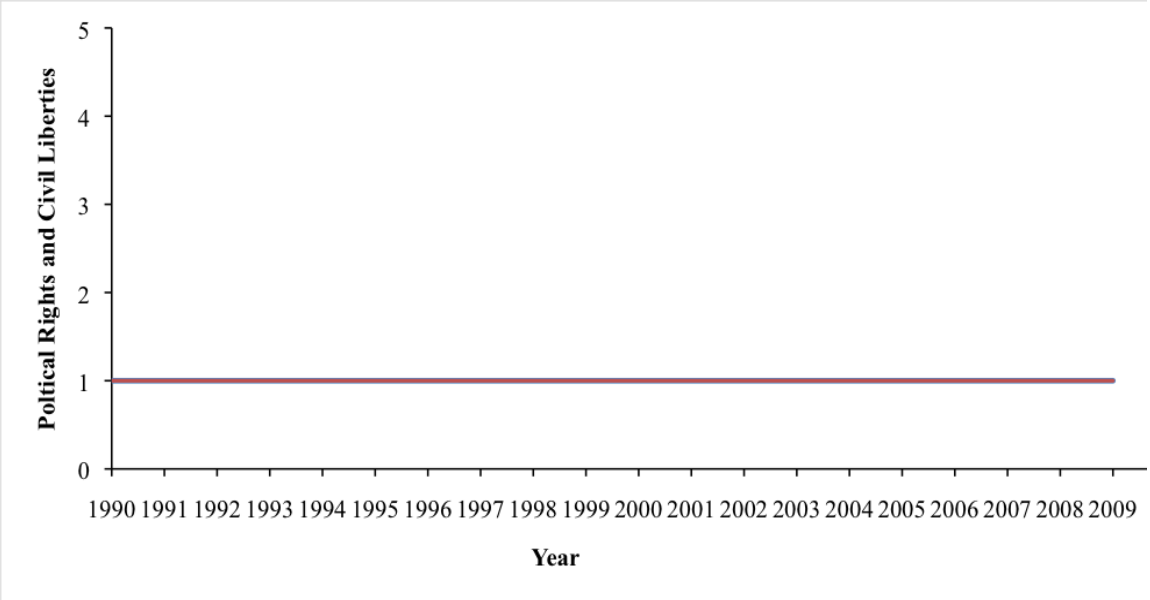

Figure 18. Politica1 rights and civil liberties of Barbados from 1990 to 2009. Note that both political rights and civil liberties have the same index and hence overlap. Red = political rights, blue = civil liberties.

Dominica.

Growth (GDP per capita, annual growth in %). Every year from 1990 to 2009, economic growth of Dominica was positive albeit highly fluctuating (0.5 to 7.3 %) except for the years 2002, 2005 and 2009 (Fig. 19). During these three years, economic growth was slightly negative with a low in 2002 of -2.0 %.

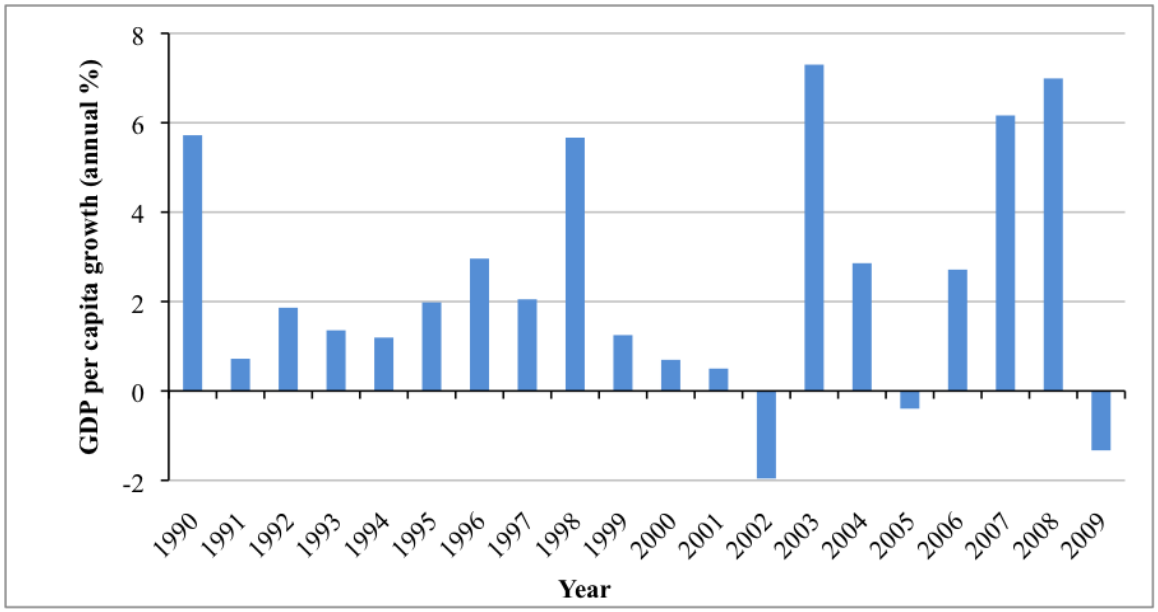

Figure 19. Economic growth of Dominica from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Imports to Dominica were significantly higher (> 10 %) then exports from 1990 to 2009 (Fig. 20). Both imports and exports were higher from 1990 to 2000 than from 2001 to 2009. Imports ranged from 54.5 % (2000) to 80.5 % (1990), whereas exports were between 43.0 % (2000) and 53.7 % (1998) between 1990 and 2009. In contrast from 2001 to 2009, imports ranged from 44.9 % (2003) to 62.7 % (2008), whereas exports were ranging between 30.3 % (2009) to 37.0 % (2006).

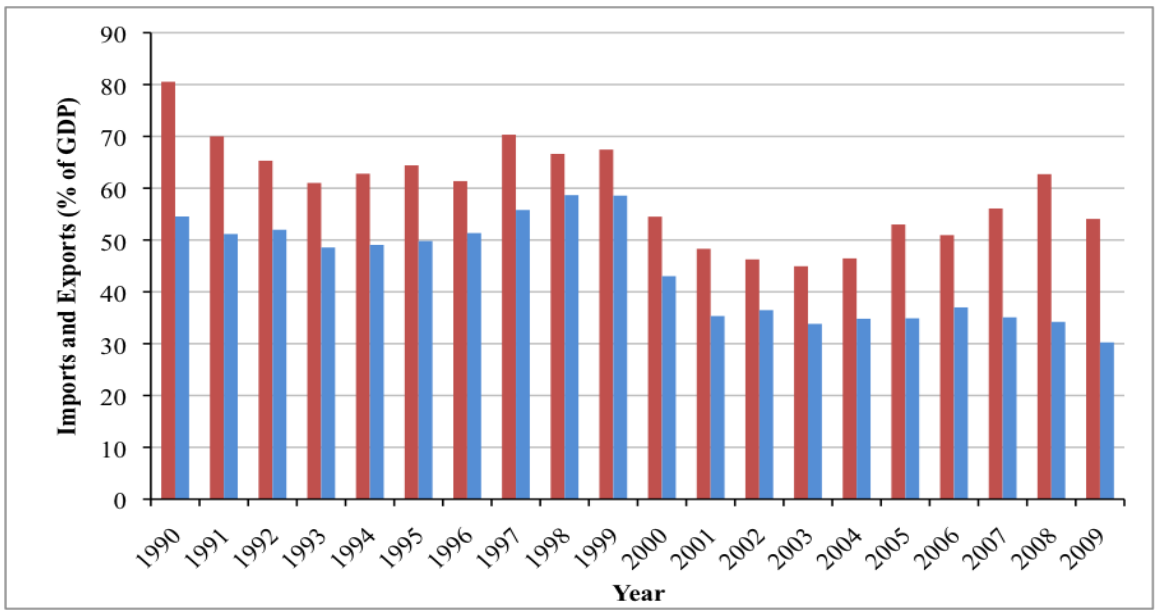

Figure 20. Imports and exports of Dominica relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Inflation in Dominica ranged widely between 1990 to 2009, although it was commonly positive and < 8% (Fig. 21). However, in 2000 inflation reached a high with 25.0 %. The lowest inflation was reported from 2003 with -3.7 %.

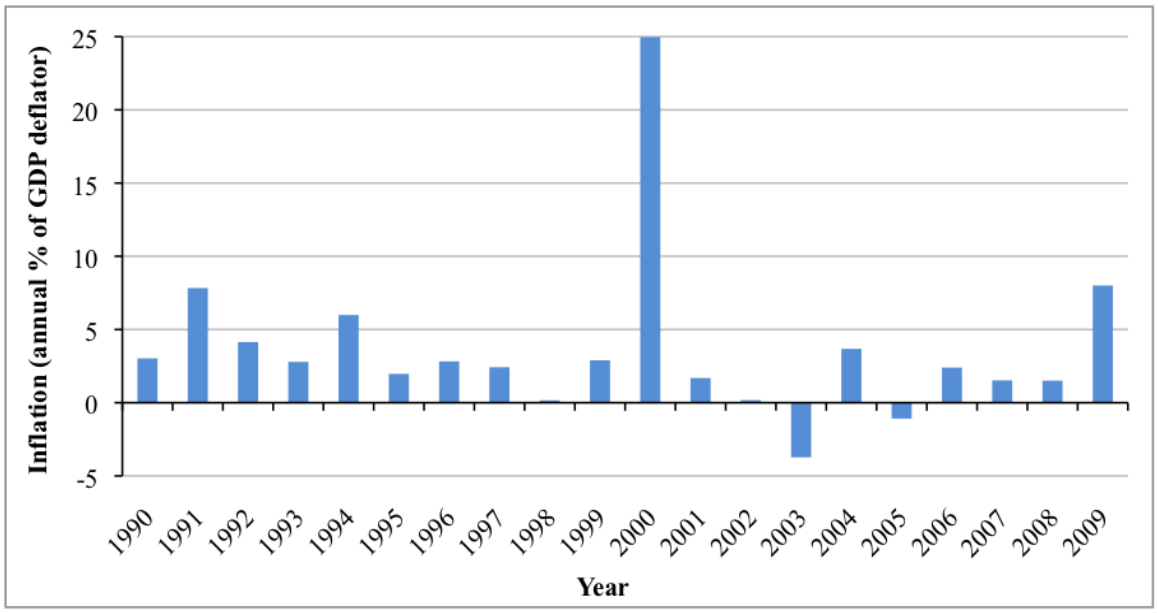

Figure 21. Annual inflation rate of Dominica from 1990 to 2009 expressed as %.

FDI. There is no trend regarding FDI inflows throughout the investigated time period for Dominica. Nevertheless, FDI inflows into Dominica generally were between 5

and 13 % between 1990 to 2009 with the exceptions of 1995 and 1998 when FDI inflows were at 24.1 and 2.5 %, respectively (Fig. 22).

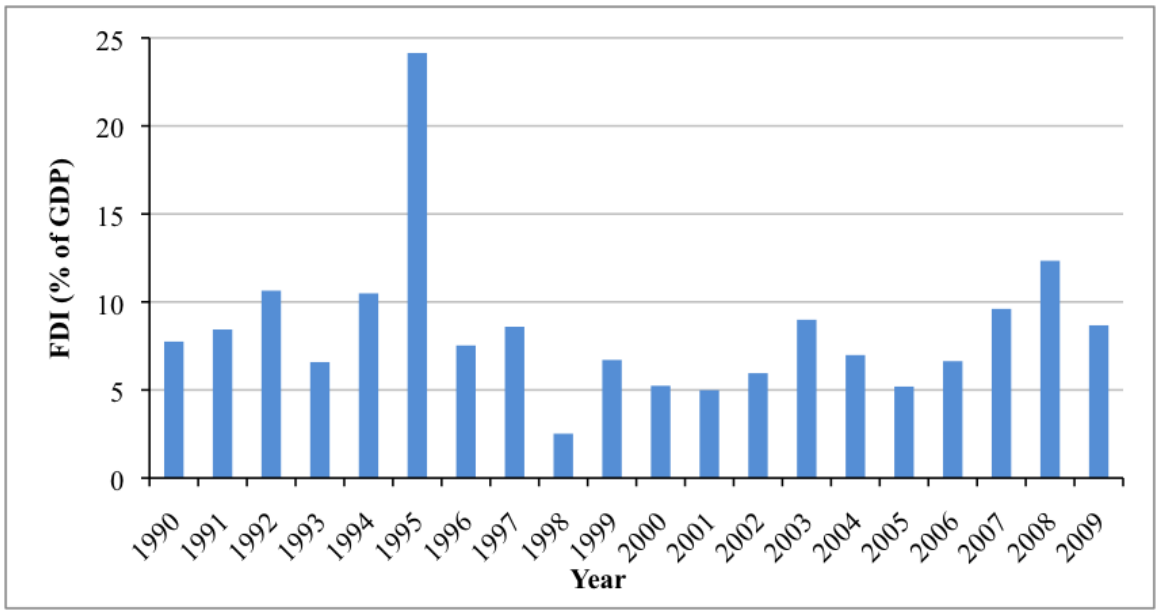

Figure 22. Foreign direct investment of Dominica from 1990 to 2009 based on the net inflows as a percent of GDP.

Human capital (secondary school enrollment). Data were only available for 1999 to 2001, 2003 to 2006, and 2009. For these years, secondary school enrollment for both genders are above 60 %; furthermore, there was a consistently higher female enrollment (> 80 %) than males (Fig. 23).

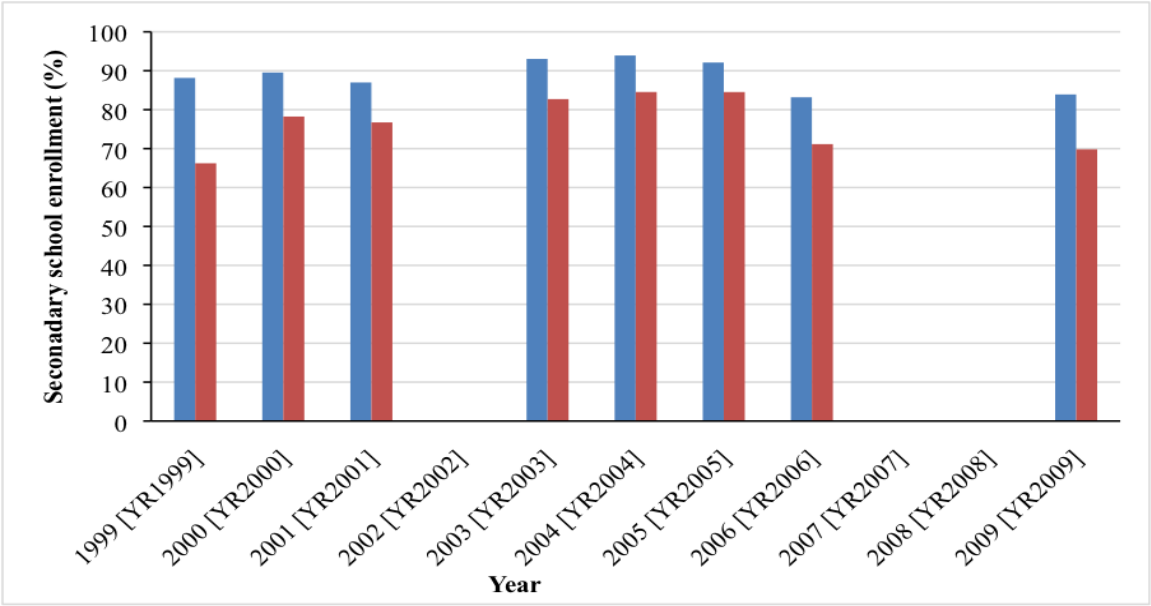

Figure 23. Secondary school enrollment rate for Dominica from 1999-2009. Data prior to 1999 and for 2002, 2007, and 2008 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). It can be observed that there was more political freedom in Dominica from 1990 to 1995 as compared to civil liberties. After 1995, both freedom parameters had the lowest index of 1.

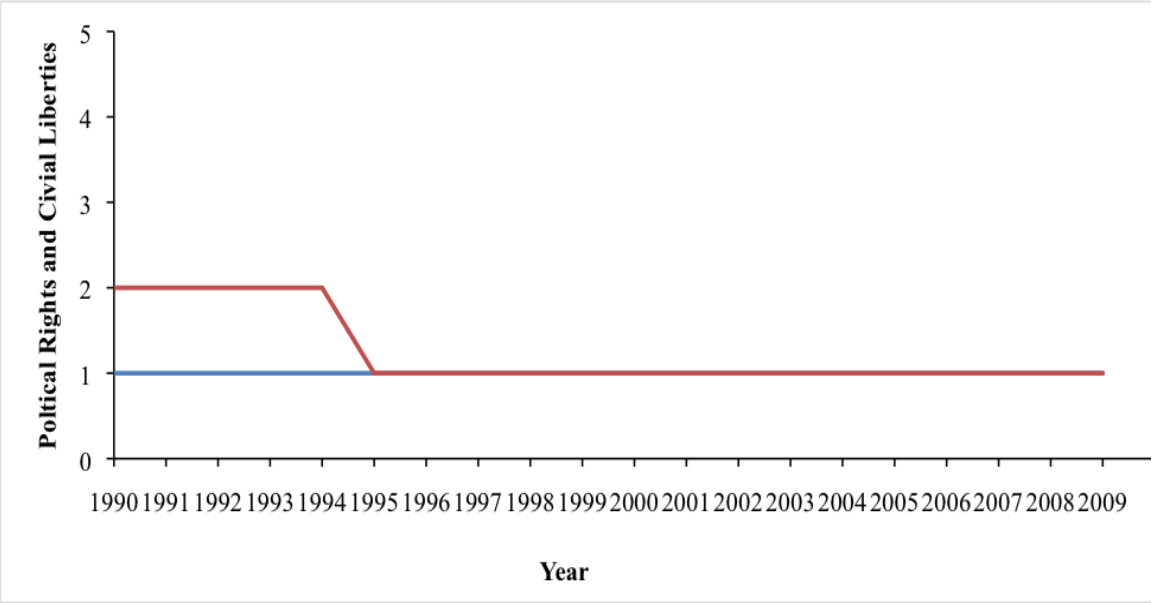

Figure 24. Politica1 rights and civil liberties of Dominica from 1990 to 2009. Note that both political rights and civil liberties have the same index and hence overlap from 1995 on. Red = political rights, blue = civil liberties.

Grenada.

Growth (GDP per capita, annual growth in %). Economic growth in Grenada varied greatly for 1990 to 2009 with values ranging from -6.9 % (2009) to 12.9 % (2005; Fig. 25). A small trend can be observed for 1994 to 1999 when economic growth steadily increased from 1.6 to 9.9 % before it significantly decreased again and became highly fluctuating in the 2000s.

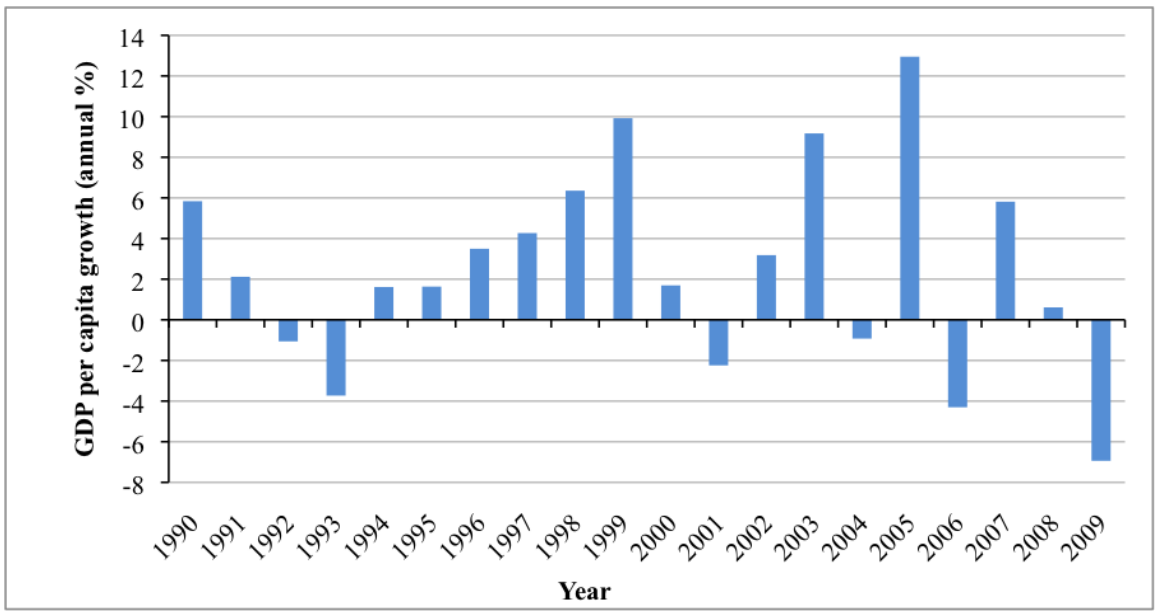

Figure 25. Economic growth of Grenada from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Similar to Dominica, imports were much higher in Grenada than exports for 1990 to 2009, whereas imports were ≈ 15 to 35 % above exports (Fig. 26). Imports ranged from 46.8 % (2009) to 74.3 % (1998). Moreover, imports were generally lower in the 2000s compared to the 1990s. Exports behaved similar with values ranging from 39.6 % (1992) to 57.4 % (1999) in the 1990s compared to 21.4 % (2005) to 45.3 % (2000) in the 2000s.

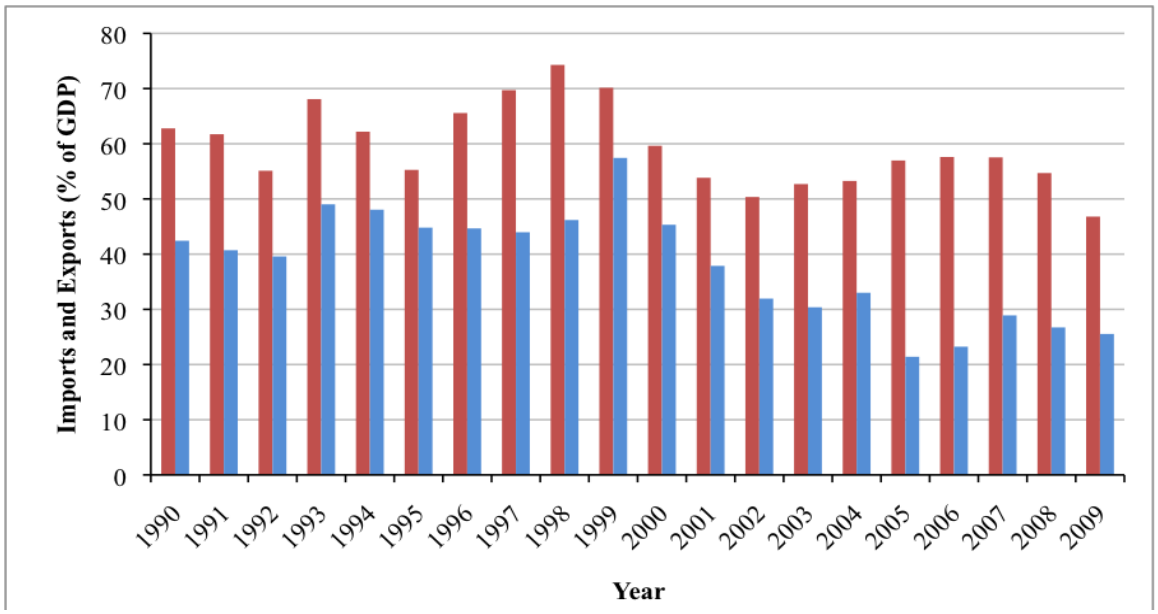

Figure 26. Imports and exports of Grenada relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Figure 27 shows the inflation rate of Grenada. It was relatively low from 1990 to 2009 ranging from -1.4 % (1990) to 7.9 % (2008) with dominantly positive values. However, inflation significantly increased to 34.5% in 2000 before decreasing to 2.1 % in 2001.

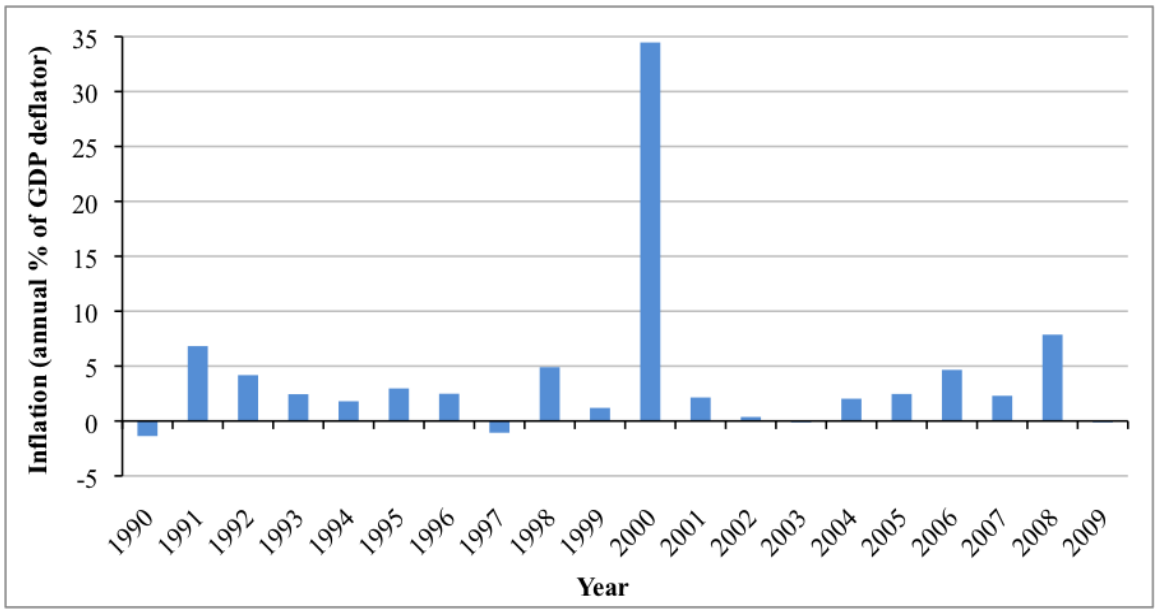

Figure 27. Annual inflation rate of Grenada from 1990 to 2009 expressed as %.

FDI. Grenada received FDI inflows >5.8 % for the studied period. For 1990 to 1999, FDI inflows were fluctuating and ranged between 5.8 % (1996) and 14.3 % (1998). In the 2000s, FDI inflows were higher than in the previous decade and increased up to 20.6 % in 2007 before decreasing to 13.3 % in 2009.

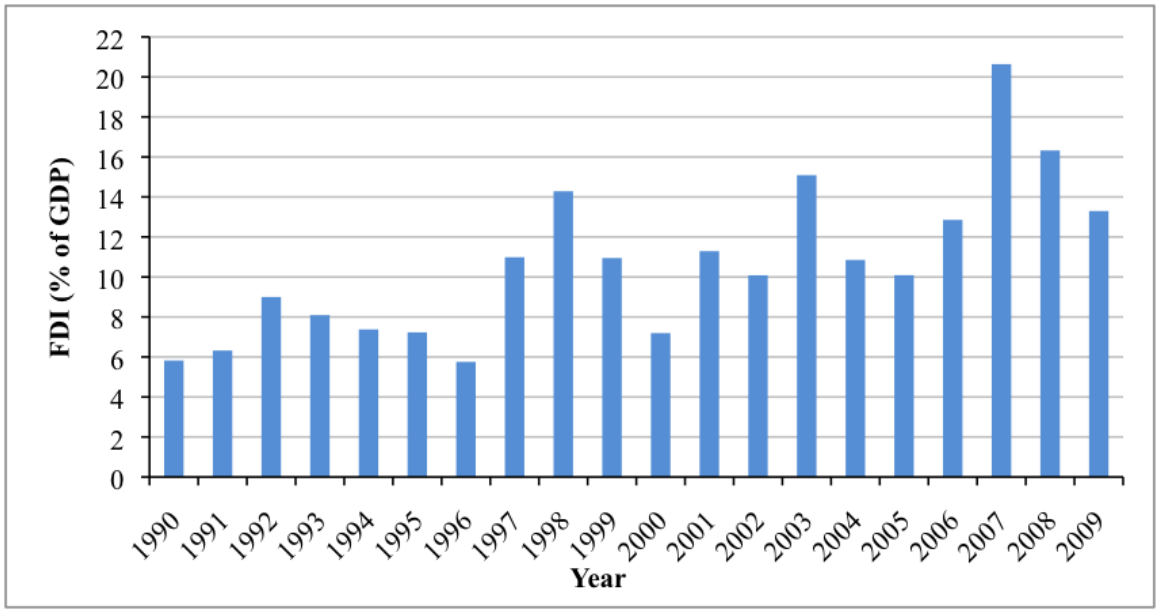

Figure 28. Foreign direct investment to Grenada from 1990 to 2009 based on the net inflows as % of GDP.

Human capital (secondary school enrollment). Data were very limited for Grenada and only available for 2002 to 2005. For this time span, secondary school enrollment was above 75 % for both genders (Fig. 29). In 2002 and 2004, the secondary school enrollment for males was higher than their female counterparts; however, in 2003 and 2005, the secondary school enrollment for both genders were almost equal.

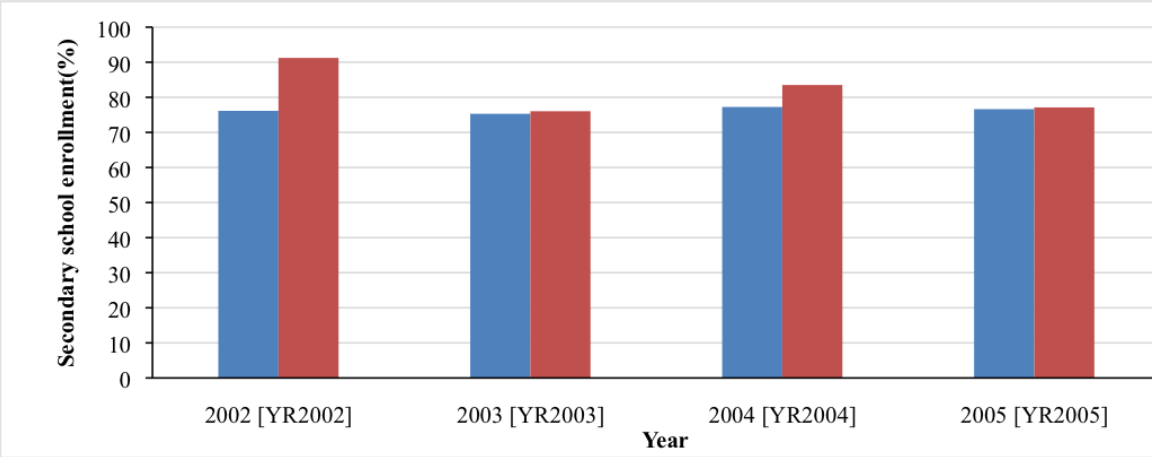

Figure 29. Secondary school enrollment rate for Grenada from 2002 to 2005. Data prior to 2002 and after 2005 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). Civil liberties were at a constant index of 2 for the observed time span (Fig. 30). In contrast, political rights declined from index 2 in 1990 to the lowest index of 1 after 1990.

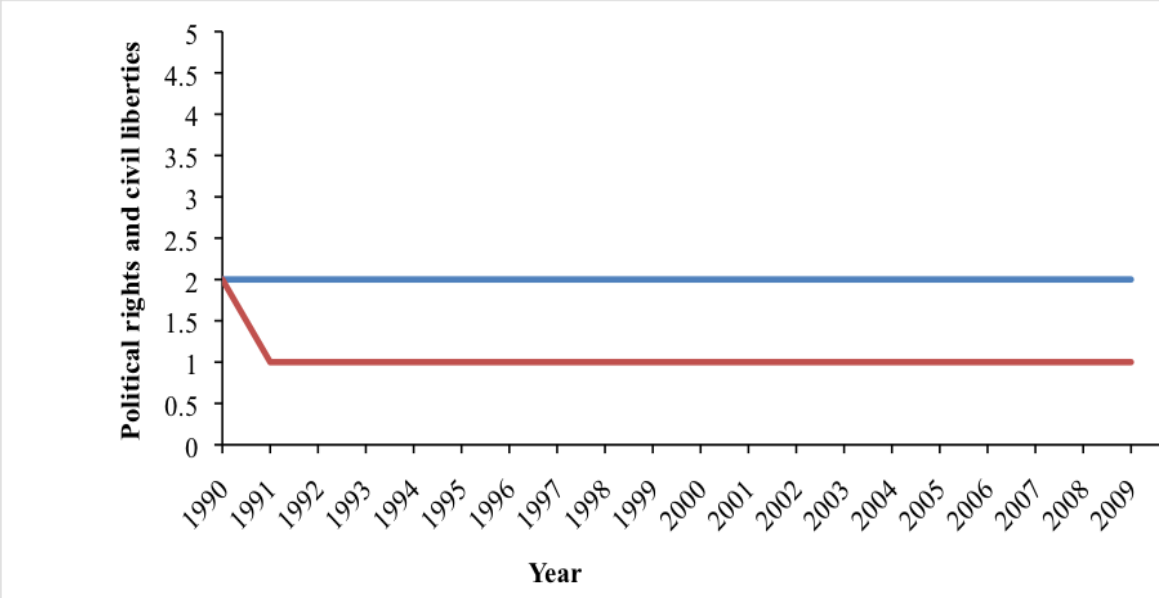

Figure 30. Politica1 rights and civil liberties of Grenada from 1990 to 2009. Red = political rights, blue = civil liberties.

Jamaica.

Growth (GDP per capita, annual growth in %). Generally, the economic growth was fluctuating between negative and positive values from 1990 to 2009 (Fig. 31). In 1993, the economy of Jamaica increased to a high value of +8.6 % before decreasing and reaching a low of -4.8 % in 2009.

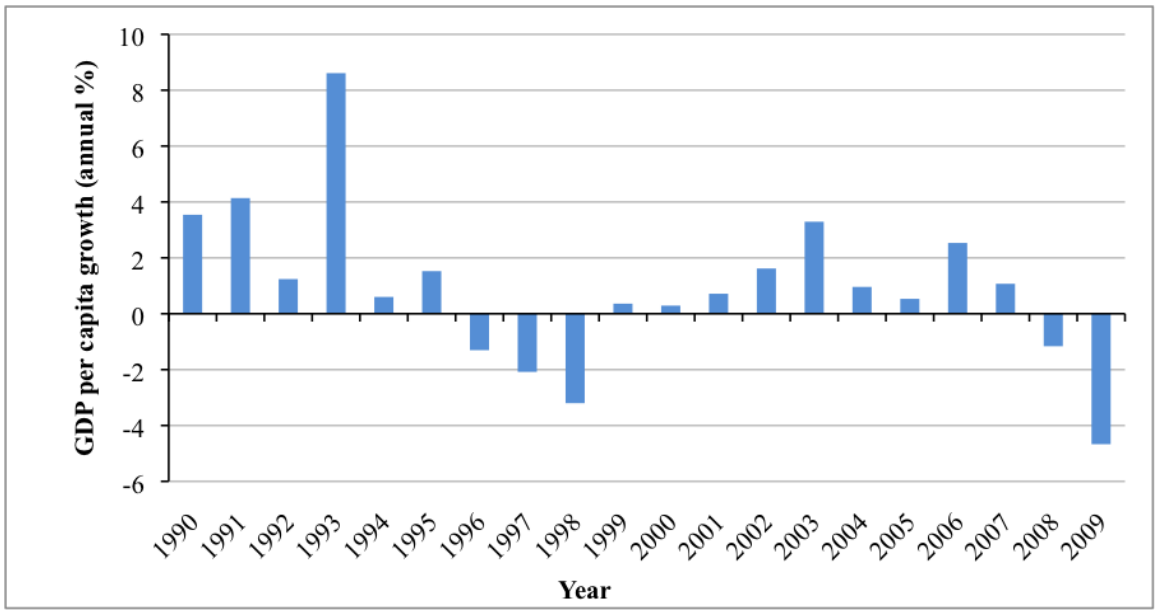

Figure 31. Economic growth of Jamaica from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Data were not available for 1998 to 2001 for unknown reason. Form Figure 32 it is seen that exports were higher from 1990 to 1997 with an all-time high of 62.3 % in 1992. In contrast, exports were contributing less to Jamaica's economy from 2002 to 2009 when values ranged between 32.8 to 41.9 %. Imports were higher than exports for the investigated time period and generally > 50% with the exception of 2002 (49.1 %). Differences between imports and exports were more significant from 2002 to 2009 with imports up to 30 % higher than exports (2008). In contrast, differences between imports and exports were less from 1990 to 1997 and never exceeded a difference of 12 % (1997).

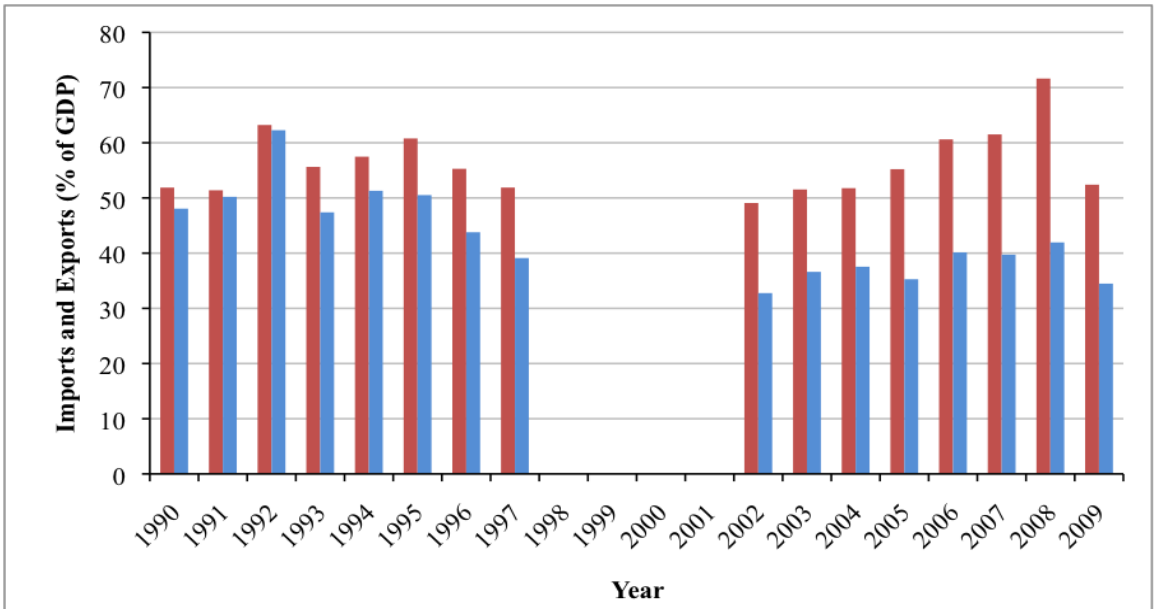

Figure 32. Imports and exports of Jamaica relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. The inflation rate of Jamaica is constantly positive for the investigated time period. Highest values occurred in the first half of the 1990s with the highest value of 60 % in 1992. Inflation decreased significantly afterwards with values around 10 % in the 2000s (Fig. 33).

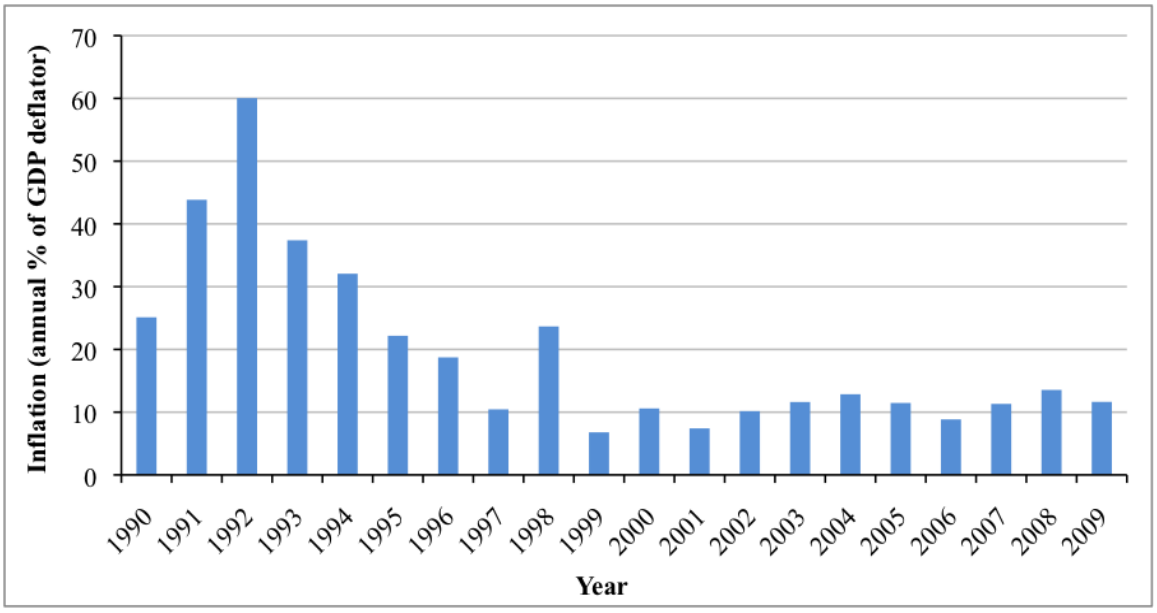

Figure 33. Annual inflation rate of Jamaica from 1990 to 2009 expressed as %.

FDI. Foreign direct investment to Jamaica has been constantly below 10 % from 1990 to 2009 with the exception of 2008 when FDI was 10.1 % (Fig. 34). Although,

values FDI inflows haven been below 10 % a steady increase from the late 1990s on can be observed before FDI inflows decreas in 2009 down to 4.0 % from 10.1 % in 2008.

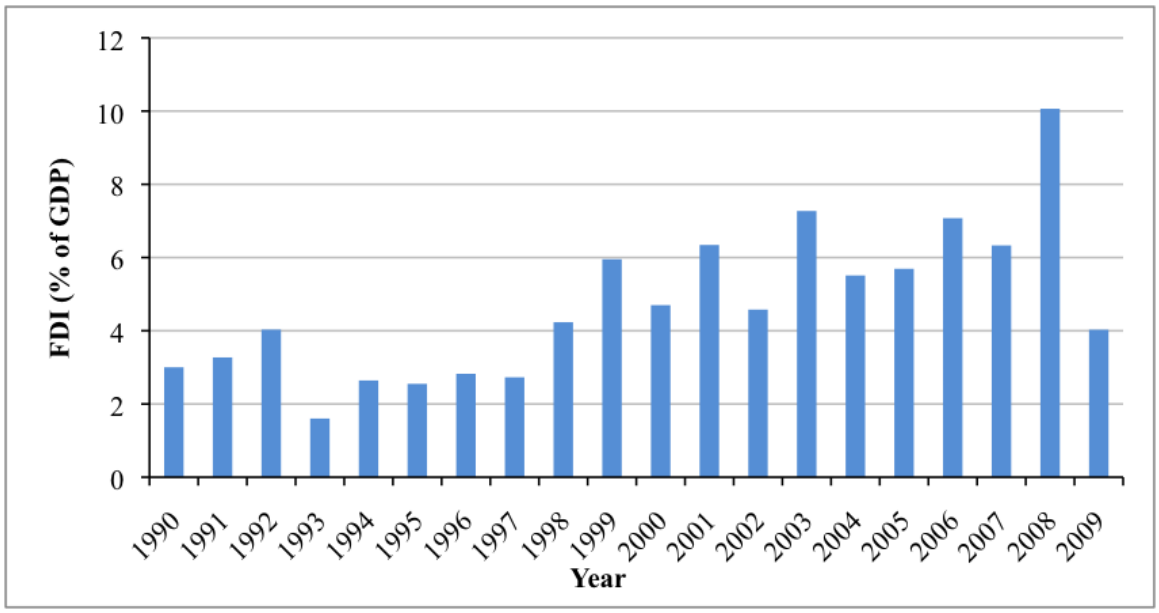

Figure 34. Foreign direct investment of Jamaica from 1990 to 2009 based on the net inflows as % of GDP.

Human capital (secondary school enrollment). Data were only available from 1999 to 2005. For this period, secondary school enrollment for both genders were constantly >75 %, whereas males had a slightly higher enrollment rate than females in Jamaica (Fig. 35).

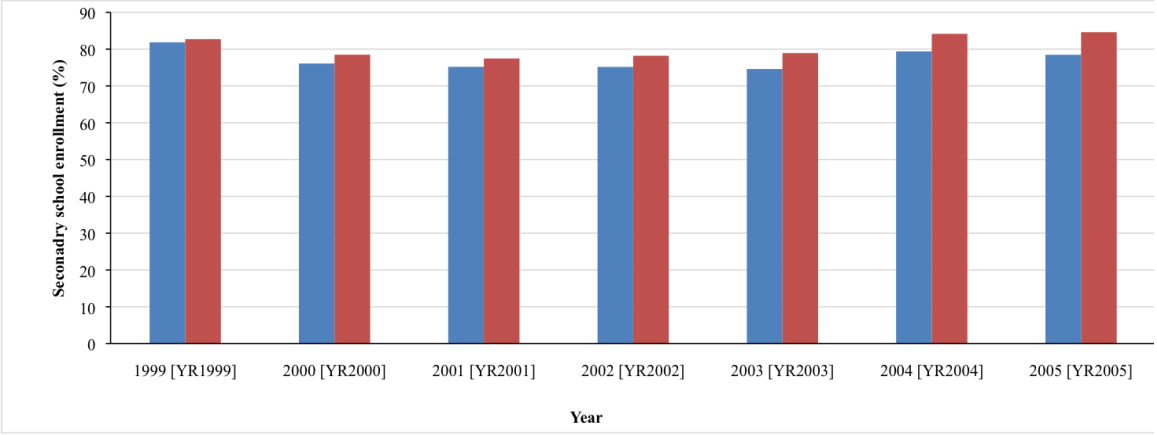

Figure 35. Secondary school enrollment rate for Jamaica from 1999 to 2005. Data prior to 1999 and after 2005 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). Political rights were at a constant low index of 2 from 1990 to 2009 (Fig. 36). In contrast, civil liberties were commonly at a higher index of 3 for most of the investigated period with exception of 1990 to 1992 and 1998 to 2000 when civil liberties had the same index as political rights.

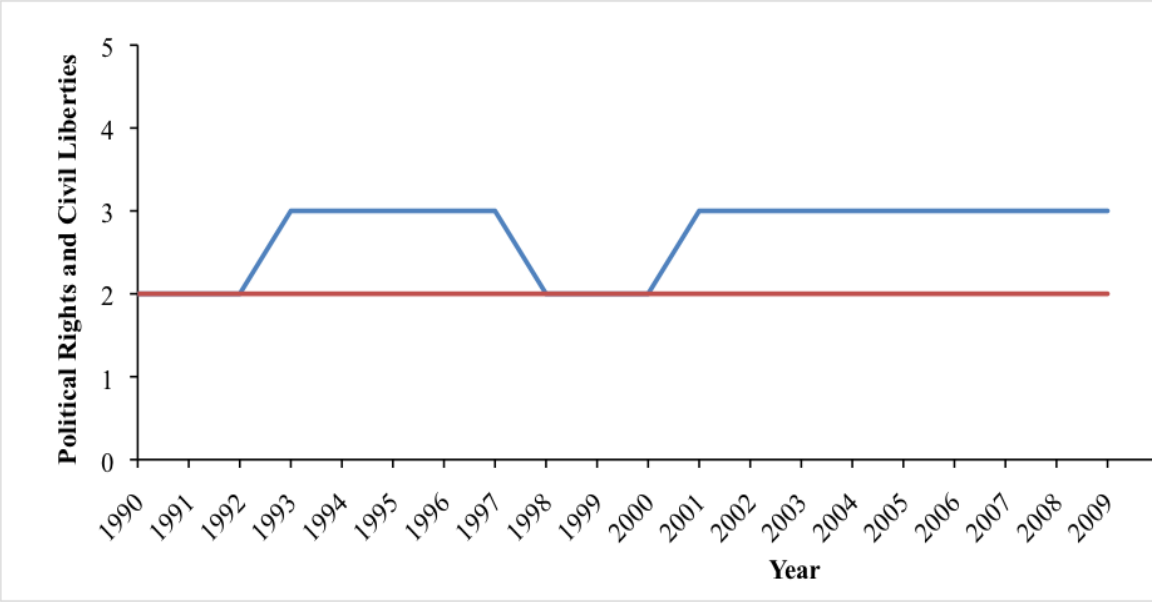

Figure 36. Politica1 rights and civil liberties of Jamaica from 1990 to 2009. Note the overlap of political right with civil liberties for 1990 to 1992 and 1998 to 2000. Red = political rights, blue = civil liberties.

St. Kitts and Nevis.

Growth (GDP per capita, annual growth in %). St. Kitts and Nevis showed positive values for GDP per capita for most of the investigated time period with the highest value of +7.7 % in 2005 (Fig. 37). Negative values were only reported in 1991, 1998, 2003, and 2009 with the lowest value of -6.7 % in 2009.

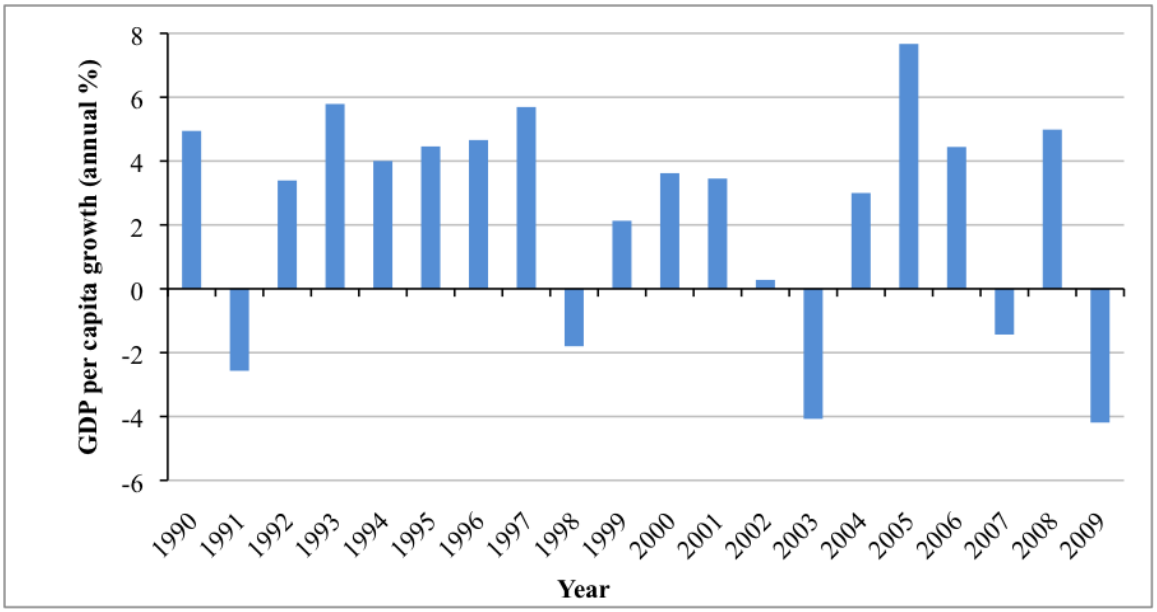

Figure 37. Economic growth of St. Kitts and Nevis from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Imports and exports for St. Kitts and Nevis from 1990 to 2009 are shown in Figure 38. Similar to Dominica, Grenada, and Jamaica, imports were higher than exports throughout the investigated time period and imports were generally greater than 10 % compared to exports with the exception of 1992. Imports ranged from 48.2 % (2004) to 63.4 % (1990) from 1990 to 2009 and did not show a trend throughout the years. Exports ranged between 24.4 % (2009) and 49.2 % (1992) for 1990 to 2009 and show a weak sinus-like pattern.

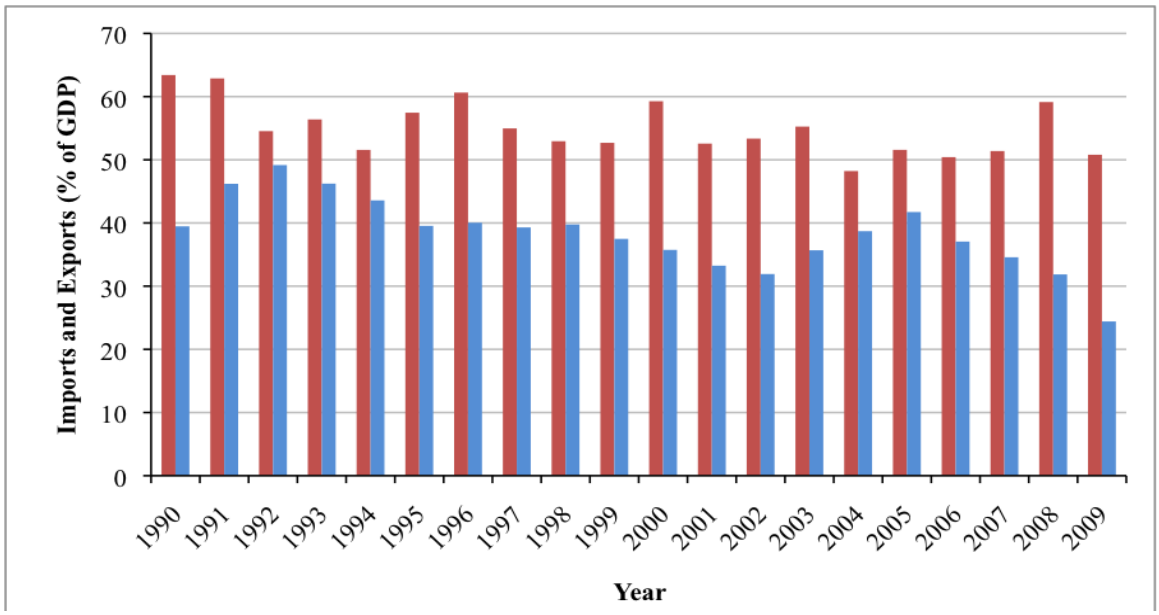

Figure 38. Imports and exports of St. Kitts and Nevis relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Generally, the inflation rate of St. Kitts and Nevis fluctuated between positive and negative values; however, inflation rates > 2 % dominated for 1990 to 2009 (Fig. 39). Highest inflation rate occurred in 2006 with 10.6 %. In contrast, the lowest inflation was recorded in 2003 and 2005 with negative values of -1.1 and -0.8 %, respectively.

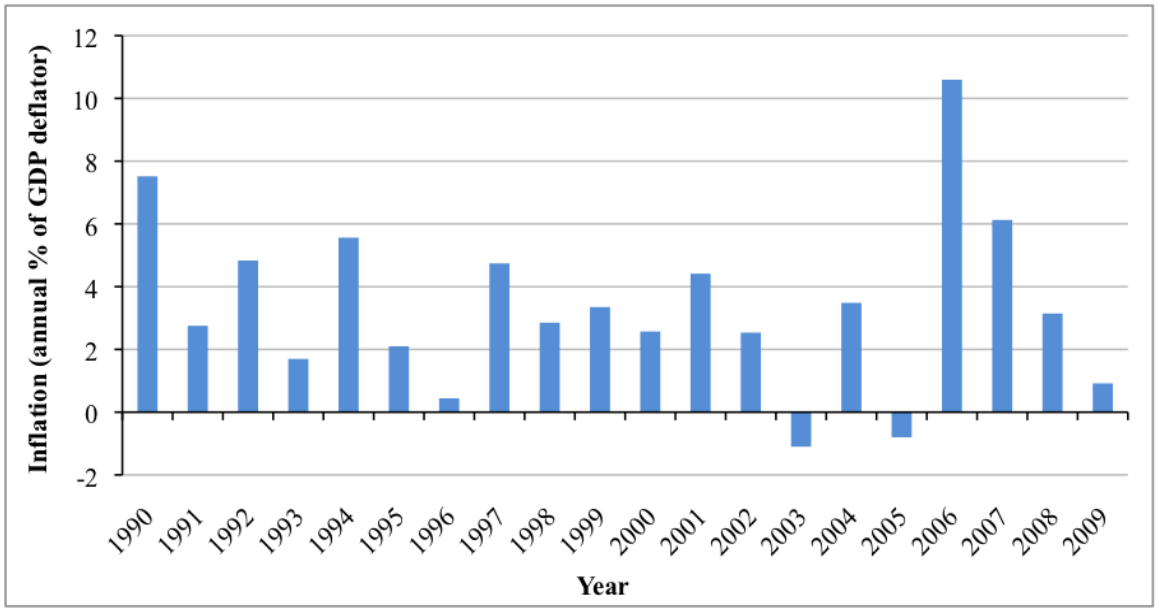

Figure 39. Annual inflation rate of St. Kitts and Nevis from 1990 to 2009 expressed as %.

FDI. Foreign direct investment inflows into St. Kitts and Nevis were commonly <15 % in the 1990s with the exception of 1990 when FDI reached 23.4 % relative to GDP (Fig. 40). Inflows increased significantly in the 2000s with annual values constantly >15 % relative to GDP and a high value of 24.2 % in 2008.

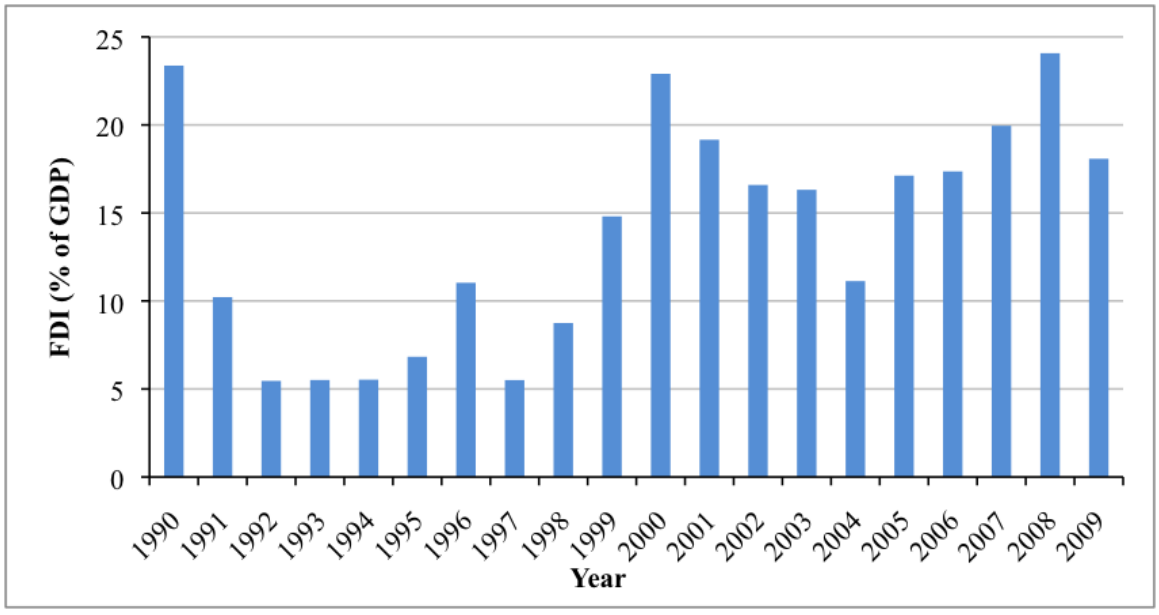

Figure 40. Foreign direct investment of St. Kitts and Nevis from 1990 to 2009 based on the net inflows as % of GDP.

Human capital (secondary school enrollment). Secondary school enrollment data for St. Kitts and Nevis were available in 1992, from 2000 to 2005, and from 2007 to 2009. The available data in Figure 41 show a rate for both genders >73 %, whereas males typically have a higher enrollment rate and reach even 100 % in 2000 and 2001.

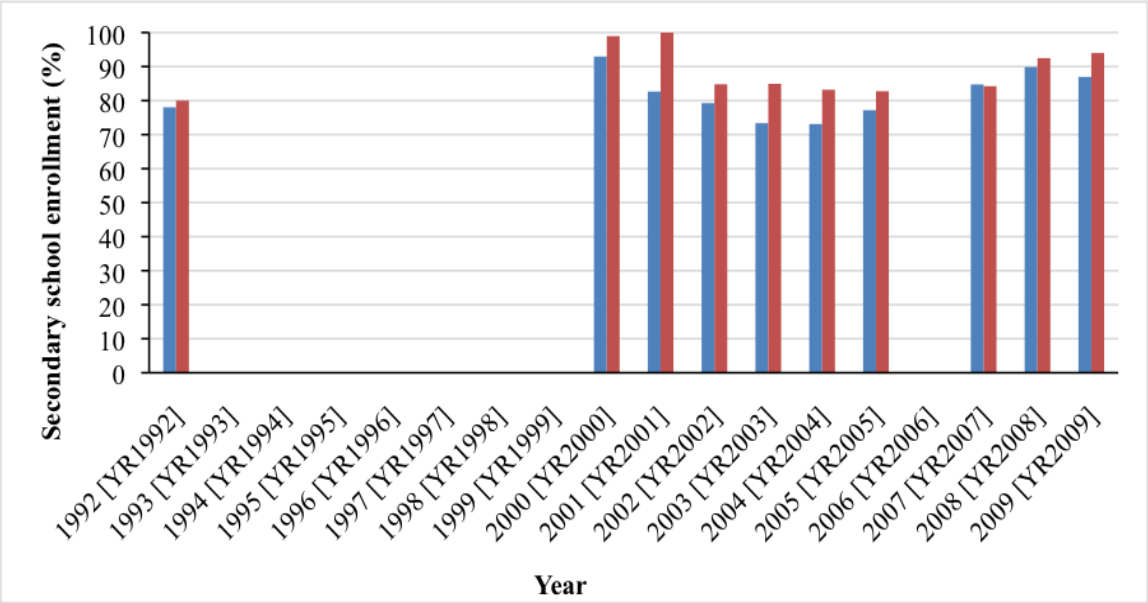

Figure 41. Secondary school enrollment rate for St. Kitts and Nevis from 1992 to 2009. Data prior to 1992, from 1993 to 1999, and 2006 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). Both political rights and civil liberties had low indices from 1990 to 2009 in St. Kitts and Nevis (Fig. 42). Civil liberties constantly were on an index of 1 with the exception of 1994 where it reached 2. Political rights had a similar low index of 1 in the early 1990s and late 200s contrasting to a value of 2 from 1994 to 2005.

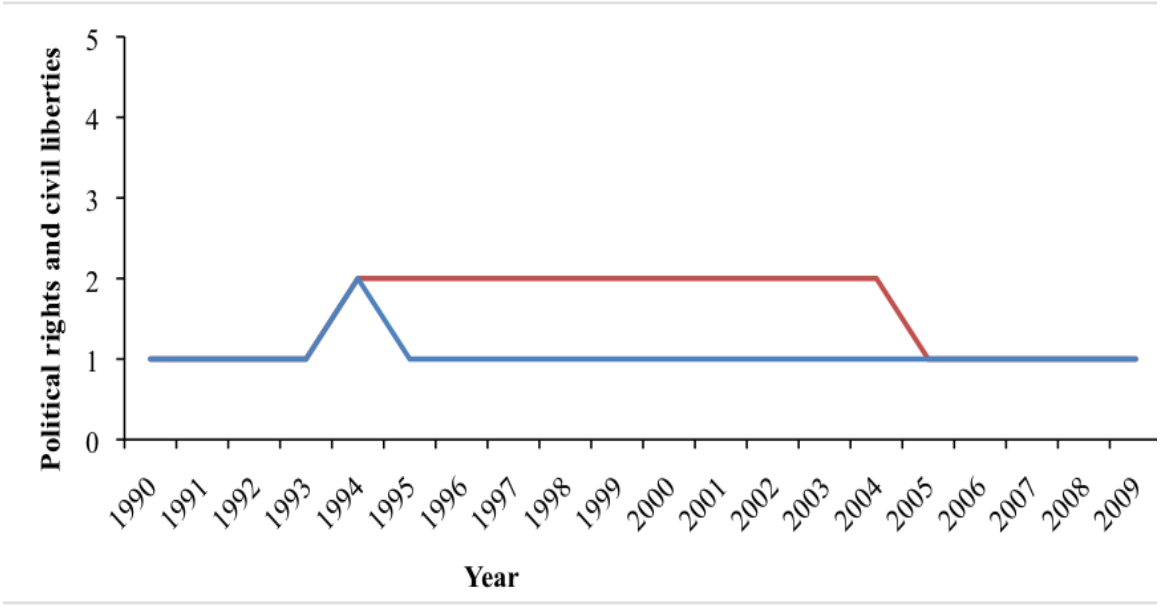

Figure 42. Politica1 rights and civil liberties of St. Kitts and Nevis from 1990 to 2009. Note the overlap of political right with civil liberties for 1990 to 1994 and 2005 to 2009. Red = political rights, blue = civil liberties.

St. Lucia.

Growth (GDP per capita, annual growth in %). Saint Lucia had the highest economic growth in 1990 with +21.6 % before it declined rapidly and highly fluctuated between –4.3 % (2001) and +7.1 % (2004) for the time period of 1991 and 2009 (Fig. 43).

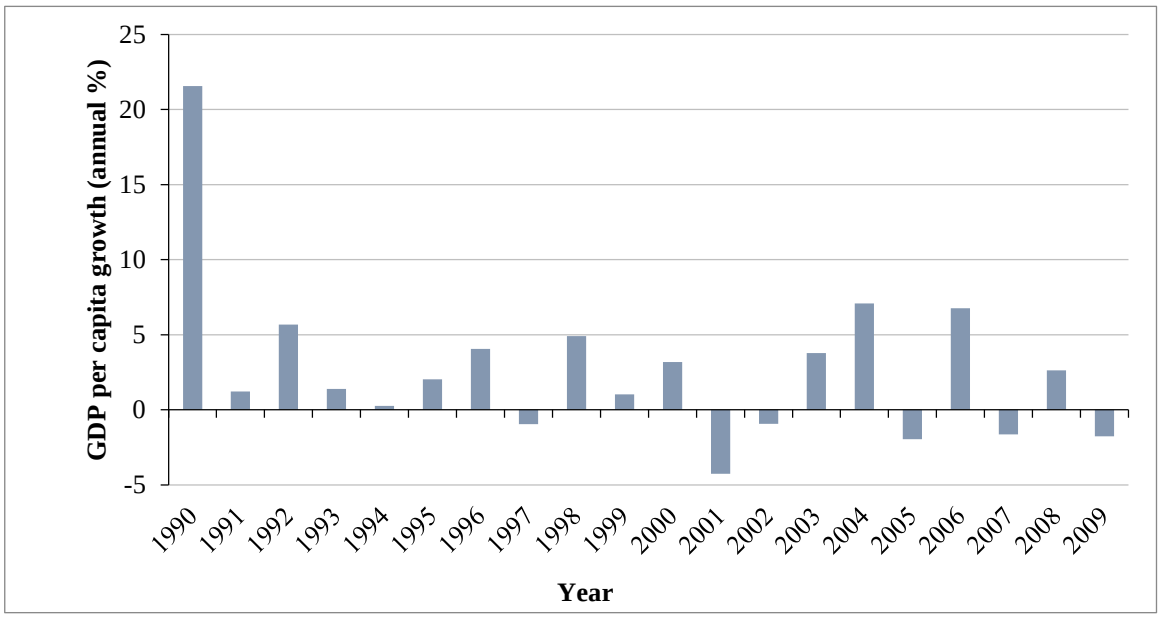

Figure 43. Economic growth of St. Lucia from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Imports were constantly higher than exports for 1990 to 2009 and ranged from 53.7 % (2002) to 84.2 % (1990). Exports from St. Lucia has been constantly high and >50 % relative to GDP in the 1990s before declining in the 2000s with a low value of 39 % in 2007 (Fig. 44).

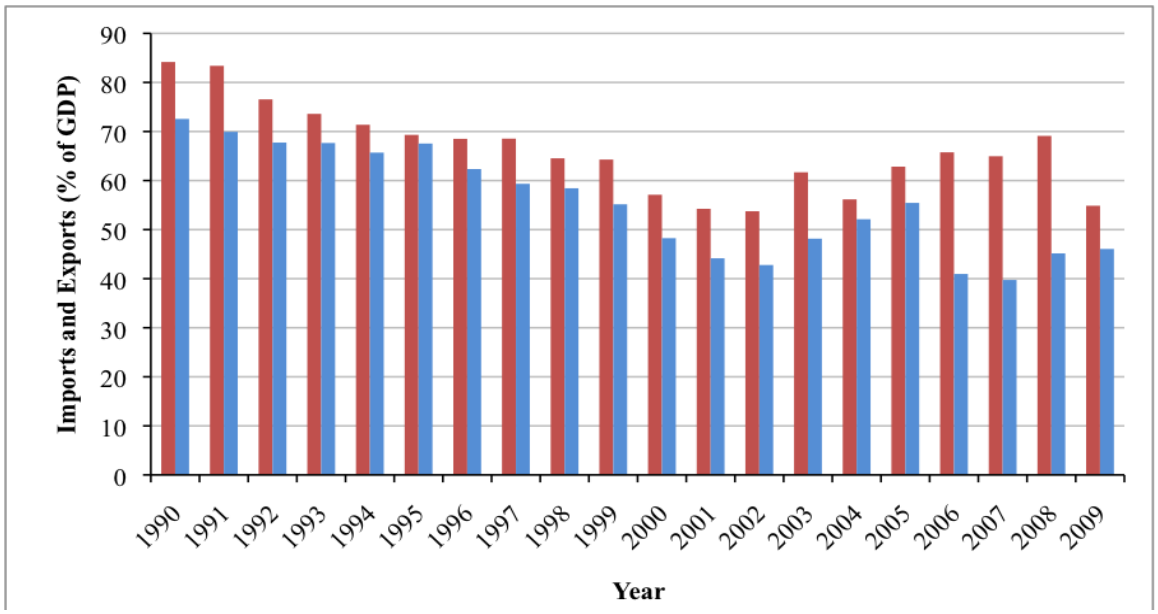

Figure 44. Imports and exports of St. Lucia relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. The inflation rate of St. Lucia has been largely fluctuating through the period under study with the lowest value of -4.2% in 1996 and the highest inflation at +8.5 % in 2007 (Fig. 45).

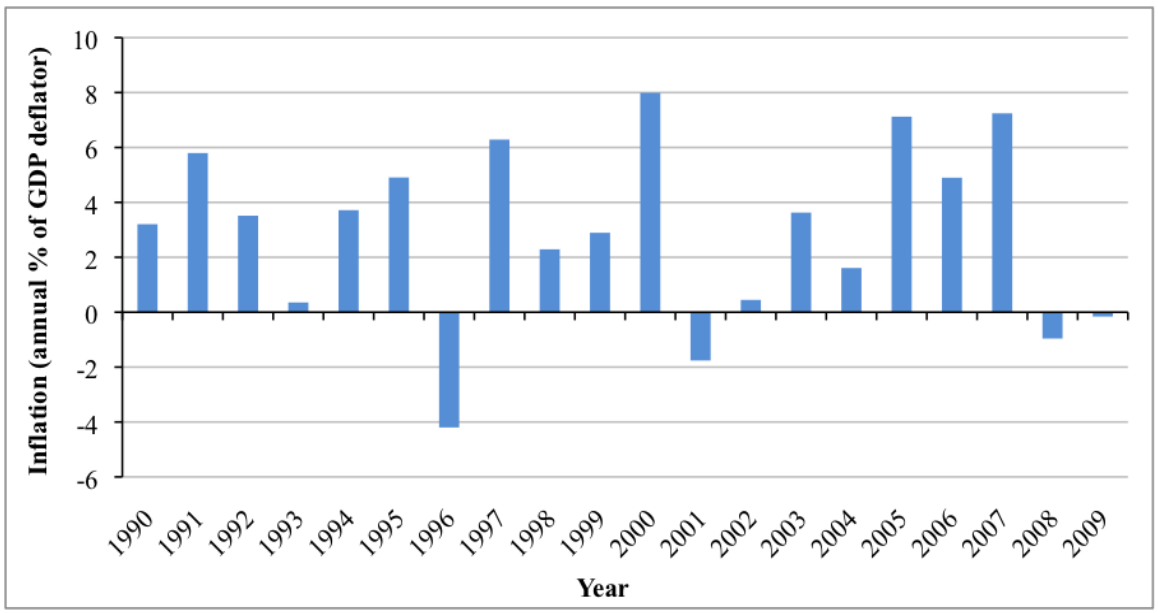

Figure 45. Annual inflation rate of St. Lucia from 1990 to 2009 expressed as %.

FDI. With the exception of 2006 and 2007, FDI inflows into St. Lucia were >15 % relative to GDP and ranged from 3.3 % (1996) to 13.5 % (2008) for 1990 to 2009 (Fig. 46). For 2006 and 2007, FDI inflows were 21.8 % and 23.2 %, respectively.

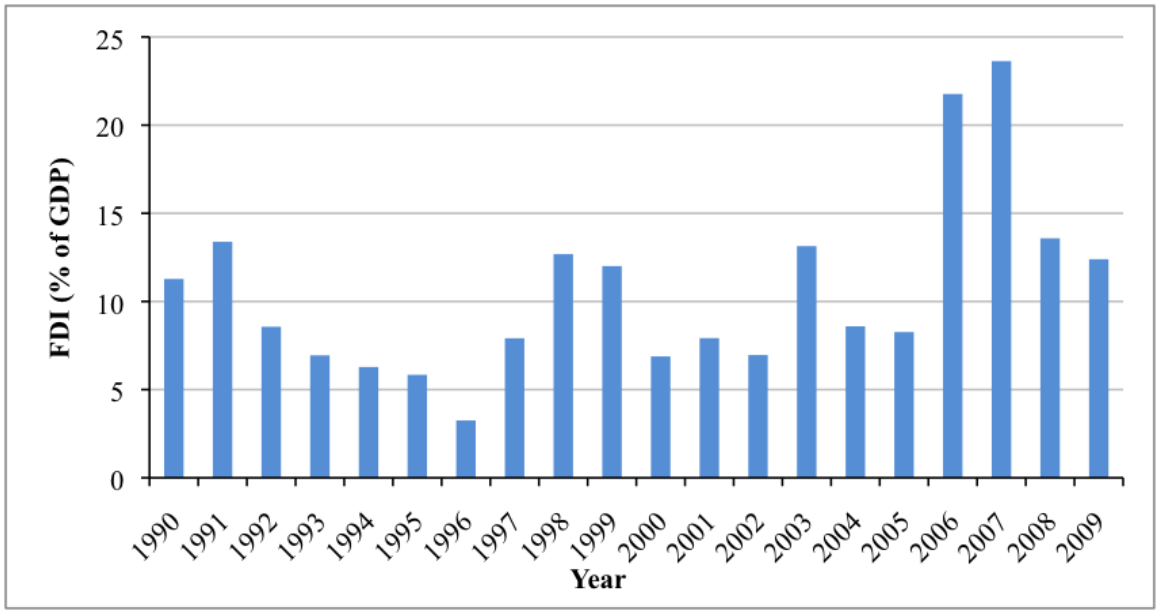

Figure 46. Foreign direct investment of St. Lucia from 1990 to 2009 based on net inflows as % of GDP.

Human capital (secondary school enrollment). Secondary school enrollment data for St. Lucia were only available for 1999 to 2009. The data are presented in Figure 47 and show a constantly a higher enrollment of females compared to males; although the

difference in enrollment between females and males is decreasing over time. Moreover, the secondary school enrollment rate is slightly increasing for both genders from <70 % in 1999 to >80 % in 2009.

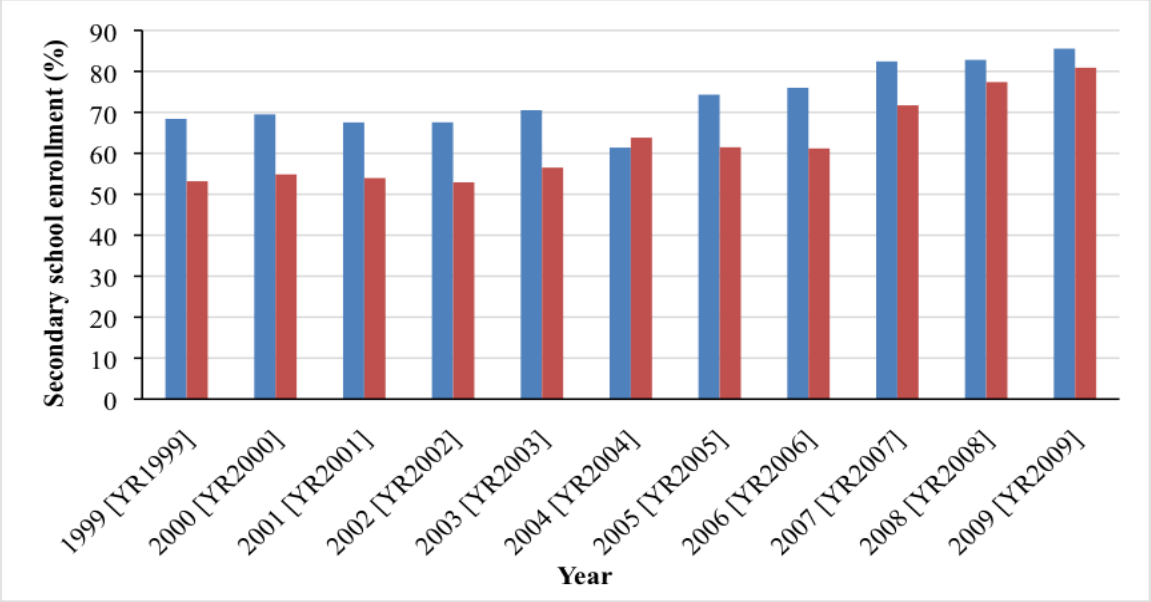

Figure 47. Secondary school enrollment rate for St. Lucia from 1999 to 2009. Data prior to 1999 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). The index of civil liberties has been slightly higher (2) than political rights (1) in St. Lucia between 1990 to 2004 before civil liberties also dropped down to the lowest index of 1 in 2005 and have been on that value till 2009.

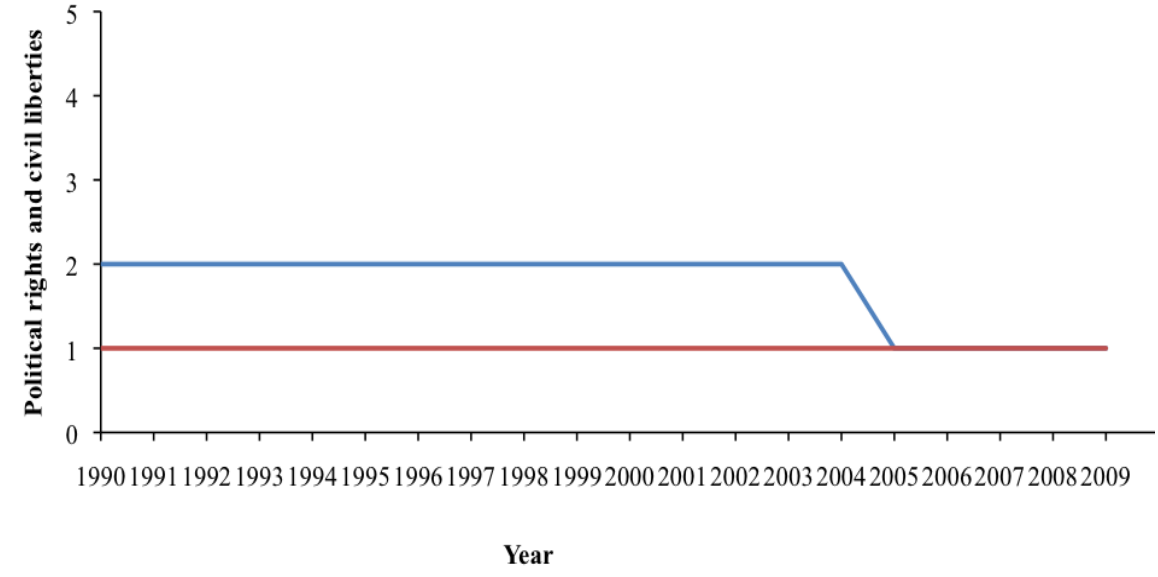

Figure 48. Politica1 rights and civil liberties of St. Lucia from 1990 to 2009. Note the overlap of political right with civil liberties for 2005 to 2009. Red = political rights, blue = civil liberties.

St. Vincent and the Grenadines.

Growth (GDP per capita, annual growth in %). From Figure 49 it is clear that economic growth for St. Vincent and the Grenadines has been highly fluctuating between negative and positive values from 1990 to 2009. The country had the lowest GDP with -2.2 % in 2009 and the highest GDP with +7.8 % in 1995.

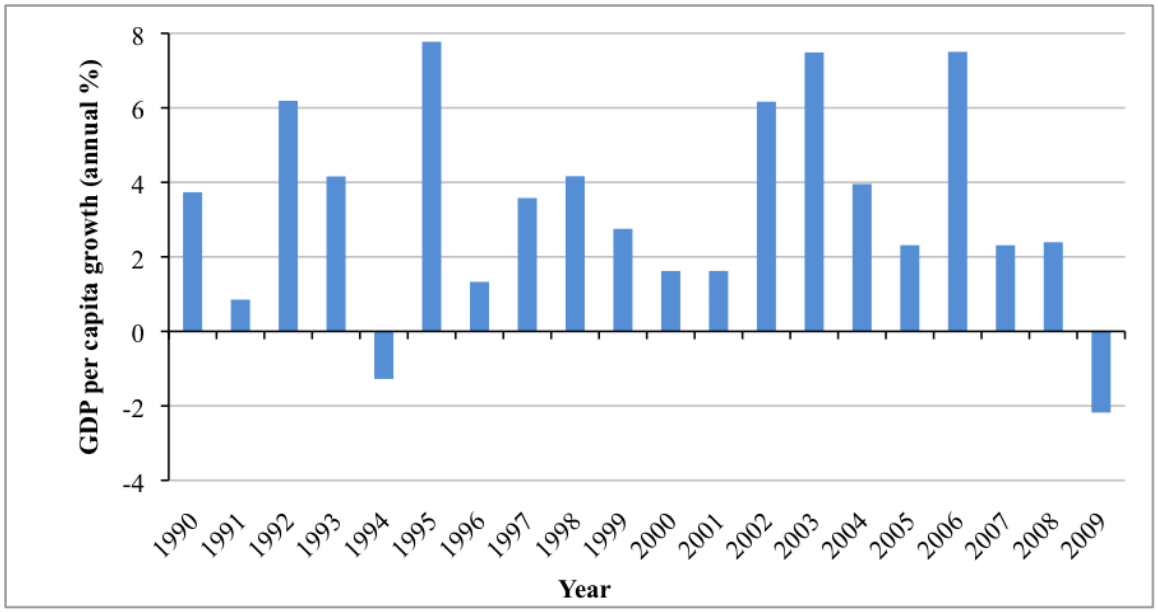

Figure 49. Economic growth of St. Vincent and the Grenadines from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Similar to other developing Caribbean countries, imports were significantly higher than exports in St. Vincent and the Grenadines from 1990 to 2009 (Fig. 50). Imports were commonly >50 % with the exception of 2000 and 2001 when imports decreased to 48.7 and 46,5 %, respectively. Exports, though much lower than imports, were >40 % until 2001 with the exception of 1994 before constantly decreasing from 40.9 % in 2001 to 28.5 % in 2009.

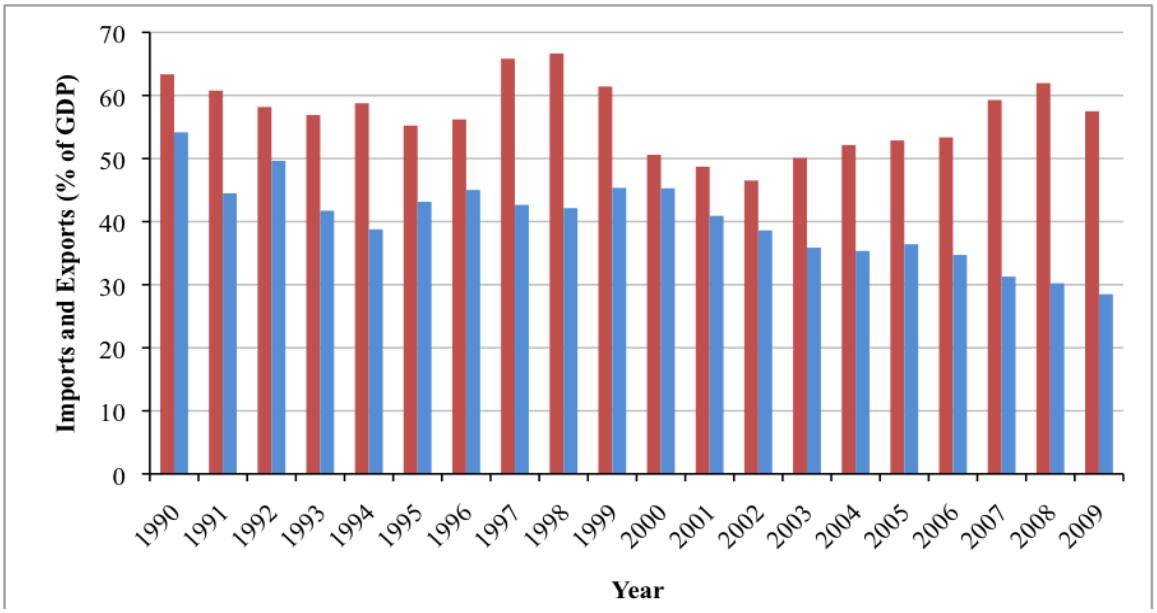

Figure 50. Imports and exports of St. Vincent and the Grenadines relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Inflation in St. Vincent and the Grenadines has been highly fluctuating between 1990 to 2009 ranging from -3.1 % (2003) to +8.4 % (2007); there is no clear trend developed over the studied time period (Fig. 51).

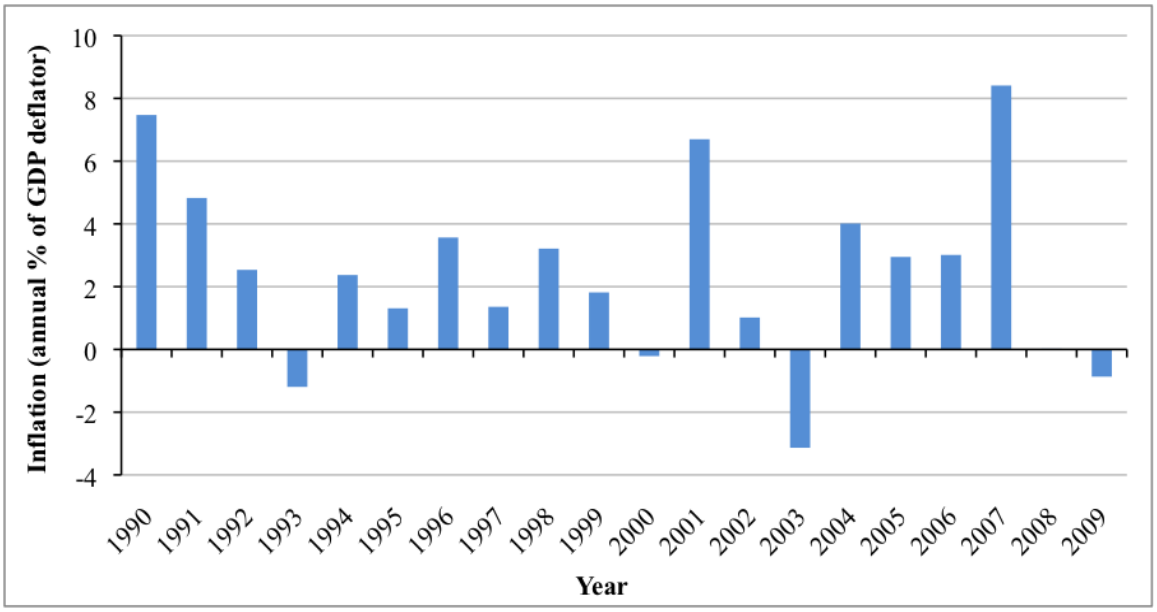

Figure 51. Annual inflation rate of St. Vincent and the Grenadines from 1990 to 2009 expressed as %.

FDI. The inflow of FDI into St. Vincent and the Grenadines increased from 1990 (3.2 %) to 1998 (26.6 %) before decreasing again down to 4.9 % in 2001 (Fig. 52). After

2001, with the exception of 2005, FDI increased again until 2008 (22.9 %) before FDI inflows decreased to 16.3 % in 2009.

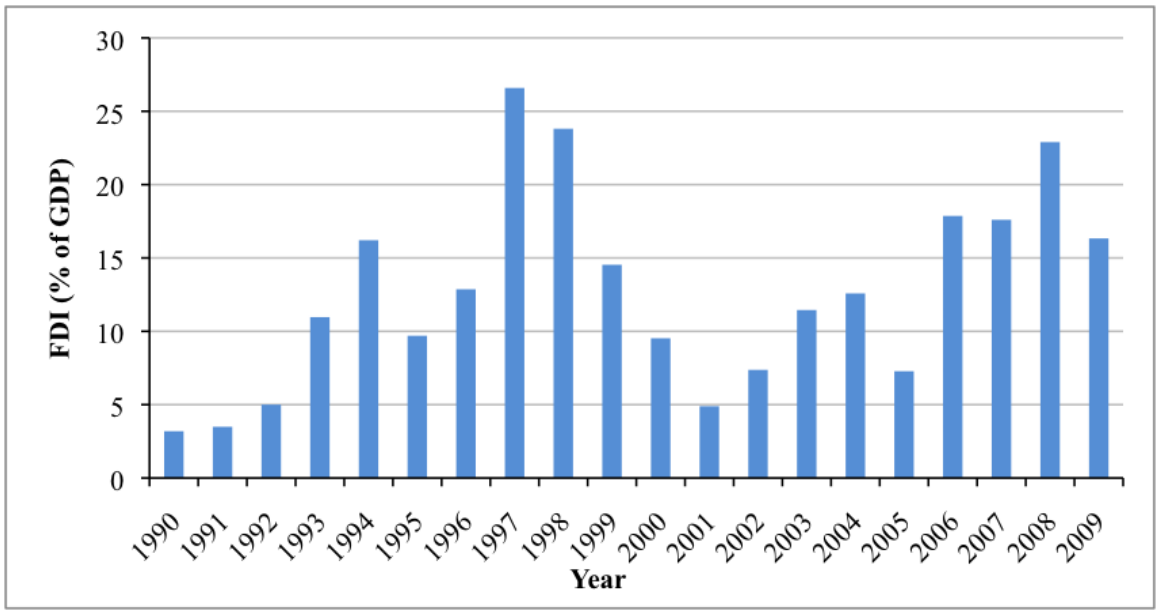

Figure 52. Foreign direct investment of St. Vincent and the Grenadines from 1990 to 2009 based on net inflows as % of GDP.

Human capital (secondary school enrollment). Data were only available from 2000 to 2005, 2008, and 2009. Figure 53 shows that males generally had a higher enrollment into secondary school than females. Between 2000 and 2005 the enrollment for males ranged between 73.4 % (2001) and 82.4 % (2005), whereas enrollment rates for females were much lower over the same time period ranging from 57.6 % (2000) to 72.1 % (2004). The enrollment was significantly higher for both genders in 2008 and 2009 with >92 % for males and >85 % for females.

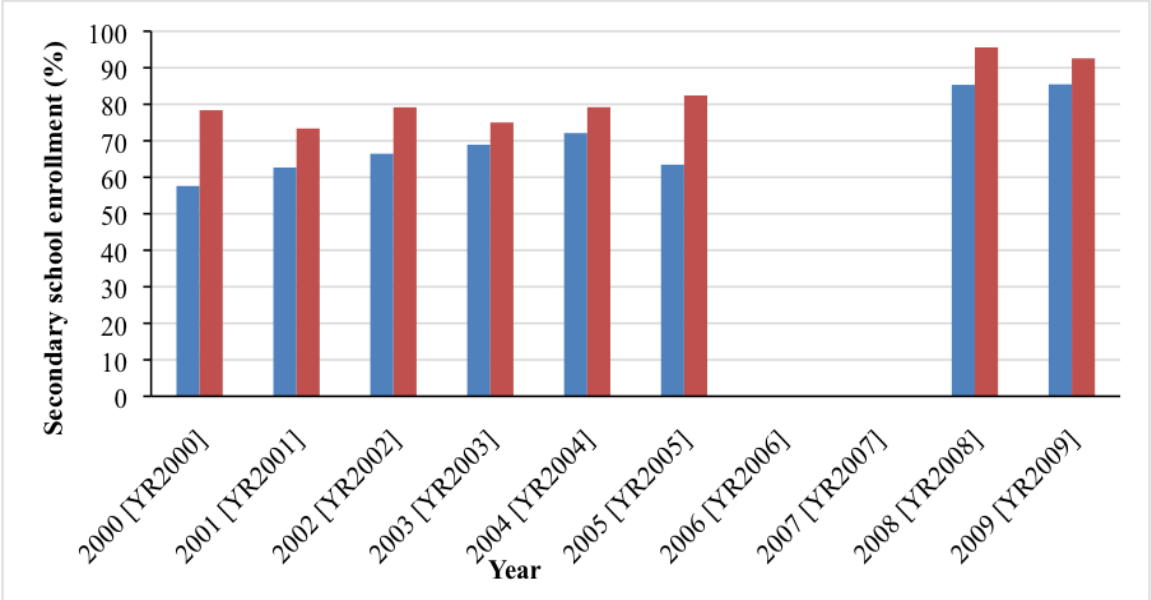

Figure 53. Secondary school enrollment rate for St. Vincent and the Grenadines from 2000 to 2009. Data prior to 2000 and for 2006 to 2007 were not available. Blue = female, red = male.

Freedom (political rights and civil liberties). Similar to the other investigated Caribbean developing countries mentioned above, indices for political rights and civil liberties were low for St. Vincent and the Grenadines from 1990 to 2009. Civil liberties had an index of 2 from 1990 to 1992 before dropping down to 1, whereas political rights showed the opposite trend (Fig. 54).

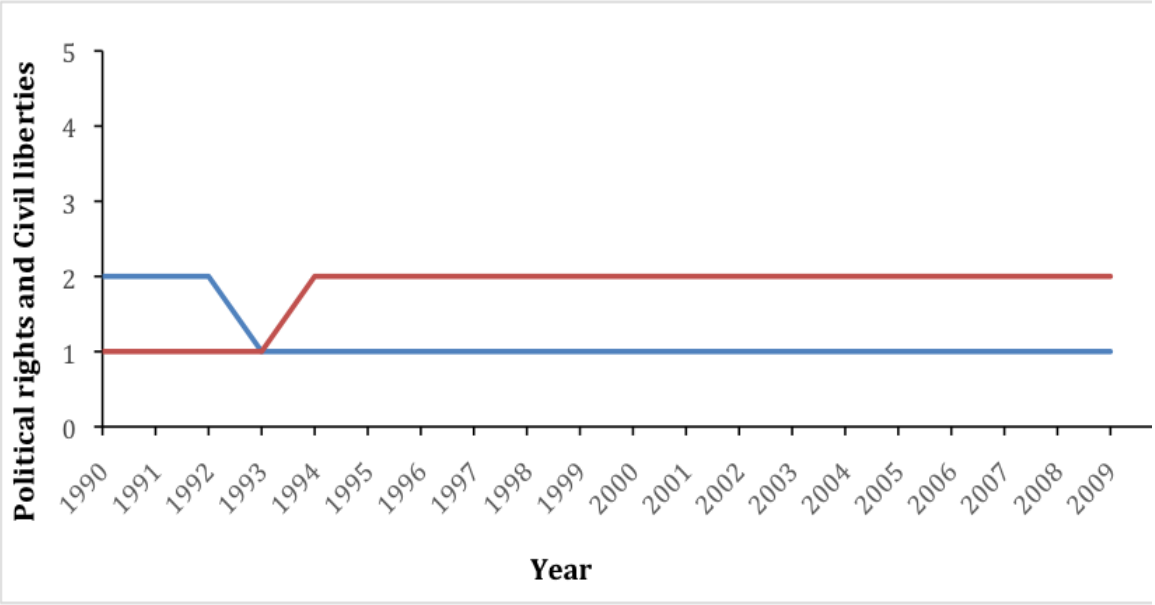

Figure 54. Politica1 rights and civil liberties of St. Vincent and the Grenadines from 1990 to 2009. Red = political rights, blue = civil liberties.

Trinidad and Tobago.

Growth (GDP per capita, annual growth in %). Figure 55 shows the economic growth of Trinidad and Tobago from 1990 to 2009. Prior to 1994, the economic growth fluctuated between +2.0 % (1991) and -2.2 % (1992). Between 1994 and 2008, the economy slowly increased from +3.1 % in 1994 to ≈ 8 % in 1998, where it remained fairly steady around +7.5 % for the next years before declining again from 2004 on. The only exceptions in this rather steady pattern from 1998 to 2004 were the years 2001 (+3.8 %), 2003 (+13.9 %), and 2006 (+12.7 %). In 2009, the economic growth dropped significantly to a low value of -4.8 %.

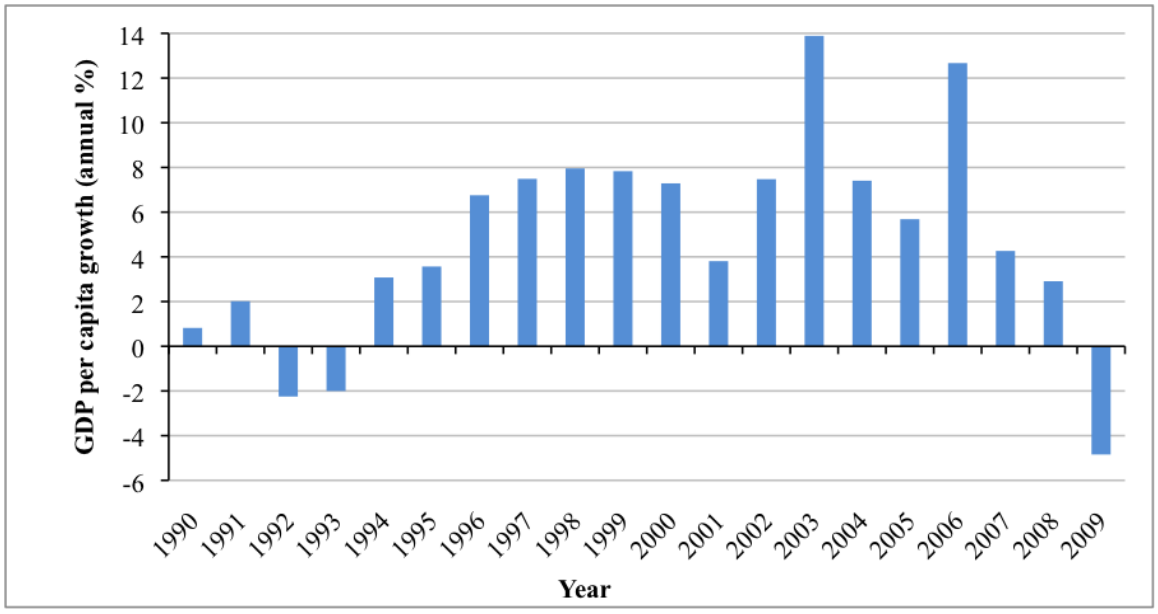

Figure 55. Economic growth of St. Vincent and the Grenadines from 1990 to 2009 based on the annual % relative to GDP per capita.

Imports and exports. Contrary to the other developing Caribbean countries of this study, Trinidad and Tobago had higher exports than imports for 1990 to 2009 with the exception of 1997 and 1998 when imports where less than 5 % higher than exports. From 2005 to 2008, exports were more than 20 % higher than imports. Export rates from Trinidad and Tobago were fairly steady from 1990 to 1994 (40.3-45.2 %), 1995 to 2004 (48.5-59.4 %), and 2005 to 2008 (65.3-81.8 %) before decreasing to 52.1 % in 2009 (Fig. 56). Imports ranged from 29.3 % (1992) to 56.3 % (1997) for the studied time period and had their highest values in the late 1990s before steadily decreasing <40 % until 2009. Trinidad and Tobago had the lowest imports (28.2 to 33.5 %) in the early 1990s.

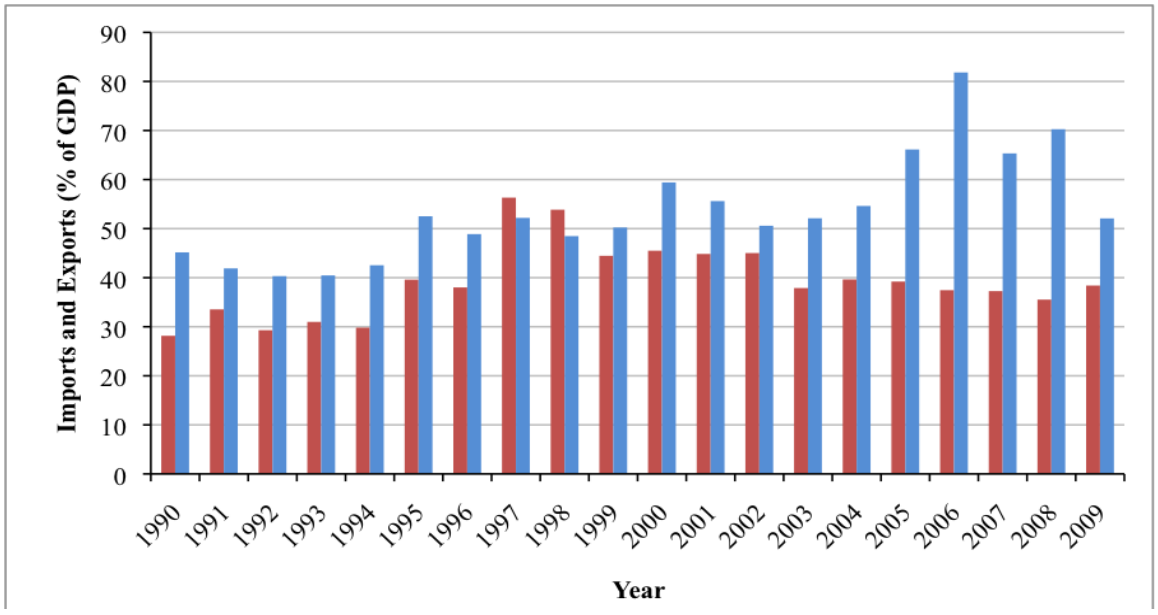

Figure 56. Imports and exports of Trinidad and Tobago relative to % of GDP from 1990-2009. Red = imports, blue = exports.

Inflation rate. Generally, the inflation of Trinidad and Tobago has been greatly fluctuating, in particular between 2008 (+23.8 %) and 2009 (-27.6 %; Fig. 57). Inflation prior to 2008 ranged greatly between negative (-5.2 %, 2002) and positive (+15.5 %, 1990) values as well and showed no clear trend over the investigated time period similar to the aforementioned Caribbean developing countries.

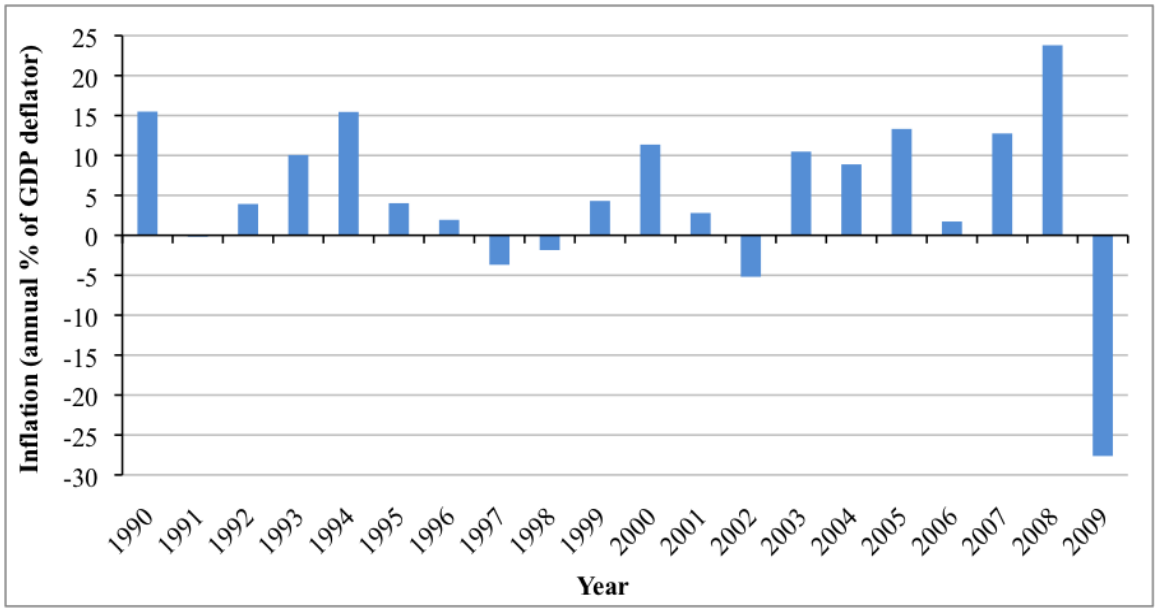

Figure 57. Annual inflation rate of Trinidad and Tobago from 1990 to 2009 expressed as %.

FDI. Inflow of FDI into Trinidad and Tobago was highest in 1997 with 17.4 % and >8% in 1993 to 1994, 1998 to 2002, and 2008 (Fig. 58). Trinidad and Tobago received the lowest FDI inflow in 1990 with 2.2 %.

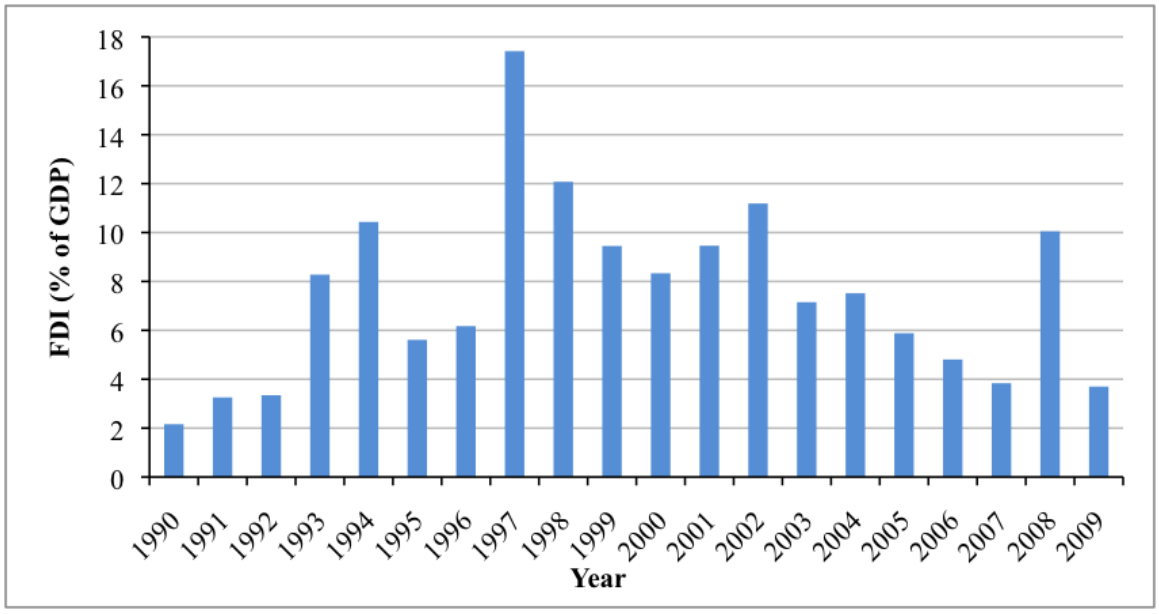

Figure 57. Foreign direct investment of Trinidad and Tobago from 1990 to 2009 based on net inflows as % of GDP.

Human capital (secondary school enrollment). Data of secondary school enrolment for Trinidad and were only available for the years 1993 and 2004 (Fig. 59). The enrollment rate for females was lower than males for both years and was 68 % in 1993 and 65.8 % in 2004. The enrollment of males into secondary school also decreased from 1993 to 2004 from 75.2 to 70.2 %.

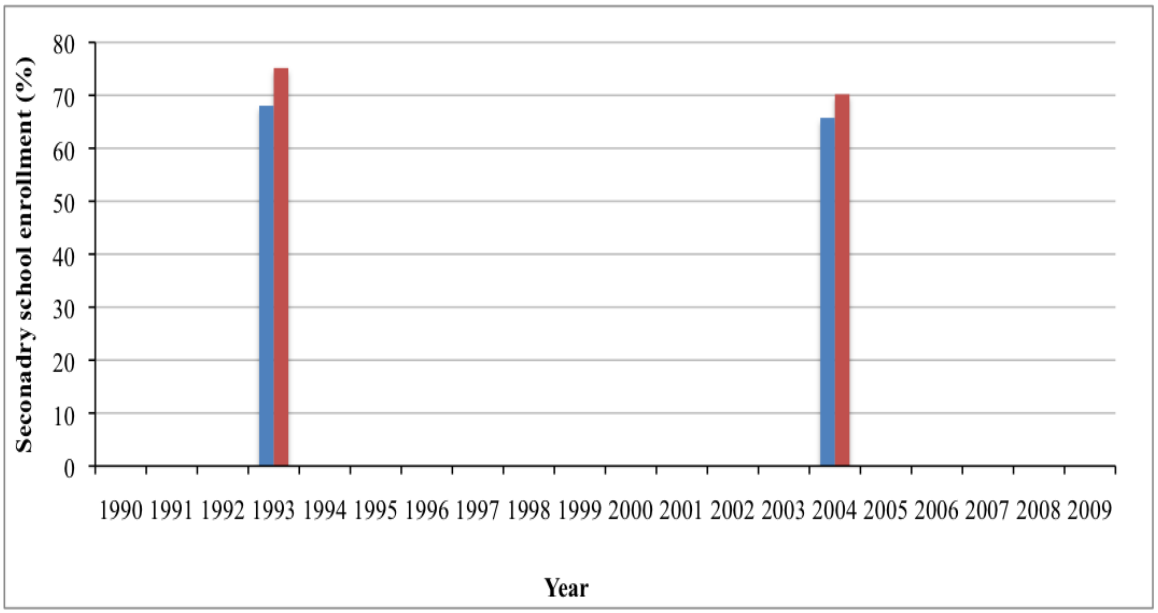

Figure 59. Secondary school enrollment rate for Trinidad and Tobago of 1993 and 2004. Nota that data were not available for the other years of the studied period. Blue = female, red = male.

Freedom (political rights and civil liberties). Both political rights and civil liberties had been steadily increasing from index 1 in 1990 to index 3 in 2001. In 2004 and 2005 civil liberties and political rights, respectively dropped to index 2 (Fig. 60).

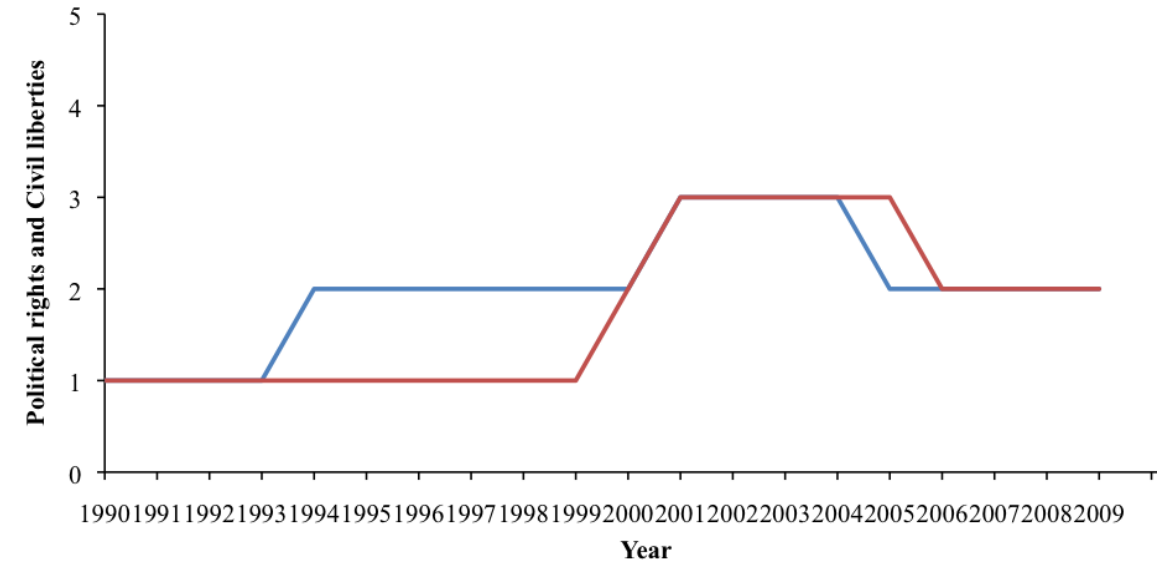

Figure 59: Politica1 rights and civil liberties of Trinidad and Tobago from 1990 to 2009.

Red = political rights, blue = civil liberties.

Results: Part II. Panel Data Analysis

This section presents the results obtained from performing panel data analysis regarding the relationships of the chosen variables against the inflows of the FDI from 1990-2009 for 10 developing Caribbean nations. Panel data analysis was chosen to model time series regression for longitudinal data and identify relationships amongst the various factors and the dependent variable over time. Two models were applied: (1) General Method of Moments (GMM), and (2) Ordinary Least Squares (OLS).

General method of moments (GMM) model. The GMM model is usually applied to data that are large (this study: N = 10) but occur over a small amount of time intervals T (this study: T = 4), whereas the OLS model uses least square correlation to show a possible relation between dependent and independent variables. Both models are based on Equation (1); however, for the GMM model a two-step statistic calculation is further applied to the data to control potential endogeneity (i.e., false correlation between error and variable) for the different variables.

Equations (1) and (2) applied to the GMM model result in Equations (3):

$$Economic\ growth = 2.505 - 0.343 \times FDI + 0.0073 \times GDP\ per\ capita + 0.003 \times Exports + 0.005 \times Inflation + 0.00001 \times human\ capital + (-0.002) \times Freedom + error \quad \textbf{(Eq. 3)}$$

The results are presented for the GMM model are shown in Table 2 and present the relationship between economic growth and FDI, and between different factors and FDI numerically. Constant values α for each variable and their errors are reported in columns 2 and 3; column 4 shows values of α_t when time intervals *t* (1990-1994, 1995-1999, 2000-2004, 2005-2009) taken into account; column 5 (Sig.) shows the significance of the data at $p < 0.05$, meaning the values calculated for α, and α_t are statistically significant if they are ≤ 0.05; columns 6 and 7 show the upper and lower value for each constant α of each variable at the 95 % confidence level; and the last column, partial η^2 (i.e. partial eta-squared), is a measure of effect size for each variable and ranges for the data in this study between 0 and 0.665 and is analogous to R^2 from multiple linear regression. The higher partial η^2, the better the correlation between the used data.

Data from column 2 show that the correlation between economic growth and FDI is negative (-0.343) with an error smaller than the absolute α value for FDI. This negative correlation implies that FDI has a rather negative effect on economic growth for the 10 developing Caribbean countries over the time span 1990 to 2009.

All financial factors (GDP per capita, exports, and inflation), however, have a positive correlation to FDI expressed by positive values (0.003, 0.073, 0.005), although the correlation is very weak. Education is also weakly positive correlated to FDI. In contrast, freedom is negatively (-0.002) correlated to FDI.

Results from column 4 show the same trend albeit their absolute values are higher, which is explained by the addition of values from each 5-year time interval for each variable. Values in column 5 of Table 2 for Sig. <0.05 mean that the results between FDI and economic growth and each variable and FDI are statistically significant over the investigated time. From Table 2, results showing the correlation between FDI and economic growth, FDI and GDP per capita, FDI and exports, and FDI and human capital are statistically significant at $p < 0.05$. In contrast, there is no statistical significance between FDI and inflation, and FDI and Freedom.

Ordinary least square (OLS) model. Results from the OLS model are shown in Table 3 and the statistical background information for the OLS results are shown in Table 4. Similar to Table 2, Constant values α for each variable and their errors are reported in columns 2 and 3; column 4 shows values of α_t when time intervals *t* (1990-1994, 1995-1999, 2000-2004, 2005-2009) taken into account; column 5 (Sig.) shows the significance of the data at $p < 0.05$, meaning the values calculated for α, and α_t are statistically significant if they are ≤ 0.05; columns 6 and 7 show the upper and lower value for each constant α of each variable at the 95 % confidence level.

Contrary to the GMM model, FDI is weakly positive correlated to economic growth in all 10 studied countries; however, the error is larger than the absolute value. Therefore, FDI has no significant relationship to economic growth in the 10 developing Caribbean countries.

Results for financial factors are similar to results for the GMM model regarding exports and GDP that show positive correlation between GDP per capita and FDI, and exports and FDI. The former correlation is relatively strong (0.970) contrasting to the

latter (0.017). Inflation is weakly negatively (-0.008) correlated to FDI. This is contrary to the positive relation of exports to FDI in the GMM model (Table 2).

Human capital is stronger related to FDI in the OLS model. In this model, both genders were evaluated and the enrollment of females in secondary school as expression of human capital is weakly negative (-0.014), whereas the enrollment of males in secondary school weakly positive (-0.019). The enrollment of males dominated in most Caribbean countries over females and therefore it can be assumed that human capital expressed as secondary school attainment of both genders is weakly positive correlated to FDI.

Among political factors, both civil liberties and political rights have a positive correlation to FDI; however, the error for political rights is larger than its absolute α value.

When taken data from 5-year time intervals into account, results in column 4 of Table 3 show the same trend than column 2 albeit their absolute values are higher, which is explained by the addition of values from each 5-year time interval for each variable. Values in column 5 of Table 3 for Sig. <0.05 mean that the results between FDI and economic growth and each variable and FDI are statistically significant over the investigated time. However, results show that only the correlation between FDI and GDP per capita, FDI and exports, and FDI and civil rights are statistically significant at $p < 0.05$ (column 5, Table 3). There is no statistical significance between FDI and inflation, FDI and human capital, and FDI and political rights.

Table 1

GMM model of 10 nations of the Caribbean region

Dependent Variable: Economic Growth							
Parameter	α	Standard Error	α_t	Sig.	95% Confidence Interval		Partial η^2
					Lower value	Upper value	
Intercept	2.505	0.297	8.426	0.000	1.919	3.091	0.269
FDI	-0.343	0.072	-4.764	0.000	-0.486	-0.201	0.105
GDP per capita x FDI	0.073	0.004	19.591	0.000	0.065	0.080	0.665
Exports × FDI	0.003	0.002	2.042	0.042	0.000	0.006	0.021
Inflation x FDI	0.005	0.003	1.461	0.146	-0.002	0.012	0.011
Human capital x FDI	0.0000011	0.00000052	2.180	0.030	0.0000011	0.0000022	0.024
Freedom × FDI	-0.002	0.009	-0.232	0.817	-0.020	0.016	0.000

$R^2 = 0.699$ (adjusted $R^2 = .689$)

Table 2

OLS model of 10 nations of the Caribbean region

Dependent Variable: Economic Growth						
Parameter	α	Standard error	α_t	Sig.	95.0% Confidence level	
					Lower value	Upper value
Constant	-0.586	0.227	-2.580	0.011	-1.034	-0.138
FDI	0.005	0.008	0.628	0.531	-0.011	0.021
GDP per capita	0.970	0.011	86.095	0.000	0.948	0.993
Exports	0.017	0.004	4.400	0.000	0.009	0.024
Inflation	-0.008	0.006	-1.383	0.168	-0.019	0.003
Human capital: female	-0.014	0.011	-1.303	0.194	-0.036	0.007
Human capital: male	0.019	0.012	1.623	0.106	-0.004	0.042
Civil liberties	0.315	0.077	4.088	0.000	0.163	0.466
Political rights	0.010	0.068	0.140	0.888	-0.125	0.144

Table 4

Statistical summary for the applied OLS model

Dependent Variable: Economic Growth								
R*	R^2	Adjusted R^2	Standard error of estimate	Change Statistics				
				R Square Change	F Change	degree of freedom df_1	degree of freedom df_2	Sig. F Change
0.989[a]	0.978	0.977	0.632	0.978	1050.524	8	191	0.000

* Predictors: Constant, FDI, GDP per capita, Exports, Inflation, Human capital: female, Human capital: male, Civil liberties, Political rights

Hypothesis testing. The study sought to test the proposed null hypothesis that is:

H_0. There is no relationship between political, educational, and financial factors, the inflow of FDI, and economic growth at statistical significance of $p < 0.05$.

In order to perform such a test, analysis of variance (ANOVA) was conducted between the political, educational, and financial factors, the inflow of FDI, and economic growth. The study compared these variables of the Caribbean countries to test its reliability. Results show that the H_0 is rejected for most parameters, because data are statistically significant at $p < 0.05$ as shown in Tables 2 and 3 for GMM and OLS models, respectively. Additionally, values of F in ANOVA analyses are >10 and therefore showed that the relationship between the different variables is not by chance and rather due to real effects. ANOVA results for two countries (Antigua and Barbuda, the Bahamas) are shown in Appendix B.

Evaluation of Findings

Descriptive data involving each variable (growth, imports and exports, inflation, FDI, human capital, and freedom) for each of the investigated 10 developing Caribbean countries show that the economy in each country was rather fragile from 1990 to 2009 with fluctuating values for growth expressed as annual GDP growth, inflation, and FDI. Moreover, imports were generally higher than exports over the studied period with the exception of Trinidad and Tobago. These results display the rather low economic status of Caribbean countries (The World Bank, 2006, 2009, 2014). Moreover, many of the investigated Caribbean countries faced economic challenges throughout the investigated time period such as change of currency in the early 1990s in Jamaica resulting in high inflation, damages by tropical storms in the 2000s resulting in negative growth and high inflation especially for Grenada and St. Lucia, and the aftermath of the financial crisis of 2008 resulting in low economic values for all studied countries in 2009.

Data for human capital were only sporadically available for each country from 1990 to 2009. Despite that these data show moderately high secondary school enrollment data for both genders (≈ 60 - 90 %), the data are still well below data for developed countries (UNCTAD, 2015).

Political rights and civil liberties as expression of the political climate were low (index 1 to 2) for all Caribbean countries. Only the Bahamas, Jamaica and Trinidad and Tobago showed a moderate freedom index of 3 in some years from 1990 to 2009. Low freedom index is common in most developed countries (Freedom House, 2015).

In order to examine the descriptive data more thoroughly, panel data analysis was applied. Of the two applied models (GMM and OLS) results from GMM model are seen as more reliable despite a low R^2 of 0.689 (Table 2) compared to $R^2 = 0.977$ in the OLS model (Table 4). Reason here fore was that GMM results lessen the effect of endogeneity between the variables and therefore the error (Basu-Guariglia, 2007; Roodman, 2009; Feeny et al., 2014). Therefore, the GMM model (Table 2) was used to answer the research question of this study.

Q1. What is the relationship between the different factors (e.g., political, educational, financial) and FDI regarding the economic growth in developing Caribbean countries?

There is a statistic significant but negative relation between FDI and economic growth for all Caribbean developing countries implying that FDI influences economic growth negatively. This is in accordance with findings by Alfaro et al. (2004, 2010) and contribute to the ongoing debate if FDI contributes significantly to economic growth especially among developing countries (e.g. Azman-Saini et al., 2010; Bartels et al., 2010; Gui-Duby, 2014; Feeny et al., 2014). A closer look regarding the relationship between financial, educational, and political factors and FDI from this study further underlines that FDI is a very complex financial tool that has no one-dimensional and straight relationship to economic growth. This study shows that not all investigated factors have a relationship with FDI. Only GDP per capita, exports, and human capital affect positively and significantly, albeit weakly, FDI in the studied countries. These findings are in accordance with studies by Al-Sadig (2013), Borenzstein et al. (1998), Gui-Duby (2014), and Feeny et al. (2014). Inflation and political factors have, however, no significant relationship with FDI and are in contrast to Bannanga et al.'s (2013) study.

Q2. Are there differences in the economic growth between the investigated Caribbean developing countries?

Although the descriptive data show relative differences in the growth rate between the different developing countries, results from GMM and do not show different relationships between economic growth and FDI for the different studied countries. Feeny et al. (2014) showed similar results for Pacific Island countries that had each different economic growth rates but in showed no differences regarding the relationship of FDI and economic growth.

Q3. What factors in particular have led to differences in economic growth between the studied developing Caribbean countries?

Based on GMM model results, there were no differences observed between the 10 studied countries. However, the different variables varied individually between the different countries as shown in Figures 1 to 60. This can be attributed to political, economic, educational, and financial differences of each country.

Q4. Are there any temporal changes within the investigated relationships for the different investigated countries and if yes, why?

No significant temporal changes were observed within the investigated relationships for the different investigated countries using GMM model. Temporary changes for the individual variables, however, are reported and can be attributed to the different political, economic, and financial systems of each studied country.

Summary

The chapter dealt with the description of each variable and the analysis of data using panel data analysis. For panel data analysis, GMM and OLS models were applied to determine the relationship between the inflow of FDI and economic growth, and FDI and political, financial, and educational factors related to economic growth in 10 Caribbean countries from 1990 to 2015. In both models, the GDP per capita, FDI, exports of goods and services, inflation, secondary school enrolment and the freedom variable consisting of political rights and civil liberties were regresses against the economic growth as the independent variable of each particular country in the Caribbean region.

GMM results are preferred and show that the relationship between FDI and economic growth is weakly negative at $p < 0.05$. The results underline the on-going debate about the direct relation of FDI to economic growth especially among developing countries. The study also hypothesized that a relationship exists between political, educational, and financial factors, the inflow of FDI, and economic growth. This study shows that not all investigated factors have a relationship with FDI. Only GDP per capita, exports, and human capital affect positively and significantly, albeit weakly, FDI in the studied countries. These findings are in accordance with other studies (Al-Sadig, 2013; Borenzstein et al., 1998; Feeny et al., 2014; Gui-Duby, 2014). Inflation and political factors have, however, no significant relationship with FDI and are in contrast to Bannanga et al.'s (2013) study that showed that political rights and factors representing good governance have a positive relation to FDI.

Implications

Research question 1. Of the four research questions addressed in this study question 1 dealt with the relationship between FDI and different factors (financial, educational, and political) regarding economic growth in Caribbean developing countries. Results from both models (GMM vs OLS) were similar in this regard as outlined in chapter 4, although GMM results are seen more reliable due to less endogeneity between the different variables. Results from the GMM model showed that there is a positive and statistically significant relation between FDI and GDP per capita, FDI and exports, and FDI and human capital for $p < 0.05$ (Table 2). In contrast, no statistically significance exists between FDI and exports, and FDI and freedom (political rights, civil liberties). The results are in accordance with several other studies as discussed below and also show the complex relationship of FDI and possible factors affecting it.

Bornstein et al. (1998) showed in their classic study that human capital especially in mid-level developing countries (i.e. GDP per capita between 800-1,200USD/year) such as the Caribbean has a positive and statistic significant relationship to FDI. This is confirmed in this study. Although, there are studies that showed no statistically significant relationship between human capital and FDI such as Gui-Duby's (2014) study or Bartels et al. (2014) study, it should be kept in mind that both studies were conducted in African countries that have a much lower annual GDP than the Caribbean. Borenzstein et al. (1998) showed that the annual GDP indeed plays a role if human capital has any impact on FDI or not and is generally negligible in extremely poor developing countries such as African nations studies in Bartels et al. (2014) and Gui-Diby (2014).

Financial factors commonly show a statistically significant relation to FDI as it is the case in this study. However, the true meaning of this relation has been highly debated and questioned especially by Azman-Saini et al. (2010), who sees economic freedom has much stronger catalyst for economic growth especially among developing countries.

The results regarding FDI and political rights and civil liberties is contrasting the observations of Bannaga et al. (2013), who concluded a positive relationship between good governance (e.g. rule of law, political stability) and FDI and therefore economic growth. The factors these authors used to describe good governance overlap partly with

political rights and civil liberties conducted by Freedom House (2015). Similar to this study, results from studies of Bartels et al. (2014) and Gui-Diby (2014) on the relationship of FDI and freedom in African developing countries are statistically insignificant. One reason for this negative albeit statistically insignificant relationship may be that African developing countries receive FDI dominantly from China (Barrasi & Zhou, 2012) in which political rights and civil liberties are rather low compared to western developed nations that are FDI contributors to many other countries.

Although inflation is positively related to FDI this relation is statistically insignificant and therefore inflation not necessarily affects FDI in Caribbean developing countries. This is contrasting to the negative and statistically significant results shown for Pacific island countries by Feeny et al. (2014).

Summarizing, the results of this study regarding research question 1 show that the relationship between FDI and different factors is only partial statistically significant, where as other factors such as Freedom and inflation have no significant relationship to FDI. Among the factors that have indeed a significant relationship to FDI in Caribbean developing countries the relationship is very weak despite its positive connotation. reasons here fore may be of political and cultural nature that expand the scope of this study. Finally, it should be mentioned that the relationship between FDI and economic growth in the GMM model showed a statistically significant, negative relationship. This is contrary to results from Feeny et al. (2014) that saw a weakly positive relationship between FDI and economic growth in Pacific island countries. It is also contrasting to the results from Thomas & Serju (2009) and Oladipo (2013), who investigated FDI inflows and their result on economic growth in Jamaica and Caribbean countries, respectively. Reason for the results of this study contrasting with results from other workers (Feeny et al., 2014; Oladipo, 2013; Thomas & Serju, 2009) may be the used GMM model, because results from OLS modeling showed a very weak positive correlation. However, to minimize statistic errors results from the GMM model were preferred over OLS. It also should be noted that discrepancies between the two models have long been known and are often addressed in the different studies (Anderson & Hsiao, 1980; Feeny et al., 2014; Oladipo, 2012; Roodman, 2009). For instance, results from Oladipo (2009) are based solely on OLS modeling, whereas Feeny. et al.'s (214) and Thomas and Serju's (2009) results are based on GMM models. Additionally, to different models, the negative relation between FDI and economic growth in Caribbean developing countries may be attributed to intense competition among the Caribbean nations and other regions such as Latin and South America (Aitken & Harrison, 1999). Aitken and Harrison (1999) further cited cases with numerous trading issues, for instance, price wars and business tariffs; the entry of FDIs result in decelerated business growth thus affecting developing economies. Therefore, there is a need for developing nations to infrastructures and efficient programs that can promote FDIs through policy formulation and enactment.

Research questions 2, 3, and 4. Economic growth between the different Caribbean nations varied (Figs. 1, 7, 13, 19, 25, 31, 37, 43, 49, and 55) to different degrees and magnitude albeit all nations show fluctuations in economic growth in the 1990s, degree of growth in the early 2000s and then an abrupt decrease after 2008 as

result from the world's financial crisis. These results are in accordance with reports from Mintz (2014) and UNCTAD (1999, 2006, 2009, 2014) that outlined that small developing countries such as the studied Caribbean nations have been suffering much stronger and harder from the world's financial crisis than developed countries that have better financial markets and resources to buffer the effects of 2008.

Research question 3 was difficult to directly answer from the given study and its results, because of the very weak positive correlation between FDI and the different statistically significant factors. However, a closer look on the collected and presented data (Figs. 1-60) showed for all studied nations that when the FDI was highest, the inflation was reduced drastically to almost zero and the exports were still high. This was in line with Pelinescu and Radulescu's work (2009) when they found out that with globalization and through FDI, nations have been able to not just produce more goods and services for the export. In addition, they have enhanced the quality so as to reach and thus address varying market needs. It was also observed that when the FDI was high, the secondary school enrolment remained quite high. It was only in few years that when the FDI was high, there was a high secondary school enrolment. Alfaro et al. (2003) concurred with this when he cited that as a result of FDI, the local human capital often benefit from the trainings and other employee development opportunities offered hence ensuring that in cases where transnational corporations pull out, there is sufficient manpower to sustain development ventures that had already been initiated. Gui-Diby (2014) also added that the education level of the human capital influences the nature and rate of FDI that a given country will receive. Furthermore, educated human capital heightens the probability of attracting FDIs because the workforce is an asset in the marketplace.

Inflation rates were exceptionally high in most studied nations at least for one year among the studied time period and Bannaga et al. (2013) illustrated that the inflation rates is one of the critical factor that ought to be watched closely as it can negatively impact economic growth, and thus there is a need for localized initiatives to link the nation with other global development and technological trends.

Temporal relationships between FDI and economic growth and FDI and the different factors were not detected at a statistically significant level.

Recommendations

The results of this study showed that the relationship between FDI and economic growth in developing Caribbean countries is weakly negative. However, it has been argued by Javorcik (2004) and Goecer, Mercan, and Peker (2014) that domestic investment also contributes to FDI investments and economic growth. Therefore, it is recommended that data evaluating the domestic sector of the different Caribbean countries should be collected to further investigate the nature of the relationship between FDI and economic growth.

This study focused on the time interval of 1990 to 2009, but did not investigate the economic situation after 2009. Therefore, it is recommended that additional data from the used sources should be incorporated to investigate if the studied relationships

changed due to a general worldwide economic upwind in recent years after the world financial crisis in 2008.

Conclusion

The purpose of this study was to determine the relationship between FDI and economic growth among 10 Caribbean developing countries from 1990 to 2009 using a correlational quantitative approach. This was informed by the background that Caribbean developing nations have been receiving the one of the world's highest FDI inflows relative to GDP, but having a rather small economic growth (UNCTAD 1999, 2006, 2009, 2014). The study focused on several factors (political, educational and financial) and their relationship to FDI and therefore, economic growth. The study hypothesized that there was no association between the various factors and FDI, and between FDI and economic growth. However, the results from GMM panel data analysis indicated that there is relationship between FDIs and economic growth, albeit weakly. In addition, the results suggested a link between FDI and GDP per capita, FDI and exports, and FDI and human capital, whereas no statistically significant relationship existed between inflation and freedom.

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Appendix A: ANOVA results for Antigua and Barbuda and the Bahamas

Table B1

Summary: ANOVA results of the data from Antigua and Barbuda

Groups	Count	Sum	Average	Variance
Economic Growth	20	66.09081	3.304541	28.59558
Exports	20	1341.213	67.06067	301.7922
GDP per capita	20	32.18786	1.609393	28.16032
Female	20	151.6468	7.582342	553.7013
Male	20	159.9852	7.999259	612.9194
Inflation	20	56.48322	2.824161	9.322309
FDI	20	220.9291	11.04645	67.02899
Civil liberties	20	49	2.45	0.260526

ANOVA

Source of Variation	Sum of squares (SS)	Degree of freedom (df)	Mean square (MS)	F-ratio (F)	P-value	F crit
Between Groups	68386.54	7	9769.505	48.79323	8.68E-36	2.070311
Within Groups	30433.83	152	200.2226			
Total	98820.37	159				

Table B2

Summary: ANOVA results of the data from the Bahamas

Groups	Count	Sum	Average	Variance
Economic Growth	20	26.33536	1.316768	10.58654
Exports	20	916.8773	45.84386	18.75919
GDP per capita	20	-7.97078	-0.39854	11.44166
Female	20	763.2744	38.16372	1890.99
Male	20	745.39	37.2695	1798.371
Inflation	20	74.21176	3.710588	56.52464
FDI	20	74.01	3.7005	10.87995
Civil liberties	20	32	1.6	0.568421
Political rights	20	22	1.1	0.094737

ANOVA

Source of Variation	SS	df	MS	F	P-value	F
Between Groups	60705.43	8	7588.179	17.98045	2.39E-19	1.
Within Groups	72166.1	171	422.024			

Total	132871.5	179

THE RELATIONSHIP BETWEEN PERSONALITY AND INVESTMENT RISK TOLERANCE UNDER STRESS

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ABSTRACT

This study analyzes an individual's decision to choose a conservative or an aggressive investment, both in a non-stress and a high stress situation, based on gender and the personality preferences of the Myers-Briggs Type Indicator. The findings indicate that individual investors with an intuitive (N) preference appear to "double down" and choose aggressive securities in a stressed investment environment whereas those with a sensing (S) preference tend to "lighten up" and choose conservative securities under stress.

INTRODUCTION

For many years, academics and financial professionals alike have sought methods of improving tools and assessments for understanding an investor's risk tolerance. The importance of correctly evaluating investor risk tolerance is paramount when financial professionals make investment allocation choices for individual investors (Droms 1987). Thus, the failure of financial professionals to adequately allocate assets based on an investor's true risk tolerance can lead to poor investor decisions and poor advisor-client relations.

For instance, if a financial professional incorrectly judges an investor's risk tolerance to be low, then the financial professional is likely to heavily weight the allocation of the investor's assets to low-risk/low-return assets such as money markets and U.S. government securities. Over time, this allocation will not keep pace with the return goals of the investor, and the investor is very likely to become dissatisfied. However, if a financial professional incorrectly assesses an investor's risk tolerance to be high, then a far worse result may incur. The investor will not be able to handle the volatility of the more aggressive allocation (with heavier weights in asset classes like small-cap and emerging markets stocks), and withdraw the funds when they are likely at (or approaching) a market bottom, only to reinvest the decreased amount of capital into conservative investments that will be slow to recover the aggressive allocation's losses.

Unfortunately, individual risk tolerance is difficult to assess. Numerous studies have looked at variables like: gender, age, marital status, employment, income, net worth, and the number of children (Riley & Chow, 1992; Bajtelsmit & VanDerhai, 1997; Grable & Lytton, 1998; Grable &

Joo, 1999, Gollier & Zeckhauser, 2002). While some studies do report results that seem to indicate relationships between the applicable factor and risk tolerance, none provide reliable predictability.

Adding to the difficulty is the fact that "volatility", the current and most popular measure for an investment's risk, may not be an adequate measure of risk as it relates to the assessment of an investor's risk tolerance (Baillie & DeGennaro 1990). Most investors have no problem enduring volatility as long as it is associated with primarily upward movements in prices. Volatility only becomes problematic for investors when the variance is associated with large losses. Frequently, investors who incorrectly surmised their risk tolerance to be high, will choose to liquidate their risky assets after large losses (when the investor feels stress). This action, in effect, serves to lock in the large losses, which is unfortunate for the investor and his/her financial advisor.

This study attempts to lend to the currently available literature on risk tolerance by exploring an investor's decision to invest in an aggressive (high return, high potential for loss) investment or a conservative (low return, low potential for loss) in both a non-stress and a stressed situation. For instance, using gender as the independent variable, Lighthall, Mather, & Gorlick (2009) discovered that males tend to "double down" under stress while females tend to "lighten up" under stress.

This study attempts to lend further insight into the gender findings of Lightall, Mather, & Gorlick when applied to the stressful situation associated with recent investment losses. For the purposes of this study, "doubling down" would be choosing the aggressive investment after incurring substantial investment losses. "Lightening up" would be choosing the conservative investment after incurring substantial investment losses. It could, therefore, be surmised that those investors who choose the aggressive investment (under stress) have a higher risk tolerance than those who choose the conservative investment in the same situation.

In addition to analyzing the results related to gender, the primary focus in this study looks at the preferences of the Myers-Briggs Type Indicator (MBTI). The MBTI provides insight into an individual investor's preferences in several areas and may provide financial professionals with additional insight into a potential investor's risk tolerance based on their MBTI scores. Thus, the purpose of this study is to test the relationship between an investor's personality, as measured by the MBTI, and the decision to choose an aggressive investment or a conservative investment, under stress (having just lost a substantial sum of money).

The foundation for this analysis is based on type theory. In this sense, type theory refers to Carl Jung's original 1923 theory as interpreted by Isabel Myers and Katharine Briggs in the Myers-Briggs Type Indicator personality inventory. The dynamic character specified by type theory involves the interaction of a person's four basic preferences (Myers, McCaulley, Quenk, & Hammer, 2003). According to Myers:

> The MBTI instrument identifies four separate dichotomies: Extraversion versus Introversion, Sensing verses Intuition, Thinking versus Feeling, and Judging verses Perceiving. An individual is assumed to have a preference for one of each pair of opposites over the other. The four preferences direct the characteristic use of perception and judgment by an individual. The particular preferences that interact in a person affect

not only what is attended to in any given situation but also how conclusions are drawn about what has been perceived.

Exhibit 1

The Four Dichotomies of the MBTI

Extraversion-Introversion Dichotomy (attitudes or orientations of energy)	
Extraversion (E)	Introversion (I)
Directing energy mainly toward the outer world of people and objects	Directing energy mainly toward the inner world of experiences and ideas
Sensing-Intuition Dichotomy (functions or processes of perception)	
Sensing (S)	Intuition (N)
Focusing mainly on what can be perceived by the five senses	Focusing mainly on perceiving patterns and interrelationships
Thinking-Feeling Dichotomy (functions or processes of judging)	
Thinking (T)	Feeling (F)
Basing conclusions on logical analysis with a focus on objectivity and detachment	Basing conclusions on personal or social values with a focus on understanding and harmony
Judging-Perceiving Dichotomy (attitudes or orientations toward dealing with the outside world)	
Judging (J)	Perceiving (P)
Preferring the decisiveness and closure that result from dealing with the outer world using one of the Judging processes (Thinking or Feeling)	Preferring the flexibility and spontaneity that results from dealing with the outer world using one of the Perceiving processes (Sensing or Intuition)

(Myers, McCaulley, Quenk, & Hammer, 2003)

At its most basic level, the MBTI preferences are how individuals approach the following questions:

1. Where do you prefer to focus your attention? - Extraversion vs. Introversion
2. How do you make decisions? - Thinking vs. Feeling
3. How do you take in information? - Sensing vs. Intuition
4. How do you orient toward the outer world? - Judging vs. Perceiving

When faced with substantial investment losses, is it possible that an individual investor's decision to invest in an aggressive or conservative security is related to their MBTI preferences? This is the primary research question of this study.

METHODOLOGY

In order to obtain a sample for the study, several professor's classes are utilized for the purpose of administering a survey. Roanoke College offers its business majors an introductory business class (BUAD 110 – Business Connections) that introduces students to primary business functions and strategies. The course is largely comprised of first-year students who plan to pursue a business major, though the course is regularly taken by upper-class students of other majors who wish to have some exposure to business before graduation. The course typically has between sixty and ninety students each semester.

As a component of the course, the students are provided with the MBTI survey in an attempt to guide those who would benefit from career advice to potential career options that might correlate to their personal preferences. For the purposes of this study, two additional questions have been added to the MBTI survey to assess student investment decision-making in a non-stress and a stressed investment environment. These questions are:

1. If you had $5,000 to invest toward retirement, would you:
   A. Invest in a higher risk investment with the opportunity for higher returns
   B. Invest in a guaranteed investment with low returns

2. If your $10,000 retirement investment just lost $5,000 of value, would you:
   A. Invest in a higher risk investment with the opportunity for higher returns
   B. Invest in a guaranteed investment with low returns

The MBTI, along with the two additional study questions, were administered to all BUAD 110 students in the 2016-2017 academic year. The survey resulted in a sample size of N = 122 for the study.

For the purposes of this research, each of the four dichotomies of the MBTI, along with the student's gender, are tested in five hypotheses against the decision to invest in the conservative or the aggressive investment in both the non-stress and stressed investment environments. Due to the desire to test correlation and the number of variables for each test, it was determined that a chi-square test for independence would be the statistical methodology for this study.

Utilizing a chi-square test for independence involves looking at two variables to see if they are related. In this case, the independent variables are the student's gender and MBTI preference and the dependent variable is the investment decision in the non-stress and stressed investment

environment. For instance, hypothesis one tests gender and hypothesis two tests the extraverted (E), introverted (I) dichotomy.

Hypothesis one

- H0: Gender and investing decisions are independent.
- H1: Gender and investing decisions are dependent.

Hypothesis two

- H0: E/I preferences and investing decisions are independent.
- H1: E/I preferences and investing decisions are dependent.

For the above examples, to test if gender or the E/I preferences and investing decisions in the two environments are independent; the test analyzes the observed frequencies (n_{ij}) in comparison with the expected frequencies (e_{ij}) and asks, "Do the observed frequencies differ from the expected frequencies by more than chance?" *(Where n = number of observations and e = number of expected observations)*

Seeking a measure comparing n_{ij}'s vs. e_{ij}'s across all cells, the test lets $\chi^2 = \sum_i \sum j \, (n_{ij}—e_{ij})^2/e_{ij}$, and it can be shown that when H0 is true, χ^2 observed approximates $\chi^2_{(r-1)(c-1).}$ *(Where r = number of rows and c = number of columns)*

Therefore, for these hypothesis tests, the number of actual observations (investment decision of choosing a conservative or an aggressive investment) is compared to the number of expected conservative/aggressive decisions by gender and MBTI preference.

Calculating the number of expected decisions is a component of the chi-square analysis and is determined by the percentage number of students representing both genders and each MBTI preference of those students who took the survey.

Testing at the .05 significance level, the rejection region for a 5% test, χ^2 observed > $\chi^2_{(1),\,.95}$ = 3.84 for all five hypotheses.

- **Hypothesis one** – Gender and investment decisions in a non-stress and stressed environment are independent

- **Hypothesis two** – The E/I dichotomy and investment decisions in a non-stress and stressed environment are independent

- **Hypothesis three** – The S/N dichotomy and investment decisions in a non-stress and stressed environment are independent

- **Hypothesis four** – The T/F dichotomy and investment decisions in a non-stress and stressed environment are independent

- **Hypothesis five** – The J/P dichotomy and investment decisions in a non-stress and stressed environment are independent

Once the surveys were completed, the student's gender, MBTI preferences, and investment decisions in both the non-stress and stressed environment were entered into a spreadsheet for analysis.

RESULTS

The following tables show the results of the chi-square tests for all five hypotheses.

Hypothesis One – Gender and investment decisions in a non-stress and stressed environment:

In testing hypothesis one, a chi-**s**quare test for independence is run on the student's gender and their investment decisions in both the non-stress and stressed situations. At the .05 level of significance, gender is not determined to be related to investment decision-making in either situation.

Table 1 – Chi-Square Test for Independence – Gender in Non-Stress and Stressed Situation

Actual

	No Stress Conservative	No Stress Aggressive	Total	
Male	32	43	75	0.6198
Female	24	22	46	0.3802
Total	56	65	121	

Expected

	No Stress Conservative	No Stress Aggressive
Male	34.71	40.29
Female	21.29	24.71

Chi-Test = 0.3086

Actual

	Stressed Conservative	Stressed Aggressive	Total	
Male	50.00	25.00	75	0.6198
Female	34.00	12.00	46	0.3802
Total	84	37	121	

Expected

	Stressed Conservative	Stressed Aggressive
Male	52.07	22.93
Female	31.93	14.07

Chi-Test = 0.4010

Hypothesis Two – The E/I dichotomy and investment decisions in a non-stress and stressed environment:

In testing hypotheses two, the chi-square test for independence also determined (at the .05 level of significance) that the E/I dichotomy is not related to investment decision-making in either a stressed or a non-stressed situation.

Table 2 – Chi-Square Test for Independence – E/I preferences in Non-Stress and Stressed Situation

Actual

	No Stress Conservative	No Stress Aggressive	Total	
Extroverted	26	41	67	0.5537
Introverted	30	24	54	0.4463
Total	56	65	121	

Expected

	No Stress Conservative	No Stress Aggressive
Extroverted	31.01	35.99
Introverted	24.99	29.01

Chi-Test = 0.066227893

Actual

	Stressed Conservative	Stressed Aggressive	Total	
Extroverted	48	19	67	0.5537
Introverted	36	18	54	0.4463
Total	84	37	121	

Expected

	Stressed Conservative	Stressed Aggressive
Extroverted	46.51	20.49
Introverted	37.49	16.51

Chi-Test = 0.554882367

Hypothesis Three – The S/N dichotomy and investment decisions in a non-stress and stressed environment:

In testing hypothesis three, the chi-square test for independence finds that the S/N dichotomy is related to investment decision-making in a stressed situation. Since p = .02 is less than the .05 level of significance used for this test, the null hypothesis is rejected and it is concluded that the S/N preference and investment decision-making in a stressed environment are dependent (related).

Table 3 – Chi-Square Test for Independence – S/N preferences in Non-Stress and Stressed Situation

Actual

	No Stress Conservative	**No Stress Aggressive**	Total	
Sensing	28	27	55	0.4545
Intuitive	28	38	66	0.5455
Total	56	65	121	

Expected

	No Stress Conservative	**No Stress Aggressive**
Sensing	25.45	29.55
Intuitive	30.55	35.45

Chi-Test = 0.351310479

Actual

	Stressed Conservative	**Stressed Aggressive**	Total	
Sensing	44	11	55	0.4545
Intuitive	40	26	66	0.5455
Total	84	37	121	

Expected

	Stressed Conservative	**Stressed Aggressive**
Sensing	38.18	16.82
Intuitive	45.82	20.18

Chi-Test = 0.021136686

Hypothesis Four – The T/F dichotomy and investment decisions in a non-stress and stressed environment:

In testing hypothesis four, the chi-square test for independence also determined (at the .05 level of significance) that the T/F dichotomy is not related to investment decision-making in either a stressed or a non-stressed situation.

Table 4 – Chi-Square Test for Independence – T/F preferences in Non-Stress and Stressed Situation

Actual

	No Stress Conservative	No Stress Aggressive	Total	
Thinking	26	31	57	0.4711
Feeling	30	34	64	0.5289
Total	56	65	121	

Expected

	No Stress Conservative	No Stress Aggressive
Thinking	26.38	30.62
Feeling	29.62	34.38

Chi-Test = 0.889561980

Actual

	Stressed Conservative	Stressed Aggressive	Total	
Thinking	41	16	57	0.4711
Feeling	43	21	64	0.5289
Total	84	37	121	

Expected

	Stressed Conservative	Stressed Aggressive
Thinking	39.57	17.43
Feeling	44.43	19.57

Chi-Test = 0.571965426

Hypothesis Five – The J/P dichotomy and investment decisions in a non-stress and stressed environment:

In testing hypothesis five, the chi-square test for independence also determined (at the .05 level of significance) that the J/P dichotomy is not related to investment decision-making in either a stressed or a non-stressed situation.

Table 5 – Chi-Square Test for Independence – J/P preferences in Non-Stress and Stressed Situation

Actual

	No Stress Conservative	No Stress Aggressive	Total	
Judging	34	33	67	0.5537
Perceiving	22	32	54	0.4463
Total	56	65	121	

Expected

	No Stress Conservative	No Stress Aggressive
Judging	31.01	35.99
Perceiving	24.99	29.01

Chi-Test = 0.272520315

Actual

	Stressed Conservative	Stressed Aggressive	Total	
Judging	51	16	67	0.5537
Perceiving	33	21	54	0.4463
Total	84	37	121	

Expected

	Stressed Conservative	Stressed Aggressive
Judging	46.51	20.49
Perceiving	37.49	16.51

Chi-Test = 0.074876407

CONCLUSION

The results of this study do not support the gender findings of Lighthall, Mather, & Gorlick (2009) when applied to an investor's risk tolerance. While males may have a tendency to "double down" when stressed and females may have the opposite reaction to a stressful situation, this finding does not appear to be the case when applied to a stressed investment environment.

Further, most preferences of the MBTI are also unrelated to an investor's decision to choose an aggressive or a conservative security when faced with large investment losses. However, an investor's preference for information gathering (the Sensing/Intuition dichotomy) does appear to be related to investment decision-making under stress.

It is possible that the sensor's focus on facts and the intuitive's preference for the big picture may partially explain these findings. For instance, sensors are sometimes described as paying attention to physical reality (what they can see, hear, touch, etc.) and are often concerned with the details of the actual, current, and present environment. In the case of making an investment decision under stress, sensors may pay more attention to the fact that they have just lost a considerable sum of money. The future does not matter as much to the sensor as much as the current fact that their investment losses are problematic. Therefore, the sensor may choose to invest (or reinvest) in a conservative investment.

On the other hand, those with an intuitive preference are sometimes described as paying more attention to impressions and patterns. They would rather work with theory than fact. They remember events more by what they "read between the lines" than what the actual facts may state. Therefore, it is possible that intuitives take a big picture snapshot of their current investment losses and theorize that they are likely only temporary. Most investors know that, over time, the market always goes up. Being more interested in possibilities than facts, intuitives may decide to "double down" and choose to invest (or reinvest) in an aggressive investment while the market is "on sale".

AREAS OF FUTURE STUDY

While the primary focus of this study was to determine whether gender and Myers-Briggs preferences could be linked to choices made in investment decisions under a stressed and non-stressed environment, these same variables could be used to study the likelihood of someone becoming a serial entrepreneur in the face of a failed first venture. Many articles have attributed Myers-Briggs personality traits to entrepreneurs, particularly tolerance to risk, but there has been scant research done on whether these same traits could determine which individuals would become serial entrepreneurs in the face of an initial unsuccessful attempt. An initial failed startup would approximate a stressed environment to someone determining whether to try a second venture. Further study is needed to determine the causality between these factors and the likelihood of becoming a serial entrepreneur.

A study by Lafontaine and Shaw (2014) found fewer than 26% of those entrepreneurs studied opened a second business, if the first business closed in under two years. This suggests that over 74% never became a serial entrepreneur in the face of an initial failure. In the Journal of Enterprising Culture, Kathryn Densberger (2014), proposed that a high level of self-efficacy drives those with a high risk propensity to become entrepreneurs, but this study doesn't address whether that high level of confidence extends to attempting a second venture in the face of an initial loss.

This study may open the door for predicting the likelihood of an entrepreneur becoming a serial entrepreneur, in light of an unsuccessful first venture. While it may be logical to suggest most

people would be willing to start a second venture if the first was successful, in other words, a non-stressed atmosphere, how many would try again in light of the first venture failing, a stressed atmosphere?

Would the same five hypotheses tested in our investment environment result in the same or similar results, when applied to entrepreneurs after a failed versus successful first launch? This may be a study worth exploring further.

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Training and Development in South Carolina's Hospitality, SMEs (small/medium enterprise)

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Proposed Research - Extended Abstract

Introduction

Competition in the hospitality industry has made it imperative for organizations to be creative in managing its resources and adapting to changes taking place in the business environment. Employees are an important resource within these organizations and training is critical for employee development. Research has shown that investments in training can result in return on investments (ROI) through improved employee productivity, improved customer satisfaction levels, and reduction in labor turnover and associated costs [1]. Training is defined as, "the acquisition of skills, concepts, or attitudes that result in improved performance in an on-the-job environment," [2, p. 230]. Research into training in the small-and-medium sized enterprises (SMEs) in South Carolina is limited. Even though 64.2% of accommodation and food service sectors represent those employed in small businesses in the State, (a small business is defined as one with fewer than 500 employees). Prior research suggest some SMEs invest thousands of dollars annually and other resources into programs that encourage employee training [3] but the return on investment (ROI) has not justified the costs. The purpose of this study is to investigate the impact that formalized training programs have on small-and-medium sized enterprises (SMEs) in key tourism sectors in South Carolina.

Methodology

This descriptive study will investigate the extent to which formalized training programs impact employee turnover and retention. This study will investigate the constructs and relationships between formalized training in SMEs on retention, productivity, and turnover costs in context of the research questions. The study is to be conducted in field settings using a mixed method approach of qualitative and quantitative research methods. The target population consists of SMEs of small business with fewer than 500 employees located in South Carolina's most visited counties, and include Myrtle Beach and the Grand Strand Area, Charleston, Greenville, and Richland Counties. There are over 400,000 small businesses operating in South Carolina [4]. The SMEs selected represent the accommodation and food services sectors that provide products and services for immediate consumption. A cluster sampling of SMEs will be selected from targeted areas, from which SMEs will be randomly selected. The research will be conducted in various stages that include literature review, face-to-face semi-structured interviews, focus

group interviews, pilot-testing using self-administered paper questionnaires, and an online survey via Qualtrics. The survey instruments will be adapted from previous studies. Appropriate empirical data analysis using SPSS will be utilized.

Proposed Results and Conclusion

Overall, the results should indicate whether organizations that have strategic plans that incorporate training are more likely to retain employees. The results should show whether training is significantly positively correlated with employees' intentions to stay with SMEs. Overall, it should show whether employees are satisfied with the type and amount of formalized training they are receiving. There may also be evidence to support the idea that the amount of training received per employee at SMEs will influence the productivity of the employees and that SMEs that have formalized training programs have less turnover and better retention of employees. The findings should confirm/disconfirm whether on-the-job training is the predominant training method used by SMEs and that the adoption of formal training increases with firm size. These findings, if true, would be consistent with the literature that suggest on-the-job training is the predominant training method [5] [6] [7]. This research is significant and can be used to help Small Business Associations, working with SMEs in the state of South Carolina to develop and implement strategies to enable them to reduce their turnover costs, retain their staff, and create an environment where employees can be productive.

Key words: SMEs, retention, training and development

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VETERAN ENTREPRENEURSHIP IN THE FOURTH INDUSTRIAL REVOLUTION

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ABSTRACT

The objective of this paper is to define the landscape currently impacting veteran entrepreneurs. The primary factors impacting those entrepreneurs are the Fourth Industrial Revolution and the multiple forces involved: demographic, natural/physical, and technological. These forces are influencing consumer trends, business strategy, and business viability. The technological innovations in particular, especially automation and robotics, have potential for significant influence on worldwide employment across a variety of jobs and industries.

For veterans to overcome the challenges posed by the forces of the Fourth Industrial Revolution, they must rely on the power of social innovation and networks. Social innovation and social entrepreneurship present promising avenues for veteran businesses to achieve social value, not just private value. By interacting with the numerous networks available to veterans, including public-private partnerships, these businesses can leverage social, economic, and political value. For veterans and their families, this network system has been termed the Sea of Goodwill. By effectively navigating this system, veteran entrepreneurs have the opportunity to overcome declining U.S. entrepreneurship and achieve business success.

Introduction

Some economists claim we stand at the start of a Fourth Industrial Revolution or a Second Machine Age. Entrepreneurs in the 21st century face a myriad of challenges but also have exciting new opportunities. Businesses are embarking on an era of unprecedented technological growth and connectivity. For each of the advances, there is the potential for both positive and negative change.

Next generation technologies, such as 3D printing and automation, are changing the nature of our workforce. Just as major corporations are forced to adapt to these changes, entrepreneurs too must determine how to leverage these changes for growth. External factors complicating these developments include, but are not limited to, recent economic growth and climate change, forcing individuals and businesses to make decisions about their long-term future. Furthermore, recent trends such as the maker movement and the access economy, which we will describe in detail, have significantly reduced barriers to entry for aspiring entrepreneurs and their competitors.

Despite a decade of global economic growth, growth in entrepreneurship has failed to recover from the Great Recession. Research has shown that the nation's new business creation rate, which peaked in 2006, dropped more than 30 percent during the recession and has been slow to recover (Harrison, 2015). Furthermore, according to the Brookings Institute, U.S. business closures in 2008 outpaced business creation for the first time in the 40-year life of the statistic. Each of these trends indicate that, although general economic growth has been positive, Americans are not becoming entrepreneurs.

The aim of this paper is to capture the current trends impacting American entrepreneurs to help them navigate this sea of change. Specifically, our goal is to help veterans considering entrepreneurship find success in this dynamic, changing environment, enabling them to prepare for the current opportunities and challenges. This Fourth Industrial Revolution presents numerous challenges to entrepreneurs, including changing demographic, physical, and technological forces. These forces have led to movements such as the

maker movement, the access economy, and the rise of networks. Given the skills that veterans naturally bring to the table as leaders and entrepreneurs, this dynamic environment, if handled properly, presents an opportunity to fix both veteran employment shortfalls and the decline of American entrepreneurship. Veterans, cultivating the power of networks and opportunities for social innovation, can overcome the challenges and find success.

Current State of the Economy

Many economists agree that the short-term economic forecast for 2018 is strong. As the economy finally rebounds fully from the 2008 recession, consumer spending, business investment, and manufacturing are all forecasted to grow at solid rates (Davidson, 2018). According to Ray Dalio, Founder of Bridgewater Capital, one of the largest hedge funds in the world, the global economy is currently in a Goldilocks stage of the economic cycle: equilibrium with no downturn on the near horizon (Dalio, 2017). However, Dalio foresees significant social and economic turmoil when the next downturn does occur, given the divisive state of American politics and society. William Dudley (2018), President of the Federal Reserve Bank of New York, agrees that while the short-term outlook is bright, several factors including the rising national debt and wage inequality make for an uncertain long-term outlook.

This economic evaluation means that entrepreneurs currently face a strong, favorable economic environment with long-term uncertainty. Much of this is comparable to any favorable economic period—it is often difficult to forecast how long things will remain positive. However, this current uncertainty is compounded when looking at ongoing technological revolutions impacting across industries.

Fourth Industrial Revolution

In *The Fourth Industrial Revolution,* economist Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, details the drivers and megatrends for a major shift in the world economy. When outlining this industrial revolution, Schwab argues "that technology and digitalization will revolutionize

everything, making the overused and often ill-used adage, 'this time is different' apt" (Schwab, 2017). Schwab contends that the scope and scale of this change, including broad ranging innovations like autonomous vehicles, 3D printing, advanced robotics, and the internet of things will forever change the world in dramatic ways. For its impact on entrepreneurs and veterans, we examine the Fourth Industrial Revolution by looking at the demographic, economic, natural, technological, political, and social forces and factors that will directly impact current and future entrepreneurs.

Demographic Forces

Two demographic trends are drastically reshaping the world economy from what it was in previous decades: longer lifespans and decreased fertility (Ip, 2015). According to United Nations estimates, the working-age population in advanced economies is declining for the first time since the 1950s and will ultimately shrink 5% by 2050 (United Nations, 2015). In simple terms, people in the most developed countries are living longer and having less children, shifting their demographics to overall older populations. In the U.S. this change is discussed often with the retirement of the Baby Boomer generation and the associated strain on the existing government entitlement system. These changes can have broad impact, from fewer employees for companies to different consumer trends due to an older consumer-base. Entrepreneurs must consider these changes and their impact on their products or services.

Studies have shown consumer spending habits vary based on consumer age. According to the Consumer Expenditure Survey and the Bureau of Labor Statistics, younger people spend far more than older people on housing, clothing, and eating out (Foster, 2015). In general, younger generations simply spend more money than older generations, as older people are more focused on retirement savings and often have less disposable income. Older people spend an increasing share of their budget on food at home and on healthcare. In terms of dollar amounts, not just share of household budget, healthcare is the only expenditure category that increases with age. These shifts are critical to keep in mind as the population moves to an older demographic and entrepreneurs attempt to meet the needs of a changing consumer population. For

example, certain veteran entrepreneurs are well poised to meet the growing demand for healthcare services while others might rethink certain entertainment-focused business ideas, especially in markets with more significant shifting demographics.

Natural and Physical Forces

The true impact of climate change on businesses and entrepreneurs is still unknown. However, the U.S. Navy provides an excellent example of how a business or organization can combat this unknown challenge. In the 2014 Quadrennial Defense Review, the Defense Department stated "The pressures caused by climate change will influence resource competition while placing additional burdens on economies, societies, and governance institutions around the world. These effects are threat multipliers that will aggravate stressors abroad such as poverty, environmental degradation, political instability, and social tensions—conditions that can enable terrorist activity and other forms of violence" (U.S. Department of Defense, 2014).

A Harvard Business Review article from 2017, "Managing Climate Change: Lessons from the U.S. Navy," suggests ways businesses can both mitigate and adapt to the impacts of climate change. The authors contend that businesses can follow the Navy's example of mitigating their reliance on fossil-fuels, not just to reduce greenhouse gas emissions but also to reduce their own reliance on a single energy source that is highly vulnerable to price and supply-chain volatility. Businesses, too, must learn how to mitigate the potential fallout of climate change on their products and services. Furthermore, businesses must adapt, as the Navy has, to changing strategic realities brought on by climate change. For the U.S. Navy, these changing realities include greater mission demand due to increased international conflict and humanitarian relief and decreased capacity of existing infrastructure impacted by rising sea levels and stronger natural disasters (Reinhardt & Toffel, 2017).

The takeaway for both new and established entrepreneurs is the need to fully understand the potential impacts of climate change on their business. If scientific predictions for climate change are true, then

industries will increasingly be impacted by major natural disasters and changing consumer demands. Certain industries, like agriculture, housing, transportation, and communication will feel a greater burden from this impact. Additionally, these changes could further incense both domestic and international conflict. Entrepreneurs must determine ways to anticipate, mitigate, and adapt to these changes.

Technological Forces

Perhaps the most significant economic impact of this *Fourth Industrial Revolution* will be on the nature of employment. The fear, given the widespread automation across vast sectors of the employment landscape, is that large portions of the working population will be replaced by automation, robotics, and technology. In his 2015 book *Rise of the Robots*, Silicon Valley entrepreneur Martin Ford outlines the broad impacts of the current technological revolution on the job market. Even previously assumed safe jobs, like those requiring critical thinking and creativity, he argues, are at risk of automation. White-collar career fields like healthcare, journalism, finance, and education are all seeing the impact of automation on jobs (Ford, 2016). Other fields like retail and agriculture where the jobs are often defined by repetitive tasks, are quickly seeing automation take hold. The question remains whether this job displacement will be offset, as it has in previous technological revolutions, by new job creation or whether we will see massive unemployment. One proposed solution to this widespread unemployment is the implementation of some type of universal basic income, but that seems unlikely to happen quickly in the current political climate. Economists disagree on how to best handle increased automation. However, there are certainly things that entrepreneurs can do to better prepare for the impending changes.

"We can know more than we can tell, i.e. many of the tasks we perform rely on tacit, intuitive knowledge that is difficult to codify and automate" (Polanyi, 1966). This problem, the idea that we know how to do far more than we can explicitly explain how to do, was later coined Polanyi's Paradox. This paradox is a problem that leaders have faced for centuries when managing people. However, as the technological advances shape our world today, this problem is still lasting but in another way. Technological forces today

are increasing the connection between business and machines. So much so, business leaders need to be able to communicate with their technology as effectively as they do with their people. David Autor, in a paper for the National Bureau of Economic Research, links this topic to the future of the employment growth as it is affected by businesses becoming more technologically advanced. Autor, contrary to Ford's view discussed above, argued that people overstate the extent of machine substitution for human labor and ignore the strong complementarities. "The challenges to substituting machines," he claimed, "for workers in tasks requiring adaptability, common sense, and creativity remain immense" (Autor, 2014). Whether or not automation will ever replace those jobs, it is reasonable to assume that prospect is further in the future. The impending challenge is for entrepreneurs to think about whether their jobs and industries are ripe for automation or robotics *now*.

In *Machine, Platform, Crowd: Harnessing Our Digital Future,* authors McAfee and Brynjolfsson outline the development of the new age of the digital revolution. The technological forces today have formed three movements that are creating new opportunities for businesses:

1. Artificial intelligence (AI): a shift from humans to machine. The movement from a "standard partnership" between people and technology to a more efficient use of technology.
2. Platforms: a shift from products to platforms. Platforms are specific marketplaces. A connection between buyers and sellers where what the company really provides is just the ease for the transaction in the marketplace.
3. Crowd: a shift from the core to the crowd. The core is defined as centralized institutions and crowds are decentralized, self-organizing participants in a specific group.

Examples of AI are all around us today and new uses emerge daily including self-driving cars, online language translation, and Amazon's new checkout-free store. The use of platforms is still growing but their concepts have been around for years with examples like eBay or Amazon. However, new uses are connecting more than just products to consumers. Very large and successful organizations such as Uber,

Airbnb, Alibaba, and Facebook have been very successful; however, what do they own? We will discuss this movement, the access economy, more in a later section.

Crowds can be simply defined as a collaborative network. (Gray & Alt, 2016) Individuals come together and share numerous things such as ideas, information, resources, funds, etc. The methodology of crowds is more conceptual, and entrepreneurs are slow to find value in this shift. Common examples are ways people work around existing processes such as the emergence of virtual currencies like Bitcoin, sharing information by being a contributor to Wikipedia, or crowdsourcing to raise money. Nonetheless, the crowd will take on many new uses for smaller and larger companies in industries not yet fully grasped such as customer service. In a futuristic ideal software company, the perfect no-cost customer service department would be the customers themselves. This would mean an internal platform where customers gather to help each other use, install, or trouble shoot a product they all trust and value.

Although McAfee and Brynjolfsson do not say it explicitly, there are essentially three economic drivers of the technological forces described above. The first they explain as "free, perfect and instant economics of digital information goods in a time of pervasive networks." This can also describe when "the marginal cost of an additional digital copy is (almost) zero". The second driver is that platforms are strengthened by crowds and increases in the user interactions. The authors stated, "networked goods can become more valuable as more people use them. The result is 'demand side economies of scale', giving an advantage to bigger networks." The final economic driver is the strategies to promote user growth. Advanced platforms can subsidize one or more sets of users to incentivize the participation of other sets of users. In addition, digital technology allows many platforms to offer free or discounted services. As a result, natural user growth creates another ecosystem of growth by attracting more producers and/or advertisers who pay for the privilege, in turn making it more attractive for others to participate on the platform.

Each of these technological forces will have profound effects on businesses and entrepreneurs. People starting businesses now, or determining the strategic vision for their existing businesses, must consider how each of these trends will impact their business models. The success of entrepreneurs will not only depend on them planning for how their industry will be affected by these forces but also finding opportunities to leverage the potential benefits. The prepared business will capitalize on the technological forces and find a competitive advantage, providing added value to their customers through better matching of individual needs and giving them access to a greater set of options because of expanded long tail product and service offerings.

"The successful companies of the second machine age will be those that bring together minds and machines, products and platforms, and the core and crowd very differently than most do today." - *Machine, Platform, Crowd: Harnessing Our Digital Future*

Maker Movement

The maker movement is an industry shift that is simultaneously reducing the capital requirements of manufacturing, easing the cost and risk of invention, and enabling entrepreneurs to enter new markets with newly-found ease. This movement is enabled by the growth and improvement of technologies like 3D printing, laser cutting, milling machines, and other sophisticated machine tools that allow low-scale manufacturing at fractions of the costs compared to decades ago (Fallows, 2016). Combined with crowdsourcing and crowd-funding, these new products can also quickly see new markets. As a result, entrepreneurs can invent products with less risk and greater support. The maker movement is truly a game-changer for potential entrepreneurs.

Access Economy

Another important trend in technology and entrepreneurship is the access economy (also referred to as the sharing economy). The access economy is the shift from ownership to sharing of resources. Examples of

start-ups in this domain are Uber, Airbnb, and Instacart. Additionally, incumbent companies are developing products and services that utilize this trend. Examples of this are Ikea's used furniture exchange on its website and Wal-Mart's online platform to share used video games (Puschmann & Alt, 2016). These services each use a networked platform to allow exchange of resources that might have otherwise been wasted or discarded. The key benefit for consumers is making purchases with greater convenience at lower prices (Eckhardt & Bardhi, 2015).

The access economy is truly supply meeting demand at a micro level. This movement allows people to become entrepreneurs and enter business with limited capital and limited resources. It connects excess supply of goods or services like rooms, seats in a car, and artistic talent with the demand for a place to stay, a convenient ride, or a niche gift. Finally, the access economy is sparking a new way for entrepreneurs to easily and rapidly network with consumers through existing platforms or by creating their own. The challenge, however, is moving past the "side gig" and into something truly sustainable as an independent business model. Additionally, entrepreneurs with existing companies must constantly understand the threat posed by potential competitors using the access economy. Given the ease of access for new entrants, the speed at which a competitor can become a real threat is significantly increased.

Social Innovation

The Stanford Social Innovation Review (SSIR) at the Stanford Graduate School of Business defines social innovation as "a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society rather than private individuals." The core of social innovation stems from non-profit organizations and originally its work implicitly or explicitly excluded public and for-profit organizations. However, the movement is now entering for profit sectors and is paving the way for many for-profit entrepreneurs to bring value to our society.

Social innovation can be the bridge between veterans who are looking to become entrepreneurs and building success for their organizations. As mentioned before, the maker movement also played a hand in social innovation and many great ideas became the foundation for successful companies. The SSIR provides clear mechanisms and networks for social entrepreneurs and we want to highlight some of their findings. It is important to note, "the mechanisms of social innovation—the underlying sequence of interactions and events—change as a society and its institutions evolve" (SSIR, 2008).

A social innovation can be many things such as a product, production process, or technology. Nonetheless, it can also be a principle, an idea, a piece of legislation, a social movement, an intervention, or some combination of them. In a chapter about veterans' entrepreneurship in *Social Entrepreneurship as a Catalyst for Social Change*, the authors describe the economic, social, and political value from social entrepreneurship and the networks involved (Zacchea & Harris). Similarly, Greg Dees describes social innovation as "adopting a mission to create and sustain social value (not just private value)" and illustrates a clear distinction between business and social entrepreneurs (Dees, 1998). The fundamental difference between an entrepreneur and a social entrepreneur is motivation. "Entrepreneurs [are] spurred on by money and social entrepreneurs [are] driven by altruism" (SSIR, 2007). The SSIR gives a clear definition of innovation. For an entrepreneur's genuine idea to be considered an innovation, two criteria that must be met:

1. Novelty: Innovations do not have to be original, however, they must be new to the user, context, or application.
2. Improvement: Innovations can be a process, outcome, or product but it must be either more effective or more efficient than preexisting alternatives.

The revolution of social entrepreneurship offers veteran businesses plenty of benefits to support their innovations. The framework is built on finding the greatest value for society and this encourages collaboration. Through the exchange of ideas, and backing from like-minded initiatives, veterans can utilize the social entrepreneurship network to find support for their businesses.

The Global Social Entrepreneurship Network (GSEN) is the global network for organizations supporting early stage social entrepreneurs. The social entrepreneurship ecosystem is growing but the development is being strained by the fragmentation. Organizations like GSEN are striving to reach the full potential of social entrepreneurship. Networks like this are in place to help entrepreneurs find resources such as funding bids, fruitful introductions, shared knowledge, and deeper collective understanding.

Networks and the Sea of Goodwill

In 1945, economist F.A. Hayek asked the question, "What is the problem we wish to solve when we try to construct a rational economic order?" His answer was a simple explanation full of hypothetical solutions. If we have the right information, using the right system, and command the right knowledge of available means, then the answer to the economic problem comes down to logic (Hayek, 1945). However, as many entrepreneurs understand, having all these hypothetical tools is not always realistic. The information that entrepreneurs must have to make decisions and move the organization into the future is not always fully available.

Hayek's solution to this problem within a problem was finding the right source of the knowledge. Today, the organizations provide far greater knowledge than what was imagined in 1945. Networks have empowered the use of knowledge in society by connecting people, and as a result it becomes possible to influence each other's behavior and decisions (Easley & Kleinberg, 2010). Networks are a critical tool for entrepreneurs. Successful entrepreneurs take advantage of these networks and find the value that Hayek believes society has.

The nation has created an established support system for helping Service members. Admiral Michael Mullen, the former Chairman of the Joint Chiefs of Staff, called this a "Sea of Goodwill" of Americans yearning to help the ones who defended our country (Copeland & Sutherland, 2010). According to the

Chairman's Office for Warrior and Family Support, "leveraging the Sea of Goodwill for the betterment of Veterans and Military Families works best when businesses, nonprofit organizations, and government agencies work in collaborative environments free from barriers, stagnant paradigms, or egos" (Warrior and Family Support, 2013). This partnership of both private and public sectors is the perfect example of a unity within a network to accomplish a common mission.

The development of public-private partnerships is expanding. Many of these initiatives aim to help veterans kick-off their business plans. There are educational networks that will provide experiential training in entrepreneurship and small business management. Many universities and institutes offer special programs designed specifically for veterans to help educate and prepare. University of Connecticut's Entrepreneurship Bootcamp for veterans, for example, is designed to give focused, practical training in the tools and skills of new venture creation and growth and the establishment of a support structure for graduates of the program. Similarly, The Augusta Warrior Project connects veterans and their families in the greater Augusta area with "resources that provide health and wellness resources, career building education opportunities, and meaningful employment" (Warrior and Family Support, 2013). Programs such as these are the embodiment of the network theory discussed above. These networks are the tools that give veterans a leg-up over their entrepreneurial counterparts in overcoming the obstacles, challenges, and opportunities presented by the current environment.

Recommendations

While the Fourth Industrial Revolution presents challenges for all entrepreneurs, the concept of social innovation and the powerful networks connecting and supporting veterans offer a framework for entrepreneurial success. Veteran entrepreneurs must carefully reflect on and analyze the various forces defining the Fourth Industrial Revolution. Changing demographics, natural trends, and technological innovations are reshaping the economic landscape for businesses of all sizes. Today's entrepreneurs must

ask themselves what their company and industry will look like in the coming years and decades, and proactively position themselves for success.

Of the challenges presented, we feel the technological forces are the most impactful to entrepreneurs. These technological innovations have led to powerful new movements like the maker movement and the access economy that are changing entire industries. Any entrepreneur must ask themselves whether their business is viable given these shifts. After the technological forces, the next important factor to consider is the demographic swing towards an overall older population and the implications for consumer trends.

The key to finding success in this challenging landscape is to harness the power of networks. Existing networks provide great opportunity for economic, political, and social support. By using these networks, veterans can leverage all available resources to find success. We recommend that aspiring and established veteran entrepreneurs determine what public-private partnerships exist in their industries and geographic regions to support their business ventures. We also recommend they proactively connect with other veteran businesses and organizations to further establish the "Sea of Goodwill."

Future Research

We recommend further research into public-private partnerships. There is already some research into national-level organizations, such as the Wounded Warrior Project, but there are numerous initiatives on the state and municipal level that warrant further exploration and research. The success of these local programs can certainly be applied to the various networks serving to support veteran entrepreneurs.

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WHAT DO TPEOPLE THINK ABOUT AIRBNB?

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ABSTRACT

Airbnb is a new paradigm that presents great threats to the existing hotels and the growth opportunities to the entrepreneurs and innovative minds. This study explored current issues and threats that Airbnb brought to the industry in hopes to coming up with coping strategy to this new phenomenon. I also examined trustworthiness and brand personality items of Airbnb. The detailed results of this descriptive study will be presented at the 2018 SEINFORMS. The results will enable targeted marketing based on the personal traits. It can also inform the traditional hotel chains how to strengthen the relationship with existing customer who are currently reluctant to patronize the Airbnb service, hence, help prevent customers from churn.

BODY

Airbnb started on August 2008 in San Francisco, CA when a convention was in town. Three men were struggling with paying for rent and thought of the idea to rent out air mattresses on their living room floor and offer a homemade breakfast in the morning, hence Airbed and Breakfast. Their opportunity arose when the men saw hotels filling up and leaving some convention attendants without a place to stay. They then created a website and offered their house up for those who wanted to stay for $80 a night on air mattresses. The company started with three guests to now 150,000,000 plus guests and 3,000,000 listings worldwide (Airbnb, 2016). The company is based only online and serves 65,000 cities and 191 countries (Airbnb, 2016). At $25.5 billion, its net worth is 25 percent more than Hilton, which makes it the most valuable accommodations company (Love, 2016).

Airbnb is essentially an online platform through which ordinary people rent out their spaces as accommodation for tourists (Guttentag, 2015, p 1193). It is just a C2C distribution platform which allows direct communication and payment between two parties, in response to the need for a cheaper alternative for vacation rentals. Disruptive innovation is defined as a new innovation that takes over dominant companies in a certain market (Christensen, 2017). A new product is disruptive innovation when it appeals to the lower sector of the market, those who are cost cutters. Suddenly, the product starts gaining interest and then appeals to the higher sector of the market, those who are willing to spend more. It then becomes a threat to companies who were previously dominant in a certain sector, thus, causing disruption.

This new paradigm presents great threats to the existing hotels and the growth opportunities to the entrepreneurs and innovative minds. The more rooms Airbnb adds the more opportunity it has to take over the market. Adding more inventories in unpredictable manner results in constantly diluting the market (Llewellyn, 2014). A senior vice president of Starwood Sales Organization, Christie Hicks, described Airbnb as the epidemic, saying “they are disrupting our industry in a way, frankly, none of us would have seen coming five years ago, and there will be someone after them and someone after them” (Sullivan, 2014). The idea completely redefined the industry.

It is “a trusted community marketplace for travelers to list, discover, and book distinctive accommodations all over the globe” (Airbnb, 2016). This form of collaborative consumption, because all trades and communication occur on online platform, always comes with the issue of trust and safety. The same concerns arise when two individuals participate in sharing economy such as peer-to-peer lending, crowdfunding, couch surfing and ridesharing. Sharing economy allows peopleexchange tangibles and intangibles without owning them, while creating

opportunities for others to extract value from idle possessions or talents (Kim, Yoon, & Zo 2015). This highly flexible network often undercuts traditional retail or employment arrangements like the Airbnb in the lodging industry (Fang, Ye, & Law, 2015).

Researchers found that the users of any online business in sharing economy ranked trust as the most salient issues (Ert, Fleischer, & Magen, 2016). There were several threatening instances with Airbnb where the consumers raise the trustworthiness of the hosts and their postings. For instances, in 2015, an Airbnb host locked up the renter in the apartment room and assaulted him. Airbnb has a dedicated host protection program has no renter protection program that guarantees renter security (Leiber, 2015).

Airbnb offers customer reviews and homeowners' pictures. The pictures play a big role in creating trust in the renters' mind. Ert, Fleischer, and Magen (2016) found that the more the renter trusts the homeowners' picture on the Airbnb website the more willing they were to rent from them. However, they found that there was weak evidence on the effect of reputation on customers if the customer would be willing to rent due to a good or bad review. People felt more comfortable renting from a women rather than a man. The same research found the renter subconsciously be willing to trust the host due to the beauty of the female host (Ert, Fleischer, & Magen 2016).

Brand personality allows consumers to "humanize" a product and be able to relate to it. Lee and Kim (2017) adopted Aaker (1997)'s brand personality scale and Mittals (1989)'s purchase involvement scale to determine the brand personality of Airbnb renters. Lee and Kim's five dimensions of brand personality include sincerity (e.g. honest, sincere, and secure), excitement (e.g. original, trendy, and unique), competence (e.g. leader and successful), sophistication (e.g. upper class and good looking), and ruggedness (e.g. tough and rugged.). They found that there is cohesive characteristics of Airbnb users that separate them from others who booked the accommodations with mainstream hotels. The typical renter is an average age of 32, a married couple with no children, and hold personality traits such as excitement and independence.

The average household income of these renters ranges from $50,000 to $59,999 (Lee et al., 2017). Along with the previous information, Lee et al. (2017) also found that most of the respondents had some higher education, with 41.9% of the individuals with four-year degrees.

I conducted a survey during an international conference, which was held in Myrtle Beach, SC. More than 600 people attended this science conference. Most of the conference attendees were from North America (96%) with some international attendees, from Europe (4%) and Asia (less than 1%). The conference was held for three days in April of 2017. The conference chair was a biology professor from Coastal Carolina University and the school hosted viewing of the new school of science building as well as served as a major sponsor. The survey questionnaire was inserted in the program book and 40 completed the survey was gathered. The survey questions include accommodation type, information source, travel partner, important trust factors, attitudes (cognitive, affective, behavioral), and brand personality items. This study explored current issues and threats that Airbnb brought to the industry in hopes to coming up with coping strategy to this new phenomenon. I also examined trustworthiness and brand personality items of Airbnb. The detailed results of this descriptive study will be presented at the 2018 SEINFORMS. The results will enable targeted marketing based on the personal traits. It can also inform the traditional hotel chains how to strengthen the relationship with existing customer who are currently reluctant to patronize the Airbnb service, hence, help prevent customers from churn.

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"Research Propositions for a Functional Motivation based Examination of the Drivers of Future Civic Engagement Behavioral Intention"

Introduction

The proposed study addresses two research priorities. First, it addresses how civic engagement changes through experiences—past civic engagement experiences impact future civic engagement behaviors and behavioral intentions. Second, it addresses personal motives for participation in civic engagement and volunteering. Finally, underlying segments within the models will be explored and, if present profiled, to better understand what motivates people to participate in civic engagement behaviors based on their reasons, attitudes, and demographics.

This study will validate a research stream that used a regional student sample (Nicholls 2012a, 2012b; Nicholls et al, 2016). The research would use behavioral reasoning theory to address the following research questions. Do "reasons" for participation in, and experience with civic engagement or volunteering activities drive future civic behavioral intentions? If so, which "reasons?"

"Reasons" will be operationalized though a higher order formulation of the volunteer function inventory (VFI). The study also addresses post civic engagement experiences (volunteering or donations). Other research questions include "How does the prior experience influence the feedback loop from the behavior/experience to 'reasons' (satisfaction) in the driver model?" Do reasons drive attitudes toward helping others (AHO)? Additionally, what are the underlying segments describe those who participate in civic engagement. This research contributes to the fields of civic engagement, voluntary action, and nonprofit marketing.

This project will advance a deeper understanding of civic behavioral intentions, volunteering and service outcomes, nonprofit marketing implications, and drivers of voluntary action and behaviors that impact civil society. The results will identify if the motives (reasons)

for civic engagement behavioral intentions (CEBIs) are more me- or other-directed and will identify what impact the experience itself has on "reasons" as drivers of CEBIs.

Additionally, the research stream will identify the drivers of CEBIs of volunteers and donors that can be reinforced and/or targeted by nonprofits in the process of recruiting and retaining volunteers and donors. Volunteer managers may want to consider evaluating volunteers "reasons" for volunteering to determine how best to use them, keep them longer, and keep them from burning out. Likewise nonprofit development (fundraising) managers and marketing professionals may want to use the salient "reasons" identified by this study to target their marketing communications in solicitations.

Background and Literature Review

Civic engagement is defined as "a cluster of individual efforts and activities oriented toward making 'a difference in the civic life of … communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes' and through informal or formal networks." (cite)

Civic engagement relates to the dimensions of the VFI because the VFI includes knowledge, values, and skills related to volunteering and is a motivational construct. It is a functional measure that specifically examines what motivates people to volunteer, and in this research, will examine what motivates people to participate in civic engagement behaviors (or behavioral intentions).

The *values* dimension of the VFI is explained as expressing values (expectations/goals) related to wanting to help (altruism) and concern for others (humanitarian). The *understanding* dimension means providing learning experiences and the opportunity to exercise knowledge, skills, and abilities and learn about specific causes. The definition of the *enhancement* dimension

involves self-esteem and personal strength that helps personal (the ego's) growth and development, while the *social* dimension is defined as an opportunity to make or be with friends or to engage in an activity viewed favorably by important others. The *career* dimension is explained as a means to maintain career-relevant skills and to help with or prepare for a new career. Finally, the *protective* dimension is defined as protecting the ego to feel less lonely and may serve to reduce guilt over being more fortunate than others or to address or escape from personal problems (Clary et al., 1998).

Relatively new (2005), Behavioral Reasoning Theory (BRT) is a decision-making theory that extends the theories of reasoned action and planned behavior. Westaby (2005a) identifies the role of "reasons" between past behavior and future behavior. Drawing upon previous BRT research (Costa-Font, et al, 2008; Lee, et al., 2007; Sarif & Shiratuddin, 2010; Wagner & Westaby, 2009; Westaby, 2005a, 2005b, 2006; Westaby & Fishbein, 1996, Nicholls 2012a, 2012b; Nicholls et al, 2016), this study proposes a model that considers "reasons" as drivers of future civic engagement decisions, specifically future civic behavioral intentions. BRT has been used in a study of prosocial attitudes, specifically volunteer prosocial attitudes of Attitudes toward Helping Others and Attitudes toward Charitable Organizations (Briggs, Peterson, & Gregory, 2010). This proposed study extends this work by including these behaviors and behavioral intentions constructs as well as, to a lesser degree, tests the BRT itself—important academic contributions.

Conceptual Framework

In BRT research, attitudes directly predict behavior and behavioral intentions (Ajzen, 2008; Ranganathan & Henley, 2008; Webb, Green, & Brashear, 2000; Westaby, 2005a, 2005b, 2006). Second, as has been demonstrated in several studies by Westaby (2005a, 2005b, 2006), attitudes influence the relationship between "reasons" and behavioral intentions. Third,

"reasons" has two components; "reasons" for and "reasons" against a behavior (Westaby, 2006) and has been empirically explored by Westaby (2005a, 2005b) and Briggs, et al. (2010) and shown to directly and positively influence attitudes and behaviors directly. Last, "reasons" are examined that directly and positively influence behaviors and behavioral intentions (e.g., Costa-Font, et al., 2008; Kim, et al., 2010; Lee, et al., 2007; Wagner & Westaby, 2009) so, in Figure 1, the six dimensions of the Volunteer Function Inventory (Clary, et al., 1998) operationalizes the reasons construct.

Insert Figure One about here

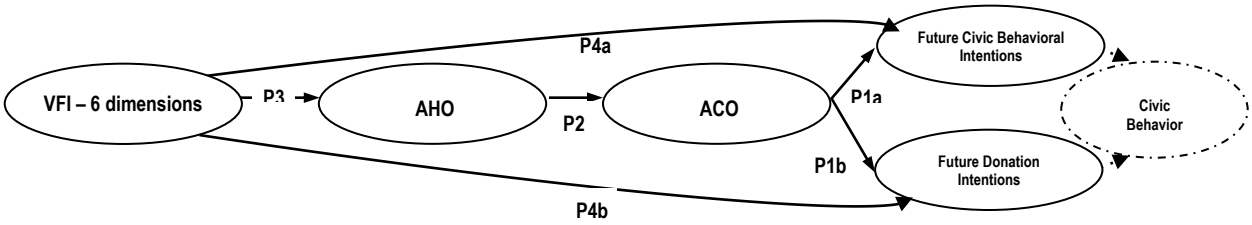
The proposed research builds upon a doctoral dissertation and associated manuscripts and publications looking at the influence of college service at a northeastern university requiring students to participate in a 30-hour volunteer program (Nicholls 2012, 2013; Nicholls et al, 2017) This body of work sets the stage for this proposal of a more comprehensive national study of examining the influence civic engagement and volunteering have on future civic behaviors and behavioral intentions. Since volunteering is touted as developing long-term civic-minded behavior, it is important to the viability of nonprofits to evaluate exactly how these experiences drive future civic-minded behaviors and behavioral intentions. In addition to this national study, the long-range plans include doing international and longitudinal studies and eventually looking at college graduates who are donors, volunteers, or employee volunteer programs to see how their college volunteer experiences influence their civic behaviors.

Models—Figure 1 examines the six dimensions of the Volunteer Function Inventory as drivers of attitude of helping others and both future civic behavioral intention and future donation intention. Figure 2 includes the role of post-experience "reasons" (feedback loop) or satisfaction to assess the role this construct has as a driver of civic behavioral intention and future donation intention.

Measures Used and Sources—VFI (Clary, et al., 1998); satisfaction (Omoto & Snyder, 1995); AHO (Webb, et al., 2000); ACO behavioral intentions measures will include both civic engagement intentions and future donation intentions, (Stukas, et al., 2009). A further explanation of the measures of the "reasons" construct—a key construct in this proposal—follows:

Volunteer Function Inventory (VFI) as "Reasons." The VFI, based on a functional approach to motivation, has, at its core a "concern[ed] with the "reasons" and the purposes, the plans and the goals, that underlie and generate psychological phenomena" (Clary, et al., 1998, p. 1517). In the discussion of BRT, Westaby (2005a) describes the Clary, et al. (1998) VFI work as a reason-based theory (like BRT) and that the VFI measures "reasons" for volunteering at non-profit organizations. The VFI is used in research to provide insight into the underlying functions of why people volunteer (Clary, et al., 1998), i.e., reasons (Westaby, 2005a). The VFI examines the extent to which the six VFI volunteer functions (values, understanding, enhancement, social, career, and protective) explain important or accurate reasons for volunteering (Stukas, et al., 2009) and what volunteers expect to receive from the experience (Clary, et al., 1998; Clary, Snyder, & Stukas, 1996). Using the VFI as the measure of the BRT "reasons" construct, Briggs (2010) empirically tested the relationships of three BRT constructs beliefs/values→reasons→ attitude using two dimensions (value and career) of the VFI as "reasons" to predict volunteer attitudes. Per Clary, et al., (1998), the theoretical basis for the VFI comes from attitude function theory (Katz, 1960) which holds that the same cognitive understanding may serve different functions (reasons) for different people. Since students will be used in this study and the college SLE is different from that previously studied, all dimensions of the VFI will be used as "reasons.

Figure 1, VFI as Reasons.



Research proposition 1a attitudes toward civic organizations will be related to future donation intentions

Research proposition 1b attitudes toward civic organizations will be related to civic behavioral intentions

Research proposition 2 Attitudes toward helping others will be related to attitudes toward civic organizations

Research proposition 3 the higher order construct of VFI (reasons) will be related to the mediating variable attitudes toward helping others.

Research proposition 4a the higher order construct of VFI (reasons) will be related to the outcome variable civic behavioral intentions

Research proposition 4b the higher order construct of VFI (reasons) will be related to the outcome variables of future donation intentions

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