Book of Proceedings

October 3-4, 2019

Southeastern Institute for Operations Research and the Management Sciences

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Abstracts

80% of Learning Is Showing Up: Impact and Costs of Unexcused Absences on Student Learning

Oral

Prof . Henry Lowenstein [1], ***Prof . Michael Latta*** [1]

1. *Coastal Carolina University*

This paper continues reporting results covering three years of empirical research demonstrating from primary data that one of the most significant impediments to business major students achieving assurance of learning, student excellence and success is self-destructive student behavior of unexcused absences (Latta and Lowenstein, 2017). This not only results in lost learning, but significant squandered tuition paid by parents, scholarships, student loans and state subsidies. To the extent this phenomenon magnifies across higher education, it contributes significantly to the national issues of high costs and it defines a massive amount of wasted tuition and state subsidy dollars approaching the over $1.5 trillion student loan debt (Lowenstein, 2017). This paper again demonstrates one of the strongest areas ensuring success of any university or AACSB business school's strategy to improve student learning success, retention and progress through degree program. By developing effective policies and processes that ensure student class attendance and attention to class sessions (face-to-face and distance learning) institutions can advance students' learning and achievement.

A Cluster Analysis of Digital Pirates: Multi-Dimensional Piracy Risk Perception Approach

Oral

Dr . Bong Keun Jeong [1], ***Dr . Bomi Kang*** [1], ***Dr . Dong Hyun Jeong*** [2], ***Dr . Soo-Yeon Ji*** [3]

1. *Coastal Carolina University* , ***2.*** *University of the District of Columbia* , ***3.*** *Bowie State University*

This paper focuses on segmenting digital pirates based on various piracy risk perception. Different piracy risks such as prosecution, financial, performance, time, privacy, and moral risk were measured to identify clusters of pirates who share similar piracy risk perception. Four pirate segments were found based on different combinations of piracy risk: anti-pirates, utility-conscious pirates, monetary-conscious pirates, and pro-pirates. Each cluster demonstrates unique attributes and behaviors associated with digital piracy. This finding can offer a more profound understanding of heterogeneous pirating segments and how they may react differently to anti-piracy strategies.

A Design Theoretic Process for Smarter Academic Advising in Higher Education

Oral

Dr . Caleb Bradberry [1], ***Dr . Arthur Carter*** [1]

1. *Radford University*

Academic advising is a necessary task for those engaged in the business of higher education. While academic committees and accreditation boards set standards as to what courses a student must take, there exists an opportunity for universities to seize the data being generated every semester by these students to improve retention through machine learning. Most students are advised to take certain courses at certain milestones in the academic career, which creates a level of homogeneity in this data. Using a design theoretic approach, we develop a system that captures similar course schedules into advising profiles for students and create training/testing datasets for machine learning. Using decision tree machine learning, we develop probabilities of a student's retention or attrition based on composite probabilities of the student's course load. The secondary advantage of this research is that it creates a smart advising system in which an optimal course load is automatically generated for the student.

A Legal Business Case - TriCove Solutions: The Cost of Standing Your Ground

Oral

Prof . DeShannon McDonald [1], ***Dr . Delmonize Smith*** [1]

1. *Alabama A&M University*

This case involves Sarah and Benjamin Long, the owners of TriCove Solutions, an 8(a) small business that was sued by GrineTec, a multimillion-dollar public corporation, for tortious interference with contracts and business relationships. Located in Columbus, Georgia, both businesses shared a congenial working relationship until TriCove hired Tony Capelli after GrineTec terminated him. GrineTec alleged that Tony violated non-compete and non-solicitation clauses when he started working for TriCove. Sarah and Ben must decide whether to fire Tony to settle the lawsuit or stand for what they believe is right, even though it may mean the end to their business and livelihoods.

A Preliminary Analysis of Student Learning Styles in Decision Science Classes

Oral

Dr . Shona Morgan [1], ***Dr . Sherrie Drye*** [1], ***Dr . patrick rogers*** [1]

1. *North Carolina A and T State University*

One of the primary missions of higher education is to ensure that students gain skills and knowledge that will be a foundation for future academic and career success. It is imperative that students persist in college to develop their intellectual aptitude to perform at their highest level in future work endeavors. For this reason, educators and their institutions must be concerned about providing appropriate support for student success in the classroom; the building blocks to a college degree. Our work augments a growing base of literature focused on the use of student learning style data to promote greater student success in collegiate coursework. We specifically study the impact of learning style data on student success in business courses rooted in the decision sciences. Preliminary results are presented from data collected over three semesters in three different decision science courses. Descriptive statistics are presented and next steps for data analysis are articulated.

A solution technique for a facility layout problem

Oral

Dr . Alan McKendall [1], ***Dr . Artak Hakobyan*** [1]

1. *West Virginia University*

The unequal-area facility layout problem (UA-FLP) is the problem of locating rectangular facilities on a rectangular floor space such that facilities do not overlap while optimizing some objective. The objective considered in this paper is minimizing the total distance materials travel between facilities. This paper presents a mathematical model and a genetic algorithm for locating facilities on a continuous plant floor at the Toyota Motor Manufacturing West Virginia (TMMWV) plant in Buffalo, WV. In other words, a genetic algorithm, which consists of a boundary search heuristic (BSH) and the dual simplex method, is developed for an UA-FLP. The results obtained demonstrate the effectiveness of the heuristic.

ABSTRACT A Historical Look at the Idea of Universal Basic Income Dr. Stan Vinson July 2019

Oral

Dr . Stan Vinson [1]

1. *Lander University College of Business*

Universal basic income is the concept of providing every citizen of a country a given sum of money, regardless of their net worth or other resources.

It is an idea that was suggested in the early 1500's by a philosophers and advisor to royalty to help forestall a spike in robberies. The thought was if everyone had a basic, subsistence level of income there would be less need for thievery and crime would go down. Since then and through history the idea of UBI has been introduced by economist, business persons and social activist as an alternative to the social welfare system as currently designed, a way to help assure more equitable distribution of income and a tool to offset the displacement of workers caused by introduction of new technology into the workplace.

Aside from the many historical thinkers advocating a form of UBI more better-known names have stepped forward to advocate a form of the program. This has included Martin Luther King, the founder of face-book Mark Zuckerberg, Dr. Robert Reich former Secretary of Labor in President Clinton's administration and Dr. Milton Friedman, a Nobel prize winner and one of the most conservative economic thinkers of the 21st century.

Dr. Friedman, a staunch Libertarian economist and advocate of free markets, believe that a form of UBI would support various of his fundamental beliefs supporting the development of strong economies. He concluded that a UBI would…..

- **Reducing government bureaucracy** by taking money from current social welfare programs to invest in a UBI – eliminate the middle man.
- **Free up persons to work.** A UBI would be in addition to any income that a person would get from working a job or at a small business – creating an incentive for persons to work and better there economic station.
- **It will let the free market economy function**. Instead of giving money to persons and guiding their spending, a UBI allows them to spend where and how they may deem appropriate. The free market will dictate supply/demand and ultimately pricing of goods and services.

While many view UBI as a radical concept and an afront to capitalism, various research studies and experiments are ongoing that suggest the idea has merit. This has included a very successful test in a province of Ontario Canada and a current experiment in Stockton California where $500 per month is given to a community to spend as they may. Early results suggest that it is having a positive effect on people's lives.

The best evidence of UBI's potential merit has been a Democratic Presidential candidate Andrew Yang's proposal for a "Freedom Dividend" in the United States – a form of UBI. Although his polling numbers are low - probably meaning his candidacy will be short lived – he is shaping a conversation around UBI which other more viable candidates have taken up.

The proposed paper will investigate the history of UBI, look at current results of historical and current experiments and examine the current political debate around UBI.

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Adapting key learnings from learning analytics to online public administration education

Oral

Dr . Meena Clowes [1]

1. *Capella University*

Abstract: In this study, the researcher sought to determine predictors of (a) student success in learning tasks and (b) efficiency in student task attempts necessary to achieve success for at-risk students in an online public administration learning environment. The study was informed by archival (de-identified) data gathered in the United Kingdom from students in an online education setting, which bears many similarities to public administration students in the US, aseptically in online settings: namely, non-traditional student demographics, less restricted enrollment, and a completely online education structure. A series of logistic regressions yielded two findings. First, the only statistically significant predictor of student success is the number of course attempts. Therefore, since number of attempts is a more statistically significant predictor of student completion than student demographics, understanding what influences how many course attempts students need in order to be successful can be more useful for targeted educational policy-making. Second, for those who only required one attempt to be successful, the number of previously studied credits was the only significant predictor. For those who required more than one course attempt, age was also a significant predictor. Thus, the number of credits students had prior to taking an online course is a useful predictor of whether a student is successful the first time they attempt an online learning module. For those who seem to need numerous attempts before being successful, age seems to be more of a statistically significant predictor than any other demographic factor.

Addressing Student Belonging in an Online Learning Environment

Oral

Dr . Matthew Peters [1], ***Mrs . Amanda Peters*** [2]

1. *Lander University* , ***2.*** *Greenwood County School District 50*

Tinto (1975, 2017) has said institutions of higher learning have tended to view student retention as an actionable goal. Students, however, do not seek to be retained but rather to persist. A student's goal is to complete a degree, often without regard of the institution from which it is earned. Student persistence towards said goal is driven by the goal itself as a motivator but motivation is also affected by student self-efficacy, student perceptions of curriculum, and by a sense of belonging to the institution. As a student comes to see themselves as a member of a community, they form a bond that binds them to the institution even when inevitable challenges arise. As the learning environment evolves to a more online-based method, this sense of belonging may find vulnerability due to the impersonal nature of distance learning, yielding lower rates of student success. This paper will address the importance of instructor-to-student interaction, student-to-student interaction, and overall student participation in an online learning environment as it affects student sense of belonging.

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Advice for Addressing Multicollinearity in Regression Models used for Analytics

Oral

Dr . Robert Andrews [1], ***Dr . Stephen Custer*** [1]

1. *Virginia Commonwealth University*

Multicollinearity can occur when performing a multiple regression analysis with a set of predictor variables that are interrelated rather than being truly independent variables. If one can design an experiment or study so that the predictor variables are independent (zero correlated), then multicollinearity will not be of any concern when building a multiple regression model. However, data for analytics studies typically are not obtained by a designed experiment or study. As a result, the predictor variables for almost all analytics studies are correlated to some degree and multicollinearity should be addressed when building a multiple regression model. This paper give advice for addressing multicollinearity when building a regression model for analytics.

AI and the future of Business School Curriculum

Oral

Dr . Rick Weible [1], ***Dr . Avinandan Mukherjeea*** [1], ***Dr . Edward Aractingi*** [1], ***Dr . Caleb Bradberry*** [2]

1. *Marshall University* , ***2.*** *Radford University*

This panel will discuss the impact of AI (artificial intelligence) on future business school curriculum. Just has data analytics has become an important part of today's business school curriculum, in the coming years AI will play an even bigger role. In the near future AI will assist everyone in business. Decisions will not be made without AI assistance.

Alerting Students to the Unexpected Consequences of Rounding

Oral

Dr . William Pollard [1]

1. *Appalachian State University*

This paper offers a cautionary note to encourage students to think twice before they study hard to learn the material and work the problem correctly – but then take a rounding shortcut that can lead to an answer that is off-the-mark.

An Innovative Approach to Teaching Healthcare Marketing

Oral

Dr . Nancy Niles [1]

1. *Rollins college*

Title of Project: An Innovative Approach to Teaching Healthcare Marketing

In 2015, the Rollins College Department of Health Professions was established as part of the Hamilton Holt School. It has three graduate and one undergraduate program that focus on various aspects of health. The undergraduate program, Health Services Management and Leadership has a core course, Health and Social Marketing, which has two educational goals. Students learn how to develop both traditional marketing strategies to promote health organizations to encourage access to health care. Students also learn how to develop social marketing strategies by persuading individuals to change from unhealthy to healthy behaviors. During the first two years of teaching this course, students did not appreciate the importance of marketing in the healthcare industry which resulted in lower class evaluations. I understood their position because the discipline of marketing was not used in the healthcare industry until the 1980s, which is late compared to other industries.

I restructured the course as a community engagement course. Each semester, there is collaboration with a community health organization on how to use marketing strategies that would benefit a community and their stakeholders. Students would use their learning in the course to develop marketing strategies that could impact high risk health behavior. We typically partner with a national organization that had an established curriculum on how to develop health social marketing. We selected, CATCH, a Coordinated Approach to Child Health, which has established curriculum for health social marketing.

The class and I selected childhood obesity as the targeted high-risk behavior and worked with educated CATCH volunteers on behavior modification strategies to teach to the students and targeted demographic. We also taught the volunteers the concepts of health social marketing. Our selected target group was middle school students that came from lower income families. We chose this group because healthy foods are often expensive, resulting in poor eating habits which creates to childhood obesity.

This presentation will discuss the implementation and results of the project.

An Inquiry Into the Nature of University Curicula

Oral

Dr . Harry Katzan [1]

1. *Webster University*

The modern society in which we now participate is characterized by a growing number of open-ended problems. Three of the situations that occupy the minds of influential scholars are how to keep pace with new social and technical innovations, the impact of global warming, and how to deal with the projected dangers of artificial intelligence. Other lesser problems involve the high cost of university studies, the excessive use of alcohol and opiates, the growing population, the deteriorating national infrastructure including roads and buildings, race relations, the trivialization of politics, the shrinking middle class, gun control, and the fear of terrorism. In some areas, even the quality of drinking water and affordable housing are problems that are not easily solved. This paper is presented as a simple dialog and addresses only one problem: the organization and presentation of simple college curricula, The subject matter is expected to be accompanied by a lively audience discussion.

APPLICATION OF INTEGRATED MULTIPLE CRITERIA DATA ENVELOPMENT ANALYSIS FOR DISASTER RELIEF SUPPLY CHAIN DESIGN

Oral

Prof . Jae-Dong Hong [1]

1. *South Carolina State University*

This paper proposes an innovative procedure of integrating the multiple criteria data envelopment analysis (MCDEA), a goal programming (GP), and the cross-efficiency (CE) evaluation methods to apply for designing disaster relief supply chain (*DRSC*) system efficiently and effectively. To overcome a weak discriminating power of the traditional DEA method, MCDEA and CE DEA models have been proposed, but several issues/weaknesses of applying them still exist. The proposed procedure can eliminate these issues/weaknesses by integrating these DEA models through the GP model. Through numerical example, we demonstrate that the proposed method performs well in terms of designing efficient *DRSC* systems.

Assessing the E-readiness in the development of the digital society in Indiana - An Exploratory Study

Oral

Dr . Sushil Sharma [1], ***Dr . Srikant Devaraj*** [1], ***Dr . Jeff Zhang*** [1]

1. *Ball State University*

Developed economies worldwide have been investing in creating strong digital infrastructure for social and economic development to ultimately pave the way for the creation of a digital society. Digital society is defined as a society where people not only communicate through electronic means, but also avail all government and other services electronically on a 24/7 basis through a robust broadband information and communication infrastructure. Despite investing in technology infrastructure, there is still a digital divide among the various regions, states, and counties in the United States. The authors have conducted an earlier study using the Human Development Index (HDI) to assess the disparity in HDI across ninety counties of Indiana. This study is an extension of an earlier study where authors have introduced an another variable, Technology Index, to examine how the Technology Index impacts the HDI ranking landscape of these ninety counties in Indiana. Technology Index is computed mainly on internet access connections per 1000 households over varying upload and download speeds and share of population with access to internet. We combine this index to form Human Development Technology Index (HDTI). We find that there is huge variation among counties after the technology index is included in HDI. We also find evidence of lower HDI, technology index and HDTI among rural places in Indiana. This study will contribute to assessing the e-readiness for social and economic development in Indiana.

Key Words:e-readiness, digital society, technology index, HDI

Auditing Online Offerings in Higher Education – An Exploratory Study

Oral

Dr . Sushil Sharma [1], ***Dr . Jeff Zhang*** [1], ***Dr . Chan Gu*** [1]

1. *Ball State University*

E-learning, online learning, community networks, virtual learning communities, all are recent phenomenon, and many students and teachers worldwide have already started embracing the online learning as part of their learning environment. E-mail networks, Wikis, instant messages, blogs, and integrated hand-held communications technologies have taken over the face-to-face meeting for learning. Many schools are moving away from a traditional model of teacher centered face-to-face learning model to student centered learning community model.

The purpose of the study is to record or document the existing approaches adopted for online learning or e-learning in India, China and USA. The study provides an overview of the current online and distance higher education courses, their delivery methods, programs and degrees to undergraduates, and graduates offered by various universities in India, China and USA. Apart from quantitative data, interview or discussion are held with the instructors, program chairs, who offer online courses as well as with persons involved in planning and delivery of online or distance education in India, China and USA. Each institute or university is treated like a case and the findings of the qualitative, case-study based enquiry will be presented. The study is limited to top thirty regular public universities in three different countries. Key players in each institutional are identified by contacting the institutions. The online survey is designed to collect information. The telephonic, skype or face-to-face interviews will be held soon.

Key Words:e-learning, web-based learning, online learning, virtual classroom

Biometrics and Individual Privacy Does Biometric Authentication Help Safeguard or Compromise PII?

Oral

Dr . Susan Conrad [1]

1. *Marymount University*

Biometrics is the scientific method of identifying a person based upon behavioral or biological personally identifiable information (PII) such as DNA, fingerprints, facial features, iris, voice, veins, palms, gait or keystrokes. Companies are quickly adopting biometrics as a method to authenticate users and minimize data compromise. But how safe is this personal non-redactable data? Safeguarding biometric data requires special considerations in terms of encryption and storage. Biometrics as a Service (BaaS) transfers the management of biometric processing to a third party who will host, encrypt and decrypt biometric data but now a third party holds this data. The European Union's adoption of GDPR requires that users must consent to collecting biometric data and organizations must specify how this data will be used and secured. Since the U.S. does not have national data privacy laws, an assortment of local and state governments has passed their own regulations regarding what types of biometrics can be collected and have in some cases banned the use of facial recognition. Without a uniform national policy confusion erupts as interpretation of what is biometric data and how it can be stored is debated. This paper examines many of the issues surrounding biometric data and individual privacy.

Blockchain Revisited

Oral

Dr . Harry Katzan [1]

1. *Webster University*

This paper gives an overview of blockchain concepts for persons not actively engaged in actual blockchain operations on a daily basis. Blockchain is a storage structure that mirrors how information is represented in a traditional ledger. The methods have become popular in a modern world of cloud storage. With cloud operations, block data is stored in the cloud, but actual computer processing is executed in the usual manner on local facilities. Innovation and leadership in the areas of computer and information systems have traditionally been associated with the business world in general and to the major corporations in particular. That conjecture has definitely been the case with blockchain technology that has heretofore been the province of cryptocurrency applications, such as the well-known Bitcoin networks. Bitcoin technology has been available since 2009, and it has attracted considerable attention, even though it is considered by some to be obfuscatory and hubristic. Actually, nothing can be farther than the truth, since Bitcoin is not blockchain even though it does in fact use blockchain architecture. This paper gives an introduction to blockchain data management and identifies some blockchain design concepts. The notion of basing computer applications on blockchains may, in fact, alter the direction of certain aspects of computer technology. The appendix gives a list of companies that are leading the way in adapting decentralized ledgers to their operating needs.

Challenges in Online Teaching

Oral

Dr . Sharynn Tomlin [1], ***Dr . richard Mills*** [2], ***Dr . Peggy Johnson*** [3], ***Dr . John N. Dyer*** [4], ***Prof . Michael Latta*** [5]

1. *Angelo State University* , ***2.*** *Robert Morris University* , ***3.*** *Lander University* , ***4.*** *GEORGIA SOUTHERN UNIVERSITY* , ***5.*** *Coastal Carolina University*

This panel/discussion group will explore the biggest challenges in online teaching. The panel will present examples of some of the strategies used to overcome certain challenges and the successes or failures experienced. Each panel member and participant should be prepared to discuss their experiences in the online environment and to openly share how those could be applied in other programs.

Cheating, does it happen? How can I prevent and deal with it?

Oral

Dr . Peggy Johnson [1], ***Dr . Joe Krupka*** [2]

1. *Lander University* , ***2.*** *Florida State University*

Cheating is omnipresent in higher education in the United States. A recent article in the Atlantic pointed out that in 2015, Dartmouth College suspended 64 students suspected of cheating in—irony of ironies—an ethics class in the fall term. The previous school year, University of Georgia administrators reported investigating 603 possible cheating incidents; nearly 70 percent of the cases concluded with a student confession. In 2012, Harvard had its turn, investigating 125 students accused of improper collaboration on a final exam in a government class. Stanford University, New York State's Upstate Medical University, Duke University, Indiana University, the University of Central Florida and even the famously honor code-bound University of Virginia have all faced cheating scandals in recent memory.

At Lander and Savannah State Universities, research recently indicates that the ubiquitous problem persists. More than five hundred students were interviewed in this study concerning their views on academic integrity and whether they engage in cheating. In this paper, examination of the issue includes the results from the above research, information pertaining to the prevention of academic dishonesty, and a compiled list of best practices for dealing with Academic Dishonesty. This paper will include statistics from literature reviews on the current status of the problem along with information regarding best practices for prevention of cheating, as well as, how to handle violations and a section on online teaching as regarding academic dishonesty.

Clearing the Opaqueness of the Fast Fashion Supply Chain: An Update at Looking Beyond Tier-1

Oral

Dr . William Crandall [1], ***Dr . Dick Crandall*** [2]

1. *UNC Pembroke* , ***2.*** *Appalachian State University*

The fast fashion industry is characterized by making available: the latest fashion clothing items, for easy purchase, in retail stores or online, at a low cost to the consumer. The intent is to offer several seasons of clothing annually, not just summer and winter offerings. But this low-cost approach to fashion comes at a high cost to workers in the supply chain, especially those employed in less developed countries (LDCs). It also leads to an abundance of environmental and resource stress to the circular economy.

In this paper, we examine the opaqueness of the fast fashion supply chain as it typically hides human rights and environmental abuse problems. We look at the problems at the 3 tiers of the supply chain; discuss the role of monitoring that chain; and then offer three recommendations for consideration.

Comparing Capital Flows into IEM Markets Before & After the Great Recession

Oral

Prof . James Winder [1]

1. *Rutgers Business School*

Presentation Proposal for 2019 SEINFORMS Conference
Research Question: Are FDI and Portfolio inflows into IEM countries stronger than prior to the Great Recession?
Investigator:
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The financial crisis began in 2007, and the IEM stock markets were rising into 2008. Investment flows into IEM countries were very strong in the years leading up to the start of the Great Recession. Equity market sectors for industrial commodities and heavy machinery were particularly robust, as investors searched for any way to participate in the "China trade." There was the widely held opinion that Asian economies and the G-7 economies had "decoupled." This was taken to mean that Asian economies could grow at a solid rate, even if the largest developed economies were languishing.
The purpose of this project is to compare IEM portfolio flows and FDI, both inward and outward, in the years before the crisis with flows after the global economy began to stabilize in 2009. One interesting result of the work will be to use these flows as indicators of investors' risk appetite. Are investors paying too much for risk?
Data Source: IFS Database from the IMF. The study will use annual IFS data for inward and outward FDI and inward and outward Portfolio flows.
The goal is to acquire data for as many IEM countries as possible and compare trends in recent years with flows before the crisis began in 2007. I will also calculate regional totals for Asia, Africa, and Latin America.

Components of Equity

Oral

Dr . Abdul Aziz [1]

1. *Morgan State University*

Equity and its components were measured through a questionnaire in a sample of 73 restaurant employees. Components of equity, superior's recognition, monetary reward, personal accomplishment and security were found to be correlated significantly with overall equity score. In addition, various components were significantly correlated with each other.

Congruence between University Mission and Vision Statements with those of Business Schools Using Textual Data Mining Tools.

Oral

Dr . Faleh Alshameri [1]

1. *Marymount University*

This research examines the congruence between mission and vision statements of universities and their business schools. Based on text mining methodology, mission and vision statements of approximately 500 AASCB universities with business schools were analyzed to determine if there is a significant congruence between the mission and vision statements of universities and those of the business schools which are housed within them. Second, the research attempts to determine if there is a trend for universities to exhibit a regional bias in the development of their mission and vision statements. Clustering Toolkit (*CLUTO*) software was used for text miming tool.

Cybersecurity Issues for Nano-Medicine

Oral

Dr . Donna Schaeffer [1], ***Dr . Patrick Olson*** [2]

1. *Marymount University* , ***2.*** *National University*

The United States Food and Drug Administration (FDA) recognizes that medical devices which are increasingly connected to the Internet, hospital networks, and/or other medical devices are vulnerable to security risks. The risks are exacerbated in the emerging field of nano-medicine. Nano-medicine comprises diagnosis, which includes imagery and sensors; treatment, which includes drug delivery and medical devices; prognosis; and monitoring of biological parameters and biomarkers. Nano-medicine uses analytical tools and nanomaterials. Clinical, regulatory, and toxicological issues emerge as nanomedicine advances.

Dealing with Uncertainty in Managerial Decision Making – Excel Made Easy!

Oral

Dr . Adel Novin [1], ***Prof . Kate Cotter-Reilly*** [1]

1. *Clayton State University*

Several studies have introduced various strategies to deal with uncertain variables in managerial decision making and strategic plantings. Dealing with uncertainty includes measuring uncertainty and modeling uncertainty explicitly into the analysis. Among popular techniques for dealing with uncertainty are: simulation, sensitivity analysis, decision-tree, and probability-based forecasting. Simulation and sensitivity analysis attempt to anticipate different future scenarios given different values for uncertain variables that most likely have an impact on the decision. Probability-based forecasting attempts to deal with uncertainty by estimating the probability that an event will occur through developing probability distributions for uncertain parameters. Improved Analysis ToolPak feature of Excel, has made it easy to factor uncertainty in managerial decision making. The purpose of this paper is to display use of Excel for simulation and probability-based analysis in dealing with uncertainty in cost-volume-profit analysis and cost estimation. The presentation should be of interest to educators for possible incorporation of the techniques in accounting and finance assignments.

DIFFERENCES IN STUDENT PERORMANCE AMONG ONLINE SECTIONS AND BETWEEN ONLINE AND TRADITIONALLY TAUGHT SECTIONS OF PRINCIPLES OF ACCOUNTING

Poster

Dr . Doug Ziegenfuss [1], ***Dr . Nadia Nafar*** [2], ***Dr . Angela Busila*** [1]

1. *Old Dominion University* , ***2.*** *Virginia Wesleyan University*

We examine the difference in student performance for all sections of Principles of Financial Accounting taught by one professor during the three academic years – 2017, 2018, and 2019. During each of the semesters the professor taught one section online and one traditionally. We plan on exploring the differences in student performance using student grades as the study variable among the online sections and between the online sections and the traditionally taught classes. We also explore the role of demographic factors (gender, race/ethnicity and age) and other factors that may explain differences in student performance. We expect this study to give insights and recommendations that administrators and faculty should heed in designing accounting online classes and more importantly implementing admission standards to online courses.

Efficacy of the Review Engagement: The Case for Rethinking Limited Assurance Services for Private Companies

Oral

Prof . Greg Kordecki [1], ***Dr . Maria Bullen*** [2]

1. *Clayton State University* , ***2.*** *San Jose State University*

The American Institute of Certified Public Accountants (AICPA) is the premier standard-setter for the role external accountant's provide for private companies in the United States. The well-known "Audit" engagement is a respected assurance service the outside accountant provides by rendering an opinion based on reasonable assurance that the financial statements and the related disclosures of the entity are in accordance with generally accepted accounting principles. The concepts of "opinion" and "reasonable assurance" often present a high bar to achieve with the increasing standards required in an audit. The users of financial information typically demand more confidence than that which is perceived from the outside CPA's services of preparation and compilation. Accordingly, an audit can satisfy that need, but on the basis of overall relevance and whether benefits exceed costs, this service becomes questionable.

The Accounting and Review Services Committee (ARSC) of the AICPA in the 1970s established formal guidance and standards through Statements on Standards for Accounting and Review Services for a "Review" service separate from compilation and audit services. Unfortunately, five decades later, financial statement users have not demanded the mid-level attestation service, with its underlying concepts of providing a "conclusion" based on "limited assurance." This paper provides the background of Review services, offers arguments for its greater inclusion or exclusion in the world of practice, and suggests procedures that might be incorporated into a Review engagement to enhance the overall quality of the annual financial statements and the accountant's report and save significant costs that would be incurred under "Audit" standards.

Engaging Students to Learn Collaboration and Diversity on Entrepreneurial Projects through Self-Directed Teams

Oral

Dr . James Lawler [1]

1. *Pace University*

An agile methodology of collaborative design thinking can engage students of all disciplines of a college on entrepreneurial projects. The methodology can be engaging especially if the students are functioning on entrepreneurial projects as members of cross-disciplinary teams. The author of this paper describes a customized design of this methodology based on a European design factory learning model that is focusing on collaborative and diverse design thinking.

The design is engaging cross-disciplinary students in a cooperative co-creator culture of a curricular program of developing ideation for product prototypes as entrepreneurial projects of self-directed teams and of introducing the projects in investor pitch presentations. The methodology is designed for non-profit and profit organizations and for non-technical and technology projects. The methodology is deliberately designed for fostering learning of not only a distinct methodology but critically divergent – business, computer science and humanities - perspectives of students by including a diversity of students on the self-directed teams. Most of the students on the teams have not encountered face-to-face other students on their teams prior to the program, nor have most of them engaged on self-directed teams in their tenure in the university. The program is engaging interactions of the students in exercises and games of sharing and of team building in initial teams. The program is also engaging international students on self-directed virtual teams with dispersed hybrid tools of the Web. Importantly, the learning process is resident with the students, as the professor is not a lecturer but a mentor to the student teams. Project resolutions and responsibilities for results are resident with the students. The project results are disruptive and non-disruptive strategies presented as pitch presentations of the student teams at the end of the semester. The benefits of the methodology offer opportunities for the students as members of the teams to learn interdisciplinary and non-hierarchical investigatory processes through collective critical thinking and team playing as if they are in new organizational ventures.

The paper presents preliminary findings from focus groups of the students, highlighting qualitatively from the reflections of the students as members of the teams and from the reflections of the professor, in a pilot semester. The benefits of the findings from the methodology, as applied by the author, may benefit professors considering collaborative and cross-disciplinary design thinking of self-directed student teams as an enhanced pedagogy in their institutions. Overall, the paper provides a methodology not in the service of cultural idealism but in the service of interdisciplinary learning for professors and students.

Estimating the Scoring Output of National Football League Teams using an Economic Production Function

Oral

Prof . Bill Levernier [1]

1. *Georgiqa Southern University*

The objective of a team in a football game is to score more points than its opponent. If it does so, it wins the game. The purpose of this paper is to develop and estimate an economic model that allows an interested person to predict the number of points a team will score in a National Football League (NFL) game based on how many yards it gains on running plays and passing plays. The model that's estimated is a traditional microeconomic Cobb-Douglas production function, where the number of points a team scores during a season is hypothesized to be directly affected by the number of yards it gains on running plays (i.e., running yards) during the season and the number of yards it gains on passing plays (i.e., passing yards) during the season. The model is estimated using data for each team for each season from 2000 to 2018, which yields 606 observations. Pre-season games and post-season games (i.e., the playoffs and the Super Bowl) are excluded from the analysis to avoid introducing possible biases that might be associated with differences between these games and the regular season games. The data for the model were obtained from the *Football Reference* website (www.footballreference.com).

In addition to the two independent variables that are the primary focus of this paper, running yards and passing yards, a series of dummy variables are included to determine if the affect of running yards and passing yards varies by year and by team. The *a priori*expectation is that the effect is constant across years and across teams.

Examination and Analysis of Cyber Threats and Risks in the Financial Messaging Network: An Investigation on SWIFT Data Breaches

Oral

Dr . Michelle Liu [1], ***Mr . Ngbede Otowo*** [1]

1. *Marymount University*

Today, banking has become increasingly global and largely electronic. However, numerous electronic transactions are still plagued by cyber breaches frequently being traced to ineffective security procedures that expose customers' data to cybercriminals. Cyber attacks do not require physical proximity nor are they deterred by national borders in which perpetrators can easily remain undetected for a long period of time. Such breaches inevitably result in losses of reputation, customer confidence and in some instances, productivity. The purpose of this study is to take a deeper look into various breaches of the SWIFT (Society for Worldwide Interbank Financial Telecommunication) messaging network to gain better understanding of vulnerabilities inherent in the international banking system and the mechanisms through which a series of advanced, persistent threats (APT) can take place. The authors discuss different opportunities for banks to embrace new security mindsets and change their risk management and mitigation processes as it relates to information protection, data retention, and network architecture. The paper concludes with the lessons learnt and the future research directions.

EXPLORING STUDENT PREFERENCES AMONG ONLINE, TRADITIONAL, AND HYBRID CLASSES

Oral

Dr . Mike Shurden [1], ***Dr . Susan Shurden*** [1]

1. *Lander University*

Have you ever taken an online class? Did you like it? Do you prefer online or traditional in the classroom education? Likewise, is there an “in between” referred to as hybrid which may be more for you? Obviously, online education is here to stay. It is a means of education which allows students to take classes without actually being on campus. Some believe that it can be easier than traditional classes. But, do students really prefer having to teach themselves the material using the tools given? Additionally, is online better “suited” for certain majors? For instance, does it work better for Management or Accounting majors? The authors explored these questions in this paper via their teaching environment which is the College of Business in a small, public school in the southeastern United States. Based on total surveys of 246 students across four emphases areas, students were asked about their preferences among online, traditional, and hybrid classes. Statistical analysis was conducted to determine if significant differences exist. You may be surprised with the results!

Exploring the process of supply chain risk management from a managerial perspective

Oral

Dr . Sergey Ponomarov [1]

1. *The Citadel*

A number of major trends have contributed to the increased importance of supply chain risk management during the last decade. Among them are globalization, outsourcing and transition to lean operations, infrastructure issues, port disruptions and piracy. While the phenomenon of supply chain risk management is gaining popularity with scholars, there is a gap between the scholarly research and managerial perspectives. Risk management issues are discussed mainly at the organizational or functional level, while the individual experiences of supply chain managers are often overlooked and neglected. Specifically, managerial decision-making in supply chain management under conditions of risk and uncertainty is not well researched at the individual level of analysis.

This qualitative research explores the process of supply chain risk management from a managerial perspective. Supply chain managers face a number of different challenging issues on a daily basis as they deal with uncertainties in demand and supply, shorter product life cycles, and changing customer requirements. Exploring supply chain risk management from the individual level can help to build a better understanding, as managers are often the ones that formulate and implement supply chain risk management strategies and tactics.

Fraudulent Financial Reporting Effect on Audit Fees

Oral

Dr . Kelli Horne [1]

1. *Lander University*

This study examines the relationship between audit fees and fraudulent financial reporting in the post Sarbanes-Oxley conservative environment. The study seeks to determine the moderating effect of audit fees upon the relationship between audit partner rotation and fraudulent financial reporting. Audit partner rotation changes were the result of the passing of the Sarbanes-Oxley Act of 2002. The SEC passed SOX section 203 to implement audit partner rotation in an effort to reduce the appearance of, and actual, auditor-client independence.

The quality of a company's audit and financial reporting is assessed by investors, regulators, and researchers, using publicly disclosed fees. In 2001 publicly traded companies registered in the United States were required to disclose the amount and type of fees paid to external auditors (Holland & Lane, 2012). These regulatory rules changed the structure of audit/non-audit service fees (NAS) between pre-SOX and post-SOX periods. It is important to research the moderating effect of audit and non-audit fees on FFR.

The driving force behind fee disclosure is the surety that investors have enough information to reasonably and accurately evaluate the independence of a company's auditors (U.S. House of Representatives, 2002). Following the implementation of the SOX Act audit fees increased substantially during 2003 and 2004. Ghosh and Pawlewicz (2009) find that audit fees increased by 74 percent in the years following the passage of the SOX Act. Bhamornsiri, Guinn, and Schroeder (2009) document a 65 percent increase in the first year following the SOX Act. Other studies also show significant increases in audit fees (Ebrahim, 2010; Cosgrove & Niederjohn, 2008). Rouse (2001) documents that audit disclosures provide initial evidence that amounts paid for non-audit services were more than three times the amounts paid for audit fees. However, Ciesielski and Weirich (2006) report that audit fees as a percentage of revenue only increased from 0.1 to 0.5 percent during 2001-2004, although total fees paid (which includes audit fees and non-audit service fees) increased 103 percent over the same time period (Lenard, Petruska, Alam, & Yu, 2012). Barua and Smith (2013) and others find support that firms cited in SEC enforcements have subsequently higher audit fees relative to non-SEC enforcement firms. This finding implies that auditors associate previous allegations of wrongdoing with litigation risk and hence increase the audit effort resulting in higher audit fees (Simunic & Stein, 1996; Feldmann, Read & Abdolmohammadi, 2009).

The debate continues about the relationship between audit quality and auditor tenure. There has been much empirical evidence regarding audit failures and earnings management and recent evidence suggests that long auditor tenure does not have a negative impact on audit quality. However, concern about the impact of tenure on audit quality is still debated by regulators and practitioners.

Economic theory suggests that when client fees comprise a large percentage of total audit firm fee revenue, the auditor is more inclined to compromise independence (Chung & Kallapur, 2003). Frankel et al. (2002) assess the effects of NAS on auditor independence using discretionary accruals and the likelihood of earnings management and find that NAS fees are positively correlated with the magnitude of discretionary accruals. Thus, NAS compromise auditor independence and increase the occurrences of fraudulent financial reporting. Lenard et al. (2012) examine the effects of fraud and corporate governance on audit fees in both the pre and post SOX periods and find a positive correlation between corporate governance characteristics and audit fees in that firms having better corporate governance pay higher audit fees. It is important to continue empirical research related to audit fees in the pre and post SOX periods because study results are inconsistent.

The hypothesis in this study states that the ratio of client's total fees to audit firm's total revenues moderates the relationship of auditor tenure and FFR in the post SOX era, such that the association between rotation of audit partners and FFR will be stronger (weaker) when firms have higher (lower) ratio of client's total fees to audit firm's total revenue. Using proper control variables, the ratio of client's total fees (paid to the external auditor and reported by the firm in its SEC proxy filing) to the audit firm's total revenues can be assessed as the higher value for TOTAR, the stronger the effect of audit fees on FFR.

I expect a positive relationship between short auditor tenure and fraudulent financial reporting in the pre SOX period (1998 through 2002) and a negative relation between short auditor tenure and fraudulent financial reporting in the post SOX period (2004 through 2008).

Data were retrieved from Accounting and Auditing Enforcement Releases and Computstat spanning the years 1998 through 2008. A logistic regression model similar to one used by Carcello and Nagy (2004) was utilized for the study. Fraudulent financial reporting served as a proxy for audit quality. This study concludes that audit fees do not moderate the association between fraudulent financial reporting and auditor partner tenure. High audit fees may send several messages to various users. For example, from the view of the investor, high audit fees may be interpreted as generating economic rents. On the other hand, higher audit fees may indicate more auditor effort and thus higher quality audit. The results are not significant and therefore, do not support the hypothesis that fraudulent financial reporting is less likely given accelerated audit partner rotation in the post SOX era.

The effect of audit/non-audit fees on auditor independence is an issue in academic research because there are many conflicting views of their effect on audit quality and financial reporting.

Prior research supports the idea that higher audit fees are associated with higher perceptions of auditors' litigation risk (Barua & Smith, 2013).

This study adds to a large volume of literature that looks into the impact of SOX on the audit profession and on the quality of financial reporting. Higher audit quality results in increased firm value. The evidence of the impact of audit partner rotation on FFR will assist regulators such as the FASB, the AICPA, the Government Accountability Office (GAO), the PCAOB, and the SEC in future legislation efforts, as well as practitioners and researchers. This study contributes to archival research by presenting empirical scientific evidence of the effect of audit partner rotation on FFR as a basis to aid in future regulations.

Global Supply Chain Risks: Governmental and Cyber Threats

Oral

Mr . Jeremy Bullins [1]

1. *Anderson University*

In the global supply chain industry, there are numerous threats that can pose many potential problems or risks to organizations and their consumers. Provided within this report will be detailed results based upon research as to how governmental regulations as well as cyber threats can pose serious concerns for organizations within their domestic and global supply chain operations. There will be conclusions drawn from numerous academic references as well as professional sources that outline steps organizations can take to help minimize these two supply chain risks. Implications of these two supply chain risks will also be examined to determine how each may affect the future of the supply chain industry. In addition, recommendations will be offered for how current supply chain managers may overcome the potential pitfalls these two risks may cause to supply chain operations.

Two sections of this report (Interview Discussion and Interview Results) are completely devoted to questions that were asked of a current supply chain manager as well as two high-level executives within the textile and pulp and paper manufacturing industries. These three professionals provided valuable insight into their supply chain operations and more specifically the current governmental or cyber threat risks they face within their organizations. The questions were derived from current supply chain literature and academic resources that define and discuss present governmental and cyber threat risks facing the industry. Utilizing their responses and insight in combination with the literature review, this report will present the results with a summarization of these risks and will recommend potential future research.

he Cruise Industry Today: Norovirus, Reality or Nonsense

Oral

Dr . denis rudd [1], ***Dr . richard Mills*** [1]

1. *Robert Morris University*

The Cruise Industry Today:
Norovirus, Reality or Nonsense

In the setting of close quarters like a cruise ship a stomach bug can become a mini-disaster. Media reporting often shows the ship being cleaned after the ship makes port. Although necessary, medically speaking this is in reality a show. A show to make people think that the ship is now “safe”. It is a well performed deception. The significant transmission vector for this disease is not the ship. The true origin is usually avoided by both the media, general public and the cruise lines. The cruise line avoids the truth, probably deliberately. In the media’s case it is more likely poor understanding of an unfamiliar disease. The ship is not the problem, the crew is.

Keywords: cruise ship; outbreak; norovirus; royal Caribbean; princess cruises; celebrity cruise lines; strategy

How do Prospective Student-Athletes Choose their Schools?

Oral

Dr . Mark Mitchell [1], ***Dr . Robert Montgomery*** [2]

1. *Coastal Carolina University* , ***2.*** *University of Evansville*

The paper examines the processes used by prospective student-athletes to decide which college to attend. Becoming an NCAA athlete is no small feat. Typically, fewer than 10% of high school athletes play their sport in college. These prospective student-athletes want to find the best-fit school for their circumstances (which are highly specific to that student). They segment schools under consideration the same way marketers segment consumer markets. And, they engage in an individualized problem-solving process to choose their schools. College recruiters can benefit by organizing their recruiting efforts to 'sell into' these consumer processes.

I am confused…" Deconstructing This Whining Complaint of Students

Oral

Dr . Janice Black [1], ***Dr . J. Kay Keels*** [1], ***Dr . Bomi Kang*** [2], ***Dr . Hongxia Wang*** [1]

1. *Coastal Carolina University* , ***2.*** *Coastal*

This panel session/workshop presents each panelists response to this often heard but very vague complaint. Audience members will be asked to contribute their responses, too. Effectiveness of the various responses will be discussed. We may not reach a resolution but we will have a nice "checklist" developed by the end of the session.

Improving the Process for Analyzing Academic Dishonesty in Higher Education

Oral

Dr . Jerry Bilbrey [1]

1. *Lander University College of Business*

Academic dishonesty is not a new topic at the university level and the effects are wide-ranging and multi-disciplinary in nature. However, as technology is changing the environment, there is a pressing issue of improving the process of analyzing academic dishonesty as the educational process affects industry as a whole. Fields of education, analytics, process engineering and psychology can be part of any analysis as well as many other academic areas of higher education. The environment of academic dishonesty and even analyzing survey data is changing regardless of the field of education. Today, technology has caused the environment of traditional students to be much more of a “now” world than ever before. Teaching methods need to change over time that follow the change in the basic environment of students. However, university professors need information on the current state of research within the realm of academic dishonesty. They need reliable information that allows them to make better decisions within their specific academic environment. This work presents (i) a look at potential improvements in the testing methods reported in the literature of academic dishonesty and (ii) uses empirical data to test theories about improving the process of discovering academic dishonesty. Due to our rapidly changing world, studies are needed to maintain pace with the change in information technology to help with understanding of the entire process. Discussed are opportunities for improving the process of studying academic dishonesty using survey data while reducing bias. As a result, better information will follow in the future from an improved process that allows the academic industry to produce higher reliability for their decisions in their educational pursuits. Results are given for before and after scenarios on actual academic dishonesty data and implications for educators are explored.

Incorporating Program Courses with Community Events

Oral

Prof . Keely Clay [1]

1. *Kennesaw State University*

Before the beginning of each semester professors begin the task of creating or revaluating classroom curriculum. Depending on the semester before or the year before, when the course was last taught, professors are able to tell what strengths and weakness an course has and how to build upon each. Community outreach is something that every University is involved. Community outreach combined with students and classroom, is usually something that is left to the professor to build upon. Some students whom are not involved within organizations will never have the opportunity for community outreach. Many students today have jobs, families or other priorities that keep their schedule not flexible for any other activities outside of the classroom. According to Astin, “the effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement” (Astin, 1999, p. 519). More employers are looking for what type of extracurricular activates students have fulfilled during their University involvement but also what community events did the student take partnership in while completing their degree. There have been many times in which I have overseen as an advisor for student organizations and it seems with each passing year students start to become less active. Wondering on how to bridge the gap between program courses and community events left me pondering how two similar goals could be achieved through one action. Reaching out to the community an attainable idea was formed, combine both classroom and community together for one higher purpose.

This semester the courses that I instruct will incorporate two different community events, into the academic fall semester calendar. Students will work as a group on various projects for specific events while still working on the regular course subject matter throughout the semester. Students will also learn new curriculum within these junior, senior classes: while turning in homework, classwork, final projects, and being a part of these two different community events.

Two community events are set to take place this fall semester one during October, and another in November. Both events will be worked on by each junior, senior level students within their major course, as well as the same format used for each event. Each of the classes have a lecture portion of class as well as a lab portion of the class. During the semester students will: learn new material as related to the course, turn in homework, classwork and final term projects along with participation of the two scheduled events. Students will have a portion of each lab course to work in their committees for each event. Lecture material in class with correspond with information that will be created as it corresponds to each event. Students will know the date of the community event on the first day of class. Students will plan their schedules accordingly to be present at each community event. One the first day of class, students will come up with five different subcommittees of their choice and choose which to be a part of. A few examples of subcommittees will consist of design, marketing, and logistics, just to name a few. By giving students freedom to choose their committee, this should peek their interest and hopefully have them inspired while also being involved. Students will also sign a contract that states: the rules of each committee, attending date of event, and abide by the rules of the contract for the semester.

Integrating Project Management, Information Management and Change Management to meet the needs of Healthcare Project Management

Oral

Mr . Richard Martin [1], ***Prof . Jay Teets*** [2]

1. *Coastal Carolina University* , ***2.*** *Virginia Tech*

Project Management methodology has evolved from a construction industry tool to one used within the software programing sector, the information technology sector and now within the Healthcare sector. This research seeks to determine what project management practices are specifically required to support the Healthcare sector and how they have evolved.

INVESTIGATION OF THE SIGNIFICANCE OF THE INCONSISTENCIES IN THE COMPUTATION OF FINANCIAL RATIOS

Oral

Dr . Adel Novin [1], ***Dr . Javad Gorjidooz*** [2], ***Dr . Mohammad Bazaz*** [3]

1. *Clayton State University ,* ***2.*** *Embry-Riddle Aeronautical University ,* ***3.*** *California State University, San Bernardino*

ABSTRACT

Ratio analysis is one of the most popular methods for the analysis of the financial statements of companies. It is covered in both Managerial Accounting and Financial Management courses. However, there are discrepancies in the suggested formulas for the computation of several of the ratios in accounting and finance textbooks. Different answers are derived for the same ratio, dependent on which textbook is used.

Using the financial statements of 30 publicly held companies, this study intends to investigate the significance of the differences in the ratio results when formulas suggested by different textbooks are used.

Null Hypothesis: There is no significant difference between the results of the ratios when formulas suggested by different textbooks are used

The results of the study should be of value to educators, financial analysts, and the students.

Just How Different are the Top Journal's Topics compared to Lower Tiered Journal's Topics: The Case of Strategic Management in 2014 and 2015

Oral

Dr . Janice Black [1]

1. *Coastal Carolina University*

Word cloud assessments of a set of journal article titles from the top journal in strategic management (Strategic Management Journal, SMJ) and a lower tier journal (Strategy & Leadership. SL) indicates that while there are differences in the repeated concepts within a year and journal, both journals publish large number of outside of the emergent theme articles. The obvious differences between the emergent themes included that SMJ published more methodology-based articles while SL focused more on applied strategic management articles. Both published strategy formulation articles and implementation articles with SMJ publishing more formulation and SL published more strategic implementation articles.

Lessons Learned Teaching in China

Oral

Dr . Rick Weible [1]

1. *Marshall University*

Teaching international students in their home countries is quite challenging. The examples provided in US textbooks referencing US companies make no sense to international students. They have no knowledge of the companies. Beyond the obvious issues of language and culture, many other factors have to be considered.

Market and Nonmarket Strategies (NMS) in China: Performance Payoffs and Penalties in Turbulent Environments

Poster

Dr . Long Zhang [1], ***Dr . John Parnell*** [2], ***Dr . Chuanhui (Charles) Xiong*** [3]

1. *China University of Geosciences* , ***2.*** *Universit* , ***3.*** *University*

This paper investigates the financial and non-financial performance effects of strategic emphasis during times of market turbulence in China. A survey of 246 middle and upper-level managers in Beijing identified market turbulence as a direct driver of firm performance, a positive moderator of the link between market strategy and financial performance, and a negative moderator of the link between market strategy and non-financial performance. Market turbulence did not moderate links between either strategic dimension and non-financial performance. These results suggest a performance payoff for leveraging NMS and a performance penalty for emphasizing market strategies during turbulent times.

Market Research on the Oil & Gas Industry

Oral

Ms . Morgan Goodall-Scott [1], ***Ms . Erica Evans*** [1], ***Ms . Emily Towne*** [1]

1. *Coastal Carolina University*

ABSTRACT

In October 2018, *The Client* engaged the Wall Fellows to conduct market research and competitor analysis of the oil and gas industry regarding cement integrity and zonal isolation to identify potential opportunities for a new product offering data logging in a small, reliable sensor. The Team collected qualitative and quantitative data from interviews conducted with professionals within the field, online resources, and information found in the Coastal Carolina University library database.

The deliverables for this project were:

a) an estimation of the market size, characteristics of the market, and needs/potentials of the market;

b) an evaluation of direct and indirect competition and potential clients; and

c) an understanding of the use of Baker Hughes Incorporated Worldwide Rig Count.

The research led to the following conclusions:

- When drilling wells, it is in the best interest of both the producer and consumer to spend ample time in the engineering phase of well drilling. By doing so, it is more likely for the completed well to be more stable, reliable, and have an extended life.
- Companies in the oil and gas industry are looking towards a more innovative future in utilizing renewable sources for energy production.
- The Baker Hughes Worldwide Rig Count can benefit *The Client* in understanding where rigs are in the world, determining the climate of the industry, and gauging the willingness of buyers to support the market.
- There are a variety of large competitors providing loggers who are established in the oil and gas industry.

From the research conducted through the course of this project, three areas of opportunity were identified for *The Client* that would allow them to effectively and successfully enter the U.S. market with the new product that focused on the oil and gas industry. Of the three opportunities, the Team recommends that *The Client* focus its efforts on U.S. startup companies in the oil and gas industry because of the risk-taking nature of startups and the current competitive saturation among existing large companies.

Millennials, Academia and the Cybersecurity skills Gaps

Oral

Dr . Belinda Shipps [1]

1. *North Carolina A and T State University*

As Cybersecurity attacks continue to grow, there is a growing need for cybersecurity personnel. It was estimated that by 2019 there would be a continuously growing shortage of two million cybersecurity professionals (Kauflin, 2017). It has been reported that only 9% of millennials are interested in careers in cybersecurity. This research explores millennials and the growing skills gap in the cybersecurity field. The research question examines why millennial students are not interested in the cybersecurity field and how can academia help increase the interest and motivation for cybersecurity fields? Will customized course content that addresses increased awareness of cybersecurity and the responsibilities and skills (behavioral and technical) help increase interest and the number of students that take courses, and adopt cybersecurity fields and careers?

In one study that was sponsored by Raytheon and the National Cyber Security Alliance, two-thirds of students stated that they were not aware of what cybersecurity is, what fields are available and what the skills, knowledge and responsibilities are for the various cybersecurity jobs (Verton, 2014). The National Initiative for Cybersecurity careers and studies(NICCS) and the National cybersecurity workforce framework (NCWF) designate seven categories of cybersecurity. Some of these categories focus more on softer behavioral skills and not just technical skills. According to Caulkins et al., (2016) there is a gap in what academia is teaching and the cybersecurity skills that are needed in the different categories. This is a work in progress which focuses on exploratory research on cybersecurity and course content and development. A theory-based model will be developed that focuses on millennial characteristics, cybersecurity categories and engagement in the development of cybersecurity courses.

Mining Pontifical Tweets for Discriminatory Linguistic Shepherding

Oral

Prof . Micheline Al Harrack [1]

1. *Marymount University*

Machine Learning and data mining methods have grown exponentially with the growth and explosion of data stored and shared every second on the web. In the age of social media platforms taking over our daily lives, Twitter has become a platform for different voices from the social, political, and cultural spectrum. Prominent political figures, famous artists, social influencers, and even the average person have equal representation on this platform with one official account tied to their persona. Even the Pope joined the choir. Pope Francis was the first Catholic Pope to join the social media wave with an official Twitter account in March 2012 “@Pontifex_” in the English language. A year later, another account in Spanish saw the daylight. Sometime later, other accounts in different languages emerged. In this research, I intend to analyze these accounts by mining a sample of tweets of 200 tweets in each language to compare and contrast them, then mining a similar sample a year later and compare the outcomes. I will be using python to scrape the pontifical tweets and search for trends, patterns, differences, similarities, and messages. What is the purpose of multiple accounts? How different are they? How many accounts does the Pope need? Why isn’t the account in English sufficient?

Mistakes were made: Negotiating a workable solution to BREXIT

Oral

Dr . George Lowry [1]

1. *Randolph-Macon College*

Never commit to anything unless you've figured out how to get out of it. That's the underlying premise of Exit Strategies and the foundation of contingency planning. This presentation explores a series of mistakes eventuating in the current situation facing the United Kingdom's efforts to leave the European Union. For several years, the UK has been in turmoil over the decision to leave the European Union and has faced great difficulty in putting together a negotiated settlement, missing two "leave" dates. Ironically, the process for exiting the EU was spirited by the UK's long-held schizophrenia over its place in "Europe" through provisions in the 2007 (2009) Treaty of Lisbon. But it seems Britain did not have a fully thought-out plan for how it would depart if a decision to leave was made. In 2014, then Prime Minister David Cameron made his "cast iron guarantee" to hold a national referendum over continued membership in the EU which set in motion a series of mistakes that toppled two Prime Ministers, split the governing party into at least three parts, destabilized the strength of the opposition party while elevating several minority parties, particularly in European Parliament elections, and threatened several UK constitutional crises. With the current exit deadline of October 31, 2019, examining the series of mistakes (and perhaps those yet to come) should be of interest to those engaged in the study of strategy, policy, negotiations, and the broader field of management.

Misunderstandings and Misinterpretations of Researchers about Hypothesis Testing

Oral

Dr . Reza Kheirandish [1], ***Dr . Uwe Czienskowski*** [2], ***Dr . Shabnam Mousavi*** [2]

1. *Clayton State University* , ***2.*** *Max Planck Institute for Human Development*

Statistical analysis is one of the main tools for many empirical studies. 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 and misunderstood topic, maybe now more so than ever, 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. Since early twentieth century, there has been heated debates between Fisher and Neyman –Pearson and some statisticians simply dislike p-values altogether. Even philosophers have published many articles on what Hypothesis Testing is really doing (for example see Deborah Mayo). 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. Refer to Gerd Gigerenzer, 2018, for an excellent survey of research in this area, see Ioannidis, 2005, for the potential problem with research findings based on a single study assessed by formal statistical significance, and look at Ziliak and McCloskey, 2004, for a research on mixing up economic and statistical significance in a leading economic journal.

In this paper, we want to investigate to what extent these survey results are replicable. We also want to see whether 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 we believe it can shed light on the recent concerns with the lack of scientific transparency and replication crisis. We present the results of our pilot study on Hypothesis Testing literacy among academics and practitioners who were participants in four different business and economics conferences, and compare them to the previous results in the literature. Using a survey of twenty True and False questions (we have also added “Don’t Know” and “Ambiguous/Undecidable” to the possible responses), we have asked participants to test their understanding of the Hypothesis Testing, with absolutely no deception (full transparency about the intent of the study) and voluntary participation in answering the survey which biases the results positively: Only those who are more comfortable with the topic and confident about their knowledge of the subject matter will participate. We also look at the differences between economists and other business professionals. The results of the pilot study are alarming, to say the least and show a deep misunderstanding about this statistical tool both among economist and other business professionals even in our positively biased sample which suggest an even more pronounced problem in an unbiased sample. For future research, we plan to collect more data from different conferences and analyze it. In the next phase of this research, we also plan to point out ways to improve the statistical practices in social sciences and business schools and provide suggestions for a smooth introduction of elements into the curricula and textbooks that rectify the presented shortcomings.

Modeling for Crop Portfolio Selection Under Limited Irrigation Resource and Uncertainties

Oral

Dr . Li Zhang [1]

1. *The Citadel*

A mathematical model and optimization framework to aid farmers in selecting crop portfolios were proposed and discussed in a recent study [1, 2]. We proposed a refined mathematical model in [3] which reduces the number of constraints to nearly half while the number of decision variables is about the same. In this project we extend the model by considering the uncertainties of the demand of the crops, irrigation water supply and the prices of the crops.

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Participation Function Index: College Students and the Drivers of the Professional Student Organizations They Join

Oral

Dr . Jeananne Nicholls [1]

1. *Slippery Rock University*

This paper proposal abstract presents the use of an adaptation of the Volunteer Function Index (VFI) (Clary et al., 1998) to look at the motives of college students joining collegiate professional organizations such as a collegiate chapter of the American Marketing Association. 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. The rewording of the VFI to reflect participating in a professional organization was minimal. The revised instrument is called the PFI – Participation Function Index.

Perceived Quality & Brand Equity: The Impact of Salesperson, Price & After Sales Service

Oral

Dr . KURT SCHIMMEL [1]

1. *Slippery Rock University*

This study looks at the impact of sales, price and aftersales service on perceived quality and brand equity in an industrial service setting. The specific company is an LTL shipping company located in the Northeast and mid-Atlantic regions of the United States of America. This study extends the work of Kim, & Hyun (2011) who explored the impact of corporate marketing efforts on brand equity in the information technology arena.

The dependent variable in the study is brand equity in a business to business (B2B) services setting. Myers (2003) notes that brand equity outcomes can include preference over other brands, a favorable bias to new brand extensions, and a willingness to pay more. Kim, & Hyun (2011) had similar findings and note that brand equity is a critical competitive driver in industrial marketing. They supported the proposition that the greater the brand strength, industrial buyers are more likely to demonstrate brand loyalty (repurchase) and are willing to pay more (Bendixen et al., 2004; Hutton, 1997; Roberts & Merrilees, 2007; Taylor, Hunter, & Lindberg, 2007). Greater brand equity is also related to perceptions of the industrial product quality (Cretu & Brodie, 2007).

The proposed antecedents of brand equity in this study include price, salesperson interaction, aftersales service quality, and brand loyalty. The role of price in the B2B setting has had mixed findings and may be industry specific. Mudambi et al. (1997) found that low price accounts for about 70% of the final decision in business markets. A finding that was supported by Cretu & Brodie, 2007 who found high prices were negatively related to brand loyalty. However, lower prices were not found to impact brand quality and brand loyalty in the IT sector (Kim, & Hyun, 2011). Perceived quality has been found to be a function of value for the money and performance (Kim, & Hyun, 2011). Perceived quality is also an outcome of direct experience with a product or service (Leek & Christodoulides, 2012). The tendency to be loyal to a brand, demonstrated by the intention to buy the brand as primary choice is the foundation of brand loyalty (Yoo & Donthu, 2001). Brand loyalty has been defined in either behavioral or in attitudinal terms. The behavioral definition equates brand loyaty with repeat purchases. While Attitudinal loyalty refers to the degree of commitment in terms value affiliated with the brand (Chaudhuri & Holbrook, 2001).

In this study, after sales service and salesperson interaction are combined into a higher order construct. After sales service has been a recognized component of the industrial marketing decision process. They are both components of a close relational interaction with the customer (Kim, & Hyun, 2011). After-sales service was found to be a more important product-selection criterion than price in some markets such as high- tech industries (Abratt, 1986). Salesperson interaction is a key component of B2B marketing (Kuhn et al., 2008; Lynch & Chernatony, 2004; Kim & Hyun, 2011). The reason is that personal selling is a medium that can develop initial brand awareness (Gordon, Calantone, & di Benendetto 1993); and offer information tailored to the needs of the industrial purchasers and purchasing cteres they interact with (Mudambi, 2002; Webster & Keller, 2004 Kim & Hyun 2011).

The survey in our study was designed to measure each of the constructs in the most parsimonious way possible and modified a technology sector, B2B survey Kim & Hyun (2011) used. The questionnaire was distributed using commercially available survey software (Qualtrics). The survey included features to improve visual clarity and attractiveness, simplify the layout, and ease navigation. In addition, the survey was broken up into sections (screens) and a progress bar indicated progress toward completion. All these features reduced the potential for measurement error and increased likelihood of completion (Hair et al., 2010). The survey was technically pretested to ensure it

worked as expected on a variety of platforms and there were not any other technical deficiencies. The survey itself was estimated to take 15 to 20 minutes (an upper limit for completing the survey), and on average, took 15 minutes to complete. The data were collected in the Qualtrics software and subsequently exported into Excel and then SmartPLS.

The population under investigation were customers of the LTL trucking firm. The survey was sent to approximately 2000 customers and 530 companies responded to the survey for a response rate of 27 percent.

Figure 1 represents the inner and outer models for this study. Evaluating these two models are the two main steps in PLS-SEM analysis. The first step assesses the measurement model, or outer model in PLS-SEM language, and shows the relationships between indicators and the latent variables. The paths are:

Latent Variable 1 -> brand loyal
Latent Variable 1 -> brandequity
Latent Variable 1 -> quality
after sales -> Latent Variable 1
brand loyal -> brandequity
price -> quality
quality -> brand loyal
sales -> Latent Variable 1

Latent variable1 is the higher order sales construct

The results indicate a valid model with all indicators loading between .750 and .950. All reliability and validity indicators were within the acceptable ranges, and the R square for brand loyalty was .670, for quality .553, and for brand equity .661. The Q square statistics were positive and within the acceptable range to indicate a valid predictive model. The paths from the higher order sales latent variable 1 construct were significant to brand loyalty and quality, but not to brand equity. The paths from price to quality, brand loyalty to brand equity, and quality to brand equity, are all significant. The lack of significance for the direct path from the higher order construct to brand equity suggests a fully mediated relationship that should be tested in future research.

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Figure 1

PROFESSIONAL STUDENT CLUBS: A SPECIAL WORKSHOP ON ESTABLISHING, ORGANIZING, RUNNING, AND ADVISING THEM BASED ON 25 YEARS OF EXPERIENCE WITH AN UMBRELLA ORGANNIZATION OF FOUR STUDENT CLUBS

Oral

Dr . Doug Ziegenfuss [1]

1. *Old Dominion University*

Professional student clubs in which a professional organization partners with a college to establish a student chapter can be a great addition to any business program. This workshop doesn't cover honor society or student social clubs. During this workshop, the workshop presenter will present and discuss the following issues concerning professional student clubs:

- Definition of professional student clubs,
- Benefits of having professional student clubs,
- Establishing professional student clubs,
- Organizing professional student clubs,
- Running professional student clubs, and
- Advising them.

Programmatic Automation of Excel Using VBA To Clean Dirty Data

Oral

Dr . John N. Dyer [1]

1. *GEORGIA SOUTHERN UNIVERSITY*

In the age of big data, professionals and academics that work with large data sets, database systems, data warehouses, etc., are frequently plagued with the dirty data issue. There are many definitions of dirty data, and any one of them is most likely applied relative to the task and data at hand. We will define dirty data simply as “data not readily suited to the task at hand.” The tasks may range from simple statistical summaries to aggregating catalog data, to performing advanced database queries or applying a myriad of analytical techniques to data. Regardless of the nature of dirty data, few software tools are available to clean the dirty data, that is, to make it suitable for the task at hand. This presentation will first describe an actual dirty data case related to preparing products for display in an online catalog, then present several common tools available in Excel to aid in cleaning dirty data. Lastly, it will show how Excel macros and VBA can easily be easily used to automate the data cleaning process. An example dirty data set containing thousands of rows and scores of columns will be presented, as well as manual and automated applications of data cleaning tools in Excel 2016.

Relating Maslow's Heirarchy of Needs to Personal Financial Decision-Making

Oral

Dr . Mike Smith [1], ***Dr . Johanna Sweet*** [1]

1. *Roanoke College*

Humanistic psychology is a psychological perspective that emphasizes an individual's natural tendency to strive towards self-actualization. The theory of humanistic psychology evolved from the perceived limitations of psychoanalytic theory and behaviorism which do not address the natural human desire to create and realize one's greatest personal potential. While behaviorism spawned the tremendously popular behavioral finance theory, no such financial theory has been introduced that describes a humanistic approach to consumer financial decisions. Utilizing a popular humanistic psychological approach, Maslow's hierarchy of needs, it can be determined, perhaps somewhat ironically, that the further a consumer progresses up the hierarchy and approaches self-actualization, the more irresponsible the financial spending tends to become.

SEEING THE LIGHT AT THE END OF THE TUNNEL – NEW INITIATIVES ALIGN ACCOUNTING EDUCATION WITH PRACTITIONERS' EXPECTATIONS

Oral

Dr . Adel Novin [1]

1. *Clayton State University*

Accounting practitioners have long criticized the degree of preparation accounting graduates have upon entering the workplace. Although over the past decades, initiatives aimed at encouraging needed changes have been deployed, including studies, recommendations, and grants, concerns of accounting practitioners have not been alleviated. However, recent initiatives undertaken by the Association to Advance Collegiate Schools of Business (AACSB) International accreditation body, the leading and most prestigious accrediting body for business schools, have given hope for having potentially more effective accounting education that may at last meet the accounting practitioners' needs. This paper discusses major initiatives of the accounting profession for the past decades and the recent initiatives of the AACSB that have offered cautious optimism for potentially effective changes in the accounting programs to meet practitioners' needs. The accounting profession could foster the needed change in accounting education by keeping a close rapport with the AACSB and supporting the AACSB in accomplishing its goals through means available to the AICPA, AAA, IMA, and other local and state accounting organizations.

Success factors for supply chain collaboration in Chinese tourism industry

Oral

Dr . Ping Wang [1], ***Prof . Qili Tang*** [2]

1. *College of Business, James Madison University* , ***2.*** *Aba Teachers University*

This research presents a theoretical model to identify success factors for Chinese supply chain collaboration in tourism and study the relationships among these supply chain participants. Among the factors are trust, commitment, mutual dependence, information sharing, incentive alignment, communication, and decision synchronization. Chinese Tourism supply chain partners may include accommodation (hotels), transportation (airlines, train and bus companies), attraction, food and beverage suppliers, travel agents, tour operators, and the tourists and customers. The possible type of supply chain collaborations in Chinese tourism may include horizontal (to reach economic of scale), vertical upstream and downstream collaboration. The success of the collaboration can be assessed by both financial and non-financial measures.

Swing Shift: Placing Fielders to Minimize the Impact of a Batter

Oral

Mr . Andrew Hartley [1], ***Ms . Ella Morton*** [1], ***Dr . Liz Bouzarth*** [1], ***Dr . Benjamin Grannan*** [1], ***Dr . John Harris*** [1], ***Dr . Kevin Hutson*** [1]

1. *Furman University*

Baseball is a sport that is deeply tied to tradition. One of these traditions is the placement of fielders in the infield and outfield. Anyone who has played any baseball knows that when a lefty comes to bat the outfield tends to take a few steps toward right field. In recent years, some Major League Baseball teams have taken this idea to the extreme and moved fielders into seemingly strange configurations. The rules of baseball only confine the positions of the pitcher and catcher, meaning that the other seven fielders are free to play anywhere. In this project we investigate how to develop a mathematical model that would tell us the optimal place for each of the seven fielders to play. Since Atlanta Braves player Freddie Freeman is a left-handed batter and a local fan favorite, we focus on his batting tendencies to develop a model that would maximize an opposing team's chance of getting him out. Although the model is developed using Freeman's hit chart, it can be applied to any batter of our choosing, making it a powerful tool for baseball teams to use so that they minimize the number of runs the opposing team gets.

Take Presentations Up a Notch with PowerPoint 365

Poster

Mrs . Wilma Andrews [1], ***Dr . Robert Andrews*** [1]

1. *Virginia Commonwealth University*

PowerPoint 365 brings many new features to the presentation field. Whether you teach, present at conferences or use PPT in consulting, using these new features can make your presentation look current and be more interactive. This session will demonstrate and give overviews of some of the newer PPT features available in Office 365.

Taking the Long View: Emergent Graduate Programs and Alignments

Oral

Dr . Janice Black [1], ***Dr . J. Kay Keels*** [1], ***Prof . Michael Latta*** [2], ***Dr . Arlise McKinney*** [1], ***Dr . Leanne Mischel*** [1]

1. *Coastal Carolina University* , ***2.*** *Coas*

According to recent popular press publications, it appears that the full-time 2-year MBA programs are on the decline and are being shut down (Byrne, 2019). The evidence points to other types of programs, specialty topic programs, focused time programs, focused student enrollment programs and even MBAs with concentrations are all trending better than the general 2-year MBA. In this session, panelists discuss how to design a program that will fit within this trend and align with the university's mission, college's mission, and even various departmental missions, utilize the skills of the faculty, meet the needs of the employers, and tickle the fancy of the students. The ideas of using certificates, and badges as the degree Is earned is also discussed. How students and employers perceive different programs will also be discussed.

Teaching Standard Costs: Alerting Students to the Logistics of Working Problems Backwards

Oral

Dr . William Pollard [1]

1. *Appalachian State University*

Most cost accounting textbooks have two chapters on standard costs. The first chapter usually discusses the overall concepts of establishing predetermined standards for costing a product and then details how to use the standards as guideposts as time passes to isolate variances from the standards. Next, the chapter usually discusses and isolates the direct materials and direct labor variances, leaving the variable and fixed overhead variances to be covered in the second chapter on standard costs. Before leaving the direct materials and direct labor variance calculations, however, students should be alerted to the logistics of working standard costing problems backwards – where the variance is given and one of the other pieces of data in the variance calculation is missing and expected to be found. The logistics of working such calculations is not difficult, but it is tricky enough that exposure to the procedure should be done well before a student sees such a question on an exam. In addition, working a question using the backwards approach does help highlight the importance of the Favorable versus Unfavorable determinant for the variance.

Teaching the Digitally Assisted Student

Oral

Dr . Rick Weible [1]

1. *Marshall University*

Students are changing. The motivation, maturity, intellectual curiosity and other characteristics of the current generation are changing. Over the past 30 years I have been teaching I have seen these characteristics in students steadily decline. If we are to prepare our students for their future careers are past approaches need to be modified. These students have never lived without a smartphone. Most human knowledge has been only a Google away. I believe we need to change the way we teach and focus on the most important outcomes in our courses. Most courses to contain a lot of excess material. Students today seem to have a “learned and dump mentality”. In our courses we need to ensure were students retain the core concepts they will need in their careers.

The Effects of Emotional Intelligence on Improving Communications and Relationships

Oral

Dr . Dean Manna [1]

1. *Robert Morris University*

Abstract:

Possession of interpersonal and intrapersonal competencies may explain why some managers are more successful than others when their technical skills are not as superior or in fact may be at a lower level. It can also explain how some managers are able to develop better relationships and communicate more effectively with little effort, or motivate others with relative ease.

Emotional intelligence (EQ) is the ability to analyze and control your own emotions and behaviors to achieve a more positive interpersonal outcomes at home and at work. The lessening influence of the five major areas that influence positive behaviors, family, religion, education, business and society, has created an entire generation that possess a great deal of emotional ignorance and an increase in social and workplace dysfunctional reactions to high stress situations.

Individuals who lack emotional intelligence tend to spend time in the past going over mistakes, home issues and rumors, or in the future speculating on what may happen. Being consumed with past or future circumstances negatively affects quality and quantity of work and creativity. Creativity, motivation, and accountability are assets that are essential in a high changing environment and this will not occur unless the mind is mentally in today.

Without competent management skills in emotional intelligence, an employee is susceptible to react to stress without thinking. EQ focuses on stress diffusion that eliminates emotional hijacking, personality profiling, self- esteem analysis and pro-active listening. Understanding oneself, having a better understanding of other individuals and learning how to take care of oneself, increases the ability to deal with others effectively.

The Impact of Neo-classical Economics on the Amplitude of Business Cycles

Oral

Dr . Nozar Hashemzadeh [1]

1. *Radford University*

In the Theory of Capitalist Development, Paul Sweezy (1942) hypothesized that Karl Marx's hypothesis 'of the increasing amplitude of the business cycle was both incorrect and old fashioned. Writing in 1942. Marx's theory of business cycles is grounded on the fluctuations of aggrecan demand. In contemporary societies (china included), production is closely tied to aggregate demand by consumers and government and international demand for domestically produced goods and services. In addition, the monetary authority uninterruptedly manipulates aggregate demand by controlling the money supply Abstract
and the cost of borrowing. Thirdly, the very existence of publicly traded companies such as (Boeing), is tied to increasing revenues and continuous profitability. Any perceptions of any fall in demand for the products or services produced by these companies significantly impact employment, suitability and the very existence of these segment of the economy. A fourth factor is the ever-increasing use of robots in the production and distribution of goods and services. It is estimated that within the next five years more than 20 million jobs will be lost to robots in leading economies of the West and China.

The Impact of Stock Repurchases on the Operating Performance of the Fortune 1000 Companies

Oral

Dr . Tanya Smith [1], ***Dr . Phillip Njoroge*** [1]

1. *Coastal Carolina University*

ABSTRACT

Signaling theory is a heavily researched topic in the business field. This research uses the act of a stock repurchase and analyzes whether this provides a signal regarding the operating performance of the firm. Consistent with the market timing theory of stock repurchase, we find that companies experience better operating performance in the period with a repurchase. This effect is robust to multiple model specifications and estimation methods. The signaled effect of a stock repurchase is $109,601 on EBITDA for an average firm in our sample. Taken together, the results imply that stock repurchase can be used as a credible signal for contemporaneous firm performance. This result adds to the literature by identifying the commonly practiced activity of stock repurchase and demonstrating the significance of the information content on assessing firm performance.

*JEL Classification:*M41

Keywords: Stock Repurchase, Signaling Theory, Firm Performance

go back

The Importance of Internships in Preparing Students for Success

Oral

Prof. Gail Moore [1]

1. *Lander University*

What is an internship? Internships certainly help with job placement after graduation, but do students need an internship to be competitive in today's job market? An internship exposes students to on the job training in their chosen field. What separates an internship from a part-time job? Internships are usually taken in conjunction with a university level class where the professor monitors the student's progress within the internship and gives feedback, along with a student's preceptors, on the skills the student is learning and the ways a student can continue to grow and learn. Is it the job field, the job experience, or the soft skills focused on in an internship that make it different? When job experience gained through internships is obtained in conjunction with an internship class for academic credit, the student gains and retains a larger set of the soft and technical skills employers are seeking that a regular part-time job. Internships prepare students for success in their future careers. This paper will review the importance of internships and how they differ from simple part-time jobs when the professor guides the student through the internship and helps them focus and grow their skill sets.

The Organization of 2/4 Transfer Programs: An Integrative Review

Oral

Dr . Tim DuPont [1]

1. *Clemson University*

This integrative review paper examines the most recent empirical literature offering suggestions for quality transfer programs between two and four-year colleges. This paper is guided by the research question: What does the ideal transfer program look like? A diagram illustrating the findings of this review and the interactions among components is provided. This diagram provides a visual guide to promote consistency among transfer programs. It may offer a basis to rank the quality of transfer programs between institutions, provide a basis to state and federal governments for future legislation regarding transfer programs and provide guidance to two and four-year college administrators as they make decisions about transfer programs.

The People Factor in Supply Chains

Oral

Dr . Dick Crandall [1], ***Dr . William Crandall*** [2]

1. *Appalachian State University* , ***2.*** *UNC Pembroke*

Global supply chains are faced with a potential crisis – the shortage of qualified employees to operate and manage them. Employees are critical resources who perform a variety of activities to assure that products and services flow as intended along the supply chain. These people are found at all levels and in a variety of functional areas within multiple organizations. Without the presence of humans, supply chains would not work. The growth of supply chains in size and complexity over the past few decades has increased the value and necessity of competent employees in supply chain management.

Where do these people come from? While colleges and universities are logical sources, they may not be able to provide a complete answer. One study voiced this concern. "Study after study has shown that for every new supply chain manager entering the workforce, two (or more) are retiring. Although supply chain programs are proliferating, today's universities simply aren't producing enough high-quality supply chain managers to fill the need. This story line, however, is incomplete. The talent crisis isn't just about demographics. The crisis is more about mindsets and skills sets—and our inability to develop the talent to thrive in tomorrow's global decision-making environment. "(Fawcett and Fawcett, 2016). The authors believe there is still a disconnect between industry leaders and academics that must be bridged if universities are to fulfill their role as supply chain talent providers.

The relationship of social entrepreneurship and ethics in the tourism industry

Oral

Dr . Gaye Acikdilli [1], ***Prof . Christopher Ziemnowicz*** [1]

1. *University of North Carolina at Pembroke*

The future points to continuing potential of the tourism sector in terms of business opportunities as well as for innovative enterprises to provide solutions in dealing with the challenges of mass tourism. This is particularly in relation to the problems facing many destinations of sustainable economic growth, inclusive development, and environmental preservation. There are increasingly strident calls from many sectors of society for the tourism industry, the world's largest industry; to adopt a more ethical approach to the way it does business. In particular, there has been an emphasis placed on the need for a more ethical approach to the ways tourism industry interacts with consumers, the environment, with indigenous peoples, those in poverty, and those in destinations suffering human rights abuses. These areas of concern are of particular emphasis by social entrepreneurs. Therefore, an increasing number of social enterprises have evolved within the tourism sector that focus on responsible tourism by contributing to poverty alleviation and environmental protection while also striving to be financially self-sustaining.

THE RIGHT TO BE FORGOTTEN: AN ETHICS CASE STUDY

Oral

Dr . Claire La Roche [1]

1. *Longwood University*

A timely ethical and legal issue with potential personal and long-term professional consequences in our digital environment is whether there should be a 'right to be forgotten'. Almost everyone has done something as a teenager or young adult that they later regret. Historically, juvenile records were 'sealed' because it was deemed to be unfair to hobble a person's educational and employment prospects based on a transgression committed early in life. Indeed, until the last 20 years, those early indiscretions were easily forgotten. Personal knowledge or an arduous search at a library would have been necessary to uncover an incident reported in a newspaper. Likewise, a background check entailed a trip to the local courthouse and a considerable amount of time combing through court records, and juvenile records would not be accessible. With the advent of the Internet, social media, and the ubiquitous cell phone, a *de facto* permanent digital record of almost everything that is said or done has been created. These digital records are easily accessible and shared. They have had devastating personal, educational and professional consequences. This case study summarizes the status of the 'right to be forgotten' and provides specific incidents to inspire discussion. The European Union's 'right to be forgotten' law and California's Minor Erase Law are both outlined. Two cases involving youthful indiscretions, one by a minor and the other by a young adult, are presented. Suggestions are made for discussion questions with additional teaching notes italicized.

The Signaling Information from Stock Repurchases on Operating Performance

Oral

Dr . Tanya Smith [1], ***Dr . Phillip Njoroge*** [1]

1. *Coastal Carolina University*

Signaling theory is a heavily researched topic in the business field. This research uses the act of a stock repurchase and analyzes whether this provides a signal regarding the operating performance of the firm. Consistent with the market timing theory of stock repurchase, we find that companies experience better operating performance in the period with a repurchase. This effect is robust to multiple model specifications and estimation methods. The signaled effect of a stock repurchase is $109,601 on EBITDA for an average firm in our sample. Taken together, the results imply that stock repurchase can be used as a credible signal for contemporaneous firm performance. This result adds to the literature by identifying the commonly practiced activity of stock repurchase and demonstrating the significance of the information content on assessing firm performance.

*JEL Classification:*M41

Keywords: Stock Repurchase, Signaling Theory, Firm Performance

TOWARDS A COMPREHENSIVE INFORMATION TECHNOLOGY STRATEGY FOR SMALL BUSINESSES

Oral

Dr . Mysore Ramaswamy [1]

1. *Southern University and A&M College*

Information Technology (IT) provides ready to use, end-to-end solutions and allow small businesses to focus on their core business. Recent innovations in IT have positively impacted businesses. With the emergence of web services, the convergence of telecom and computing is finally reaching maturity in a unified platform for doing business in the 21st

century. Business enterprises have invested heavily in information technology and the benefits have been well documented. However there is still a dearth in the current literature that analyzes how this digital technology can help small businesses in such areas as business process reengineering and data analytics. This paper seeks to fill this gap and proposes a framework that helps in choosing the appropriate IT strategy. It is essential that business processes are identified based on their cost, complexity, and criticality and then reengineered and automated based on analyzing the domain specific data.

TRUST'S ROLE IN THE EXPECTANCY THEORY OF MOTIVATION

Oral

Dr . Ed Showalter [1]

1. *Randolph-Macon College*

This study investigates the role Trust plays in the Expectancy Theory of Motivation (Vroom, 1962.) Elements of Expectancy Theory are 1) belief (probability) that Effort will lead Performance level, 2) belief that Performance will lead to an Outcome, and 3) the value placed on that Outcome. Motivational force is determined as the product of the three elements.

For the purpose of this study, Effort to Performance expectancy is operationalized as self-efficacy, or "trust in self" and Performance to Outcome expectancy is operationalized as organizational trust. For the purposes of this study, organizational commitment is used as a proxy for the value of the outcome.

Using Cluster Analysis to Group Together Similar Markets for A/B Experiments

Oral

Mr . Kevin Potcner [1]

1. *JMP*

Testing various marketing campaigns or strategies to identify the ones that are most effective has become a common task for today's marketing teams. Many campaigns and strategies can only be applied within large geographic areas (e.g., cities). When comparing say two marketing strategies (A vs. B) in these scenarios, it will only be possible to apply Strategy A in one city and Strategy B in a different city for any given period of time.

To effectively compare the impact of those two different marketing strategies, it is extremely important that that impact is isolated from the potential differences those two cities may have on the outcomes.

Using a statistical technique known as Cluster Analysis, the presenter will illustrate how characteristics of candidate cities can be used to group the cities into "similar pairs" where one city will receive marketing Strategy A and there other Strategy B. In doing so, the resulting differences in outcomes will be able to be better attributed to the marketing strategies instead of the differences between the cities.

Using Principal Component Analysis in the Validation of a Student Academic and Community Relations Intentions Scale: Responses of the HSTA Participants

Oral

Dr . Sherron McKendall [1], ***Dr . Alan McKendall*** [1], ***Dr . Ann Chester*** [1]

1. *West Virginia University*

The purpose of this paper is to perform Principal Component Analysis (PCA) on a subset of questions that are part of a logic model pertaining to the academic, career, and community relation goals of participants in an out-of-school-time (OST) program. The importance of accurately measuring such factors could allow OST programs to understand which programmatic components could improve student outcomes. A better understanding of best practices may be translatable to other OST programs as participants progress through and exit such programs. As such, longitudinal analyses of participants' intentions may provide greater insight into programmatic impact and effectiveness.

Using Probabalistic Methods of Operations Research to Optimize Admissions to the Citadel

Oral

Mr . John Pippins [1]

1. *The Citadel*

Using Probabilistic methods of Operations Research, I use past admission and arrival rates to The Citadel, the Military College of South Carolina, to develop a mathematical model that optimizes overbooking to the college, maximizing potential profit and minimizing issues with housing.

Visual Business Analytics Course: Learning From Experience

Oral

Dr . Anil Aggarwal [1]

1. *University of Baltimore*

Advances in technology is making it possible to create visual model with little or no effort. This is good news for managers who can visualize impact of their policies in real time and perform multiple analysis. Visualization is becoming an important tool for exploring data. Though many data analytics techniques exist for data exploration, only recently visualization has become feasible. It combines visuals and analytics for analyzing data. Simple visual tools can, even be used by senior executives to explore sensitive data themselves.

Visualization consists of several parts, however, two parts are dominant: Exploration and Explanation. First part deals with data analysis and second part with story building. Once data is analyzed, it need to be told in simple terms. Visualization is creating tremendous opportunities and challenges for professors. Opportunities because it is an emerging field challenges because it requires multiple functional backgrounds. However not all is lost. Software like SAS, JMP, KNIME and Tableau are making visualization a reality. It is important for business students not only to create visuals but be able to analyze them. We have developed a course which is be data-driven with visualization. This paper presents our experiences with such a course and discusses what worked and what did not work. We will also discuss how this course may evolve in future. Instructors planning to offer such a course can learn from our experiences.

What Were You Thinking? Analyzing Thought Processes in the Presence of Brand Love

Oral

Dr . Derek Ezell [1]

1. *Lander University*

This study attempts to obtain a glimpse into the minds of consumers concerning how information is processed differently in the presence of brand love. Two studies are conducted in which consumers were given various messages by various sources about a brand they identify love for. These consumers are then asked to provide thought listings, therefore providing a better understanding of how consumers process new information, and how likely they are to seek additional information under various circumstances involving brands they love. Similarly, the effects of brand love on source credibility are also examined. Results indicate that although message valence plays a role in tendencies to seek additional information and source credibility, the presence of brand love may alter this relationship.

With a View Toward Maximizing Learning Outcome Benefits, Do the Differences in Learning Theories (Andragogy vs. Pedagogy) Have Significant Implications for the Instructional Design of Advanced Undergraduate Business Courses?

Oral

Dr . Brad Johnson [1]

1. *Francis Marion University*

The primary purpose of this article is to demonstrate that the differences in learning theories (Andragogy vs. Pedagogy) have meaningful implications for the instructional design of advanced undergraduate business courses. Specifically, this article argues that if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy (Knowles 1984) into the instructional design of advanced undergraduate business courses, especially advanced sequential undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased. In this regard, the instant article has extensive public interest for educators and instructional designers.

Accordingly, the two primary objectives of this article are:

(1) **To identify**the differences between Andragogy and Pedagogy as learning theories, specifically focusing on (A) the assumptions made of adult learners vs. child learners and (B) the principles of Andragogy vs. the principles of Pedagogy, and

(2) **To argue**that the differences in learning theories (Andragogy vs. Pedagogy) have meaningful implications for the instructional design of advanced undergraduate business courses. Specifically, if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy (Knowles 1984) into the instructional design of advanced undergraduate business courses, especially advanced sequential undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased.

This article postulates that if these objectives are met, educators of advanced undergraduate business courses will be motivated to experiment with the instructional design of said courses. In this regard, the instant article has significant public interest not only for business undergraduate educators and instructional designers but educators and instructional designers, in general.

This article accomplishes its primary purpose and objectives in a stepwise fashion as follows.

- In Part I, **t**he differences between Andragogy and Pedagogy, as learning theories, are identified, specifically focusing on (A) the assumptions made of adult learners vs. child learners and (B) the principles of Andragogy vs. the principles of Pedagogy.
- (3) In Part II, this article argues that if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy (Knowles 1984) into the instructional design of advanced undergraduate business courses, especially advanced sequential undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased.
- In Part III, future empirical research that tests the current hypothesis is discussed.

"

Papers

A Cluster Analysis of Digital Pirates: Multi-Dimensional Piracy Risk Perception Approach

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ABSTRACT

This paper focuses on segmenting digital pirates based on various piracy risk perception. Different piracy risks such as prosecution, financial, performance, time, privacy, and moral risk were measured to identify clusters of pirates who share similar piracy risk perception. Four pirate segments were found based on different combinations of piracy risk: anti-pirates, utility-conscious pirates, monetary-conscious pirates, and pro-pirates. Each cluster demonstrates unique attributes and behaviors associated with digital piracy. This finding can offer a more profound understanding of heterogeneous pirating segments and how they may react differently to anti-piracy strategies.

INTRODCUTION

The wide-spread piracy of copyrighted digital content (e.g. software, music, games, books, and movies) has been a serious problem. Rapid developments in file-sharing and streaming technologies as well as decreasing cost of digital files copying mediums have provided consumers with greater access to free content. A recent survey shows that Internet users made more than 300 billion visits to piracy sites in 2017, up 1.6% from 2016. Illegal downloads and streaming of TV show is the most popular pirated content (106.9 billion visits) followed by music and movie [27]. To protect intellectual property and increase legitimate sales, digital goods industries have employed numerous anti-piracy strategies including technological protection, law enforcement, and educational campaign. Through these approaches, organizations aim to dissuade users from downloading illegal content and encourage consumers to think critically about how they acquire software, music, and other forms of intellectual property [1, 19, 41]. However, there is little evidence to suggest that these strategies have successfully decreased piracy [34, 35].

One way to improve the effectiveness of anti-piracy strategies is developing a targeted campaign that will appeal to specific audiences. However, digital pirates are heterogeneous population and each group (cluster) demonstrates unique characteristics. For example, some anti-piracy strategies may not appeal to a specific group of pirates with a certain type of piracy perception. Hence, segmentation of digital pirates can facilitate the targeted campaigns. The objective of this study is to explore whether different digital pirate segments can be outlined based on piracy risk perception. Various risks such as prosecution, financial, performance, time, privacy, and moral risk are measured to identify clusters of pirates who share similar piracy risk perception. Findings from this study can provide a better understanding of heterogeneous pirating segments and how they may react differently to piracy combatting measures. As a result, better strategies can be developed to control digital piracy.

LITERATURE REVIEW

The perceived risk has been formally defined as "a combination of uncertainty plus seriousness of outcome involved" [4]. Since the concept was introduced by Bauer, much research has been devoted to measuring risk and building a formal model and developing its components. Perceived risk has been modeled as both a two-dimensional construct (i.e., uncertainty and negative consequences) [3], and a multidimensional construct, including financial, performance, physical, psychological, and social risk [17]. Several other components of perceived risk were added later including time risk [31] and source credibility risk [26]. The perceived risk construct has been studied extensively in the marketing and consumer behavior literature for a wide-range of topics such as counterfeit brand [40], and mail-order and retail store shopping [18, 36]. Within the IS literature, the construct has been applied in the area of e-commerce adoption [11, 30], Internet banking [24], online shopping [13, 14], and digital piracy [20]. The current study adopted Jeong, Zhao, and Khouja's [20] consumer piracy risk model. As a higher-order construct, a perceived risk was conceptualized as multi-dimensional sub-constructs. This approach provides valuable information about various types of risk involved in consumer piracy behavior and the relative importance of each risk dimension. Table 1 presents the risk components that are relevant in the context of digital piracy.

Table 1: Consumer piracy risk dimensions

Dimensions	**Description**
Performance risk	The risk that pirating activities will create a loss due to malfunctioning and not performing as designed
Financial risk	The risk that pirating activities will cause a monetary loss due to re-installment of software and data recovery
Time risk	The risk that pirating activities will cause potential time and effort loss due to technological problems
Moral risk	The risk that pirating activities will cause psychological discomfort or create a loss of status in one's social group
Privacy risk	The risk that pirating activities will cause a loss of private and confidential information
Prosecution risk	The risk that pirating activities will cause a legal prosecution

METHODOLOGY

We compiled a group of questions to represent each risk component [10, 11, 37, 38, 42] presented in Table 1. The wording was then slightly modified to fit the context of digital piracy. The respondents were asked to indicate their assessment of the magnitude of perceived risk. Each question was measured on a five-point Likert scale, ranging from (1) strongly agree to (5) strongly disagree. The questionnaire was tested for validity before the actual survey was administered. Iterative review process was undertaken by four IS professionals to maximize content validity and ambiguous items were removed from the final instrument. Appendix 1 shows the twenty one items of piracy risk. We randomized the order to ensure validity of the test.

Next, we conducted reliability, convergent, and discriminant validity tests. Internal consistency was evaluated by computing average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha [15, 21]. We retained the items with factor loadings greater than 0.7 [2, 12]. Additionally, AVE values of the constructs were all higher than the minimum 0.5. All reliability measures were well above the cut-off level, indicating adequate internal consistency. The measurement items also showed excellent discriminant validity [8, 12]. The squared roots of AVE values on the main diagonal were greater than the pair-wise correlations between constructs on the off diagonal. Finally, the variables had loaded 0.6 or more

on responding construct, which indicate an excellent convergence validity of the measurements [9, 22], and all the items met this requirement.

We chose the university students as participant as the literature suggests the younger populations are more exposed and engaged in pirating activities [23, 33]. They are widely used in previous studies investigating the impact of software/music piracy [7, 39]. Students enrolled in information systems courses were invited to complete a web-based survey at the end of the class. Participation was entirely voluntary, and there was no penalty for non-participation. The confidentiality of responses was assured and the subject did not identify themselves on the questionnaires. This extra measures were taken to ensure truthful responses with regard to this sensitive topic. Of 828 subjects, 476 subjects returned fully completed questionnaires, yielding a response rate of 57.5 percent.

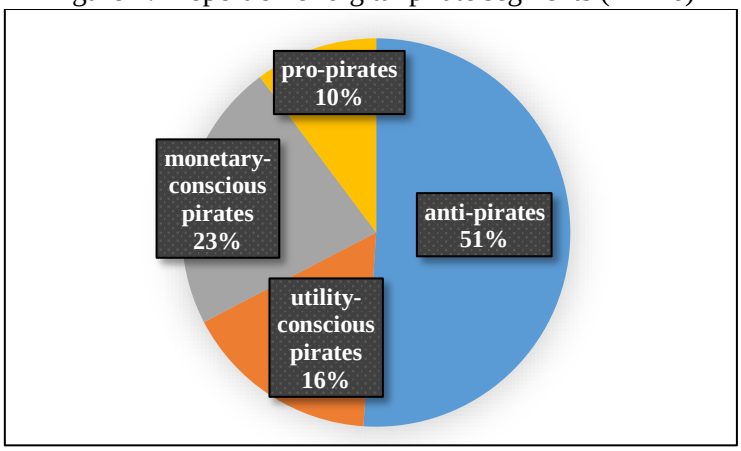
RESULTS

K-means clustering algorithm was used for cluster analysis. The K-means clustering algorithm classifies objects based on attributes/features into *k* (positive integer) number of groups by minimizing the sum of squares of distances between data and the corresponding cluster centroid [29]. Although the K-means algorithm is popular and is relatively fast and efficient, it has a major weaknesses, which the number of clusters (*k*) must be specified in advance. The silhouette coefficient (SC) was used in order to determine the best number of clusters [25]. In a good cluster solution, the within-cluster distances (cohesion) are small and the between cluster distances (separation) are large, resulting in a silhouette measure close to the maximum value of 1. A four-cluster solution (SC = 0.8) emerged as the most optimal segmentation compared with two (SC = 0.6), three (SC = 0.7), and five (SC = 0.7) cluster solutions. The four digital pirate segments are labeled as follows: anti-pirates, utility-conscious pirates, monetary-conscious pirates, and pro-pirates. Figure 1 and Table 2 present an overview of cluster composition.

Table 2: Overview of cluster composition

Risk	Cluster			
	1 (pro-pirates)	2 (utility-conscious pirates)	3 (monetary-conscious pirates)	4 (anti-pirate)
Prosecution	2.03	2.56	**3.51**	3.63
Financial	1.69	1.94	**3.10**	3.44
Performance	1.97	**3.74**	2.33	3.68
Time	1.71	**3.07**	2.19	3.34
Privacy	2.24	3.36	3.47	3.85
Moral	1.49	1.83	2.05	2.91

Figure 1: Proportion of digital pirate segments (n=476)



Anti-pirates (51%, n = 243) make up the largest portion of the sample. They have the highest risk perception on all dimensions compared with the other segments. They consider piracy ethically unacceptable, and are conscious about self-image and peer pressures from one's social group such as family, friends, and colleagues. In a follow-up contrast analysis, anti-pirates report the highest perceived risk on a loss of private and confidential information ($p < 0.0001$). Compared with the rest, anti-pirates also present the high risk on financial, performance, time, and prosecution risk.

Utility-conscious pirates (16%, n = 76) present the high risk perception on performance and time risk, thus named utility conscious pirates. They are particularly concerned about the risk that pirated copy may not function as perfectly as a legitimate product or as it was designed. A study by Bhattacharjee et al. (2006) shows that less than 10 percent of music files available on a popular Peer-to-Peer (P2P) network were considered high or near CD quality [6]. Furthermore, digital good industries have been involved in the dissemination of polluted content on P2P networks by spreading corrupted copies. Using this mechanism, the industries attempt to decrease the popularity of the file and to make it more difficult for users to download a good copy [5]. In this pirating segment, the fear of content pollution and the inferior quality of pirated content have a significant impact on their intention to engage in digital piracy. Utility-conscious pirates are also concerned about the risk that pirating activities will cause potential time and effort loss due to technological glitches. Studies have shown that some people cut back on the use of P2P networks because they frequently could not find files that they would like to download [16]. Users of P2P network must navigate a complex environment to locate content (time spent looking for an illegal copies) and may endure varying levels of downloading time due to congestion which diminishes the quality of the process. It also requires additional time to learn how to use different file sharing programs and how to protect their systems from any possible intrusions.

Monetary-conscious pirates (23%, n = 109) have the high risk perception on financial and prosecution risk. They are mainly concerned that pirating activities will cause a monetary loss such as re-installment of software and data recovery due to viruses and malwares from file sharing programs. P2P networks have been known to be vulnerable to many security attacks. For instance, one study reports that 44% of the 4,778 executable files downloaded through a KaZaA client application contained malicious code like viruses and Trojan horses [32]. Yahoo Tech also reports that many MP3 files that are being shared contain a Trojan horse program that has attacked over half a million computers in a week [28]. In this segment, the fear of financial loss due to viruses and malwares influences their decision to engage in digital piracy. Monetary-conscious pirates are also sensitive to the risk of legal prosecution. A consumer survey by IFPI reports that

50% of respondents stopped or reduced downloading music files from P2P networks due to fear of legal consequences [16]. Unlike utility-conscious pirates and pro-pirates, the punishment (law-suit or penalty) for the violation of copyright law is especially important in their intention to engage in digital piracy.

Pro-pirates (10%, n = 48) are the smallest segment of the sample. They perceive minimal amount of risk on all dimensions of risk perception scales. They do not consider piracy unethical, and experience the least amount of guilt and psychological discomfort. Even when the industry launches large number of lawsuits against individuals for copyright infringement, pro-pirates are likely to show little fear of legal consequences. Pro-pirates may become skilled and knowledgeable about piracy as they are repeatedly involved in pirating activities. This enable them to obtain illegal copies with little effort because knowledge and frequent practice reduce the time and effort needed to locate illegal copies [20]. Therefore, performance risk as well as time risk are also low in this segment.

CONCLUSION

There are various types of risks involved in consumer piracy behavior. Accordingly, we identified clusters of digital pirates based on the piracy risk perception. Four pirate segments were found based on different combinations of piracy risk: anti-pirates, utility-conscious pirates, monetary-conscious pirates, and pro-pirates. The study results support that each pirating segment exhibits unique risk perceptions associated with digital piracy. Our findings provide several implications for designing effective anti-piracy strategies. One applications would be the development of tailed anti-piracy educational campaign that appeals to audiences with specific risk perception. Major piracy campaign themes currently focus on lawsuit, fear, peer pressure, or identity theft (e.g. *"Don't expose yourself to malware at work! Report unlicensed business software today", "More than 30,000 people in the United States have been sued for illegal music downloading since 2000"*). These educational campaigns will work best for the monetary-conscious pirates who are sensitive to the risk of financial loss and legal prosecution. However, it may not be effective for utility-conscious pirates who are less concerned with financial and legal consequences. Instead, the campaign message should place an emphasis on a loss of utility and resources due to downloaded files' malfunctioning or poor performance (i.e. performance risk). This message can be revised to better fitting to the performance conscious audience. For example, *"90% music files available on popular P2P networks are not same as the quality of audio CDs. A pirated copy does not function as well as a legitimate product or as it was designed to function,"* is a better way of persuading the utility-conscious pirates.

Several limitations apply to our study and provide avenues for future research. First, although using student sample is appropriate especially for testing hypotheses in digital piracy, it still limits the generalizability of findings to the population with different educational background and age. Future research could use a more representative sample from the general population so that piracy risk perception for older adults could be represented. Second, there are other factors that can be considered in segmenting digital pirates such as subjective norms, self-efficacy, perceived behavioral control, and ethical evaluation. In addition to piracy risks, future study can include behavioral and ethical perspectives in the segmentation process to produce more comprehensive representation. Lastly, it would be interesting to examine whether and to what extent different anti-piracy educational campaigns (e.g. performance risk focused vs. prosecution risk focused) influence idiosyncratic pirating segments.

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APPENDIX: Consumer Piracy Risk Measurement

Dimension	Items
Moral Risk	1. Once my family, friends, and colleagues are aware that I have downloaded illegal content from file-sharing programs, I may lose their respect because they will think that I am unethical. 2. Downloading illegal content from file-sharing programs may negatively affect the way others think of me. 3. Downloading illegal content from file-sharing programs makes me feel psychologically uncomfortable. 4. Downloading illegal content from file-sharing programs may cause me to experience unnecessary tension.
Performance Risk	1. As I download illegal content from file-sharing programs, I worry that the pirated content will fail to play. 2. As I download illegal content from file-sharing programs, I worry that the pirated content will fail to play like the original one. 3. As I download illegal content from file-sharing programs, I worry about whether the pirated content will play as the way it is supposed to. 4. As I download illegal content from file-sharing programs, I worry that the pirated content will not provide the level of quality like a legitimate copy.
Prosecution Risk	1. As I download illegal content, I worry that I will be caught for the infringement of copyright law. 2. As I download illegal content, I worry that I will be punished for the infringement of copyright law. 3. As I download illegal content, I worry that I will have to pay a fine for the infringement of copyright law.
Privacy Risk	1. Downloading illegal content from file-sharing programs cause me a concern that I will lose control over the privacy of my information. 2. Downloading illegal content from file-sharing programs may lead to a loss of privacy for me because my personal information can be revealed without my knowledge. 3. Downloading illegal content from file-sharing programs may lead to a loss of privacy for me because a hacker may access my personal information without my knowledge.
Time Risk	1. Downloading illegal content from file-sharing programs may be a waste of time for me because it will take time to set up the required software (e.g. BitTorrent). 2. Downloading illegal content from file-sharing programs may be inconvenient for me because I will have to waste a lot of time to fix errors. 3. Downloading illegal content from file-sharing programs worries me that I will have to spend too much time learning how to download files. 4. Downloading illegal content from file-sharing programs may lead to an inefficient use of my time for searching files, understanding various software packages, and so forth.
Financial Risk	1. As I download illegal content from file-sharing programs, I worry that the pirated content will cause damage to my computer due to viruses and malware resulting in a monetary loss (e.g. new hard drive, system re-installment, data recovery). 2. Downloading illegal content from file-sharing programs may lead to a financial loss for me. 3. I may lose money as I use file-sharing programs to download illegal content.

TriCove Solutions: The Cost of Standing Your Ground[1]

On June 21, 2013, Sarah and Benjamin Long worked diligently with their twenty employees at TriCove Solutions, a small business founded in Columbus, Georgia in 2002. TriCove's expertise centered on providing government entities with research, expansion, and sustainment solutions in the areas of information technology (IT), engineering, and foreign military defense. While in the office, Ben and Sarah, TriCove's president and CEO respectively, received a call from a friend who worked at GrineTec, Inc, a Columbus-based government contracting business with 3,500 employees. During the conversation, Sarah and Ben were informed that GrineTec would likely file a temporary restraining order (TRO)[2] against TriCove for hiring and retaining Tony Capelli, a former GrineTec executive and current TriCove employee.

Though not surprised by the news, Ben and Sarah were frustrated because they were in the middle of writing two important proposals for potential foreign military defense contracts. During the last week of May 2013, GrineTec served Tony with a cease and desist letter[3]. The letter stated that Tony must end his employment at TriCove because he violated GrineTec's noncompete and nonsolicitation agreements[4] when he accepted the job with a local competitor and solicited GrineTec employees. On the same day that Tony was served, he informed Sarah and Ben, who in turn notified their three-member legal team. The attorneys made an appointment with them for the following week to review Tony's letter and explain how TriCove could potentially be impacted. At this appointment, their attorneys also discussed fees and the legal process in general. The legal fees ranged from $150 to $350 per hour, depending on how many of their attorneys were working on the case simultaneously. The attorneys were unable to inform them of the outcome of the case, how expensive the case would be because they could not foretell how long it would last, or how many hours it would take to resolve it. Furthermore, they stated that the process could be delayed due to errors, procedural mishaps, and other issues. The attorneys shared that GrineTec would likely file motions to request information about TriCove and exactly how Tony was recruited. Ben and Sarah would have to devise responses that could take extensive time to research and finalize.

Ben and Sarah were concerned about how TriCove would compete against GrineTec in a lawsuit. GrineTec was a well-established defense conglomerate with $650 million in revenue and numerous contracts in foreign military sales, IT, and engineering. In comparison, TriCove had only $6 million in revenue and had spent the last year transitioning to U.S. government contracting in foreign military sales, IT, logistics, and engineering. Sarah and Ben had invested extensive time and almost $500,000 in resources in an effort to secure two new foreign military defense

[1] The authors have disguised all of the names of individuals, companies, locations, and any other recognizable information to protect confidentiality.
[2] A TRO is a temporary order before a final decision by a judge for a person or business to stop or refrain from engaging in an action. TROs are usually granted in emergency situations.
[3] A cease and desist letter is a statement or demand by an aggrieved party (herein GrineTec) that the offending party (herein Tony Capelli) immediately stop any further violation of the aggrieved party's rights.
[4] A noncompete agreement is a covenant where a party (herein Tony Capelli) agrees not to compete against a former employer (herein GrineTec) with another employer (herein TriCove). The agreements generally restrict a former employee from working with a competitor within two year or less, within a close geographical area of the former employer, and in a similar industry where knowledge may be shared. A nonsolicitation agreement is a covenant where an employee (herein Tony Capelli) agrees to refrain from soliciting clients and employees for the benefit of the employee and/or a future employer (herein TriCove) after employee leaves the company (herein GrineTec). Employers tend to support these agreements because they protect their business interests against competitors.

government contracts - one for $25 million and the other for $20 million. Tony was, in part, hired to work on these two potential contracts. Ben and Tony were also long-time friends, having worked together for over a decade at Macon Bridge Technologies, another successful contracting business that was eventually sold to GrineTec.

When Tony was fired by GrineTec and subsequently hired by TriCove, GrineTec was alarmed because his former role as their military defense executive meant that he had confidential company information that might be shared with a competing business. Additionally, TriCove was set to hire at least four new employees who previously worked at GrineTec's Las Cruces, New Mexico location. GrineTec now alleged that when Tony started working for TriCove, he violated the nonsolicitation clause in their employee handbook as well as the noncompete clause of his employment contract. GrineTec also asserted that TriCove was positioning its business to expand due to Tony's knowledge. According to GrineTec, the small business was better able to engage in engineering research at a faster pace and therefore pursued more military defense contracts because of Tony and the other employees. Now the corporation wanted TriCove to terminate Tony's employment. Such a decision could damage not only TriCove's community reputation, but it could also impair long-standing personal and professional relationships.

To make matters worse, GrineTec employed in-house counsel who worked continually on corporate litigation. TriCove did not have a legal department and faced the prospect of paying expensive legal fees to fight the case. Ben and Sarah wondered whether TriCove could survive an extended lawsuit or if such a financial strain would bankrupt the business. As spouses and business partners, their decisions affected both their personal and professional lives. Sarah and Ben struggled with a few plaguing concerns about their case. Should TriCove fight the lawsuit? Should their company countersue? What was the impact of non-compete and non-solicitation covenants in this situation? Did TriCove violate either of these covenants? Despite these concerns, they were determined to maintain confidence in their attorneys, to focus on writing two large government contract proposals, and to handle other business matters until they received further details.

On June 28, 2013, Sarah and Ben's wait was over. Sarah completed tasks in a separate office when Ben checked his email and discovered a message from GrineTec. He quickly shouted for Sarah to join him. The email stated that GrineTec planned to file the TRO at 4:45 p.m. After carefully reading the email, they called their attorneys who had already prepared paperwork in anticipation of the filing. Later that afternoon, Ben and Sarah learned more information about the TRO. Identifying Tony and TriCove as defendants, GrineTec argued that TriCove must end Tony's employment or face a lawsuit for retaining him as an employee and interfering with GrineTec's business relationships. Sarah and Ben were extremely concerned about the future of TriCove, as their legal battle with GrineTec had begun. They had to make the ultimate challenging decision: should they fire Tony or continue to retain him as an employee?

TriCove Solutions, Inc.

The youngest of ten children, Sarah Johnson was an extroverted, single mother who was raised in a close-knit family. Upon entering college, Sarah initially studied nursing but decided to change her major to computer science. After graduation, she enrolled in graduate school and obtained a master's degree in information systems. As a business owner and servant leader, Sarah believed

in governing by example and ensured that her employees had the resources needed to complete their jobs. Her service mentality also guided her to engage in countless community endeavors. She often volunteered with non-profit organizations and held key positions on various boards of directors.

A single child, Ben distinctly recalled the day that he accompanied his mother to a local grocery store and laundromat owned by a family in the neighborhood. Ben asked his mom why their family did not own a business. "Maybe if you work hard and study hard, you can start our family business one day," his mom replied. At that moment, the seed was planted. In fact, Ben knew at a mere eight years old that he was destined to be an entrepreneur. His goals, even as he matriculated through high school and college, focused on family-owned business development. He eventually graduated with a degree in technical industrial management and later received an MBA in finance and strategic planning. While working for two companies in the Columbus area, Ben was mentored by their CEOs before assuming the role of vice president for IT and corporate development at Macon Bridge in 1996. In 1997, Sarah and Ben met through a mutual acquaintance.

The genesis of TriCove Solutions began in the winter of 2002. At the age of 30, Sarah took an unexpected detour from working in IT at one hospital to performing health-care IT consulting for multiple hospitals. Sarah's job experience allowed her to witness firsthand the roles of several health-care IT consultants. That was when she thought, "I can do exactly what they do," and hence, TriCove was born. Impressed with his extensive background in business development and finance, she asked Ben, 35, for business support when she was forming TriCove. As a new business owner, Sarah traveled throughout the United States from 2002 to 2007 performing installations of health-care information systems. Eventually, their business relationship developed into a more personal one, and Ben and Sarah married in 2003. Ben left Macon Bridge to join her at TriCove when Macon Bridge was sold to GrineTec in 2007.

In 2011, TriCove shifted from a focus on health-care IT to primarily U.S. government contracting. In 2013, TriCove had four prime and five subprime government contracts with assets totaling $3.5 million. Led by its mantra of providing results through resolving problems, the company grew from having only Sarah, Ben, and one employee in 2007 to over sixty-five employees in 2018.

As a business team, Ben and Sarah complemented each other. Sarah's outgoing charm and easy smile created an atmosphere of warmth and comfort that quickly drew people to her. Ben, an introverted businessman, was mild-mannered and kind yet supremely task-oriented. Sarah possessed a likeability and diplomacy that served to moderate Ben's keen focus on management and project completion. Sarah commented, "We work well together because Ben has a vision and is focused on making it come true. Meanwhile, I'm a people person and ensure that our employee and relational needs are met." Their combined attributes yielded a family-friendly, effective work culture at TriCove. In 2015, the company received the Muscogee County Chamber of Commerce Small Business of the Year Award. In 2017, it was the recipient of a prestigious national award for women-owned businesses.

The strategic growth of TriCove was due, in part, to the company's participation in the U.S. Small Business Administration's (SBA) 8(a) Business Development Program. The SBA implemented the 8(a) Business Development Program for small businesses that were "owned and controlled at

least 51% by socially and economically disadvantaged individuals." Program members obtained sole-source contracts. They also created groups and collaborative projects for contract bidding. "Under federal law, socially disadvantaged individuals" were categorized as "those who have been subjected to racial or ethnic prejudice or cultural bias within American society because of their identification as members of groups without regard to their individual qualities." TriCove met part of the requirements of the 8(a) Business Development Program because Sarah and Ben were both Black Americans (U.S. Small Business Administration, 2018).

Legal Troubles for TriCove

The TRO hearing was held in the first week of July. GrineTec's senior in-house counsel explained the allegations against TriCove. As a former executive vice president, Tony mentally retained invaluable insight of confidential material and corporate strategies that, if provided to a competitor like TriCove, could prove fatal to GrineTec. For these reasons, all executives were required to sign noncompete agreements as a part of their employment packages.

The key portions of the noncompete clauses in the GrineTec employment contract stated:

1. Section G: An executive could not directly or indirectly provide confidential company information, secrets, or any other such knowledge not located in the public domain that was obtained during employment with the company with any person and/or entity. Such actions were wrongful and could lead to tremendous detriment to the company; and

2. Section J: For a term of two years from the date of termination of employment, the former executive could not directly or indirectly make verbal or written statements that could cause harm to the reputation of the company. (*Plaintiff v. Defendant*, 2013).

A nonsolicitation clause in the employee handbook also revealed that former executives could not encourage current executives and employees to leave GrineTec, specifically in cases where they would work in the same industry. If committed, these actions violated the employee handbook and possibly state-level unfair competition laws, which were deceptive business practices that could cause financial harm. GrineTec believed that because TriCove hired Tony, he could then attract several other employees who worked at GrineTec's Las Cruces, New Mexico facility. From GrineTec's perspective, the TRO and potential lawsuit were a result of TriCove hiring Tony, who had allegedly violated both of his former employer's noncompete and nonsolicitation clauses.

Ben and Sarah were astounded by the allegations. Having built their business with the intent of leaving a family legacy, their goal was to accomplish TriCove's mission of "delivering the best results to every customer." Their objectives were to make decisions based on their morals and values and to not jeopardize their livelihoods for financial gain.

In the TRO hearing, Sarah and Ben countered GrineTec's allegations. Ben previously worked closely with Tony at Macon Bridge from 1996 to 2007 and had been mentored by its CEO. In fact, Tony and Ben had guided Macon Bridge to become the successful company that was sold to GrineTec. It was not unusual for TriCove and GrineTec to collaborate on government projects. The IT and government contracting communities in Columbus were small, and most of the people

knew each other. More importantly, Tony had not shared any information about GrineTec with Ben and Sarah, and they had not asked him to divert current or future business from GrineTec to TriCove. A highly competitive, hard worker, Tony was a talented businessman in his fifties, but at times struggled with customer relations and maintaining civility with colleagues and company leadership. He was employed with Macon Bridge from 1996 until it was sold to GrineTec in 2007. He ultimately became the executive vice president of one of GrineTec's largest divisions for about six years.

Tony had a strained relationship with Conrad Bianchi, GrineTec's new CEO. Conrad was in his fifties and had risen to fame as CFO of another large government contractor. At GrineTec, he started acquiring small businesses like Macon Bridge to enhance its government contracting division and to build relationships with stockholders and potential investors. He also supported a corporate work culture instead of the family-oriented one that had existed at Macon Bridge; Conrad made his business decisions based on finances and not relationships. During the acquisition process, the Macon Bridge CEO told Conrad about Tony's personality and management style. Tony was an asset who needed coaching and mentoring. At Macon Bridge, Tony was given the freedom to make his own decisions. He regularly acted independently and was very forthcoming in his opinions. A trusted colleague had acted as a buffer for Tony when he struggled with effectively communicating with coworkers and clients. GrineTec lacked such a buffer for him. The cultural shift that occurred when Conrad became CEO caused problems with employees and some executives like Tony. At one point, Conrad directed the executives to refrain from giving their employees end-of-the-year bonuses. However, Tony gave bonuses to his employees despite Conrad's directive. In time, after admonishing Tony on a few occasions and without consulting GrineTec's in-house counsel, Conrad fired Tony in March 2013. No one knew the specific details that led to Tony's departure. Two months later, Tony joined TriCove in May 2013.

To further counter the allegations, Ben and Sarah testified that in 2012, they submitted a bid to the U.S. Army Mission and Installation Contracting Command (MICC) at the Fort Benning U.S. Army base in Georgia. Before they could receive the bid award, TriCove had to hire more personnel to complete the assignment; therefore, the company placed an announcement for one year on a popular online job board. Among the numerous applications received, at least four GrineTec employees who worked at the Las Cruces site stood out. The MICC awarded TriCove the bid in September 2012. Because government procedural delays caused multiple setbacks, TriCove had been unable to interview and fill positions before hiring Tony. In support of their character and professional reputation, Sarah and Ben demonstrated how their business had been featured in the news repeatedly; the couple was also active in a number of community service activities. This character evidence reinforced what Tony had said all along–he desired to work at TriCove because of Ben and Sarah's reputations and work ethic. Lastly, Tony had not been in contact with any GrineTec employees after he was fired.

GrineTec attorneys also provided a response to the court. According to the GrineTec CEO, TriCove was incapable of performing technical work on government contracts. Conrad stated that TriCove was "nothing more than a janitorial service for local businesses." He further mentioned that if TriCove was able to secure notable government contracts, then these accomplishments were because of Tony's assistance. By hiring a former GrineTec executive, TriCove was helping Tony,

who violated the noncompete and nonsolicitation agreements, to hurt GrineTec and, by doing so, was unlawfully interfering with GrineTec's business relationships.

At the end of the TRO hearing, an interesting, unanticipated development occurred. GrineTec could not produce a copy of the noncompete agreement that the corporation said Tony had signed. GrineTec's in-house counsel stated that the agreement was not in his employment file, but that all executives were required to sign one. In contrast, Tony affirmed that he never signed a noncompete agreement.

After a mid-day recess to review the evidence, the presiding judge dismissed the TRO. Without a signed noncompete agreement, the court had no choice but to rule in favor of TriCove; specifically, the court dismissed GrineTec's claim that Tony violated the noncompete agreement. GrineTec also could not prove that immediate harm would impact its business if TriCove hired the employees at GrineTec's Las Cruces, New Mexico facility. Without enough proof, the court could not grant a TRO in favor of GrineTec's solicitation allegation.

Despite the legal victory for TriCove, GrineTec's attorneys were prepared for such an outcome. At the end of July 2013, GrineTec sued TriCove for tortious interference of contracts and business relationships[5]. GrineTec explained in the legal complaint that its main problem centered on TriCove's hiring and retaining of Tony, the executive whose strength was in foreign military sales. GrineTec aimed to prove that Tony violated the nonsolicitation clause of the employment handbook, and that by hiring him, TriCove was benefitting from Tony's knowledge of GrineTec employees. If those employees were hired by TriCove, then Ben and Sarah's company would directly benefit by interfering with GrineTec's contracts and business relationships. By going to trial, GrineTec in-house counsel would gather additional evidence to prove the nonsolicitation allegation. Sarah and Ben were surprised by the turn in events and questioned their attorneys as to whether they should countersue GrineTec for a filing a frivolous lawsuit[6] against TriCove.

The Impact of the Case

From August to September 2013, Sarah and Ben endured the grueling demands of the legal process while balancing their work responsibilities. For the first few weeks in August, they reviewed and gathered information in response to the requests of GrineTec counsel. At least 35% of each workday in August was consumed with locating information and formulating responses to questions posed by GrineTec. Once gathered, they shared the information with their attorneys who then prepared legal documents to file. Tired but determined, Ben and Sarah did not have the time to travel and relax as much as they wanted because they continued to work at TriCove daily to meet with employees, to handle daily business needs, and to continue developing the two business proposals. In the midst of litigation, Ben stated, "Lawyers are nice to have but, at the end of the

[5] Tortious interference of contracts and business relationships: This is when a third party (herein TriCove) intentionally encourages or induces a contracting party (herein Tony Capelli and/or current GrineTec employees) to break a contract/clause, causing damage to the relationship of the contracting parties (herein GrineTec, Tony Capelli, and current GrineTec employees).
[6] Frivolous lawsuit: A lawsuit where allegations are baseless or with the intent to harass, seek revenge, delay, embarrass, retaliate, and/or further a cause with minimal or non-existing merit or legal foundation. A court may award sanctions, such as money, for frivolous lawsuits.

day, you must defend yourself." In addition to their range of attorneys' fees, other costs were also causing a financial strain. Ben and Sarah were responsible for paying for each document filed with the court. These filing fees as well as court costs for subpoenas, copies of paperwork, and filing motions continued to rise. Even more concerning, Sarah and Ben typically bid for multiple government contracts at one time. The lawsuit constantly interrupted their work on the ongoing drafts of the two major government bids.

The couple had discovered that defending the lawsuit would significantly affect not only their lives but also the lives of their family and friends. Ben still enjoyed great working relationships with past colleagues and friends. Sarah had developed close connections with Ben's fellow executives from Macon Bridge and GrineTec. They routinely visited each other and attended dinner parties and community events together. Sadly, their interactions changed when the lawsuit began. They no longer talked at all because they did not want to be perceived as sharing information. Later, when they saw each other in passing or at work-related events, they were cordial but no longer friendly. Regrettably, their relationships never recovered. Furthermore, Sarah's sister Gloria worked at Macon Bridge for several years. Gloria also had kept in contact with friends at the company. Having learned about the lawsuit, she worried about how it would affect their close-knit work community and, more particularly, her sister, brother-in-law, and their family business.

Sarah and Ben were stressed. They were not sleeping as much as usual because of the increase in work hours needed to respond to legal requests and the demands of owning a small business. They were also nervous about the outcome of the lawsuit and the amount of legal fees. Doing their best to focus on their company needs and to maintain confidence in their legal team, Ben and Sarah continued their day-to-day business activities despite the issues related to the lawsuit. Regardless of their efforts, they lost business opportunities. In October 2013, Ben and Sarah were unable to submit a bid for the $25 million government contract, primarily due to insufficient time to meet the challenges of the lawsuit and daily business needs. In the months preceding this deadline, they spent their time meeting with their three attorneys to read and respond to the volumes of requests for documents sent by GrineTec. They learned that GrineTec had a reputation for being litigious and for putting a number of small companies out of business. Those companies usually were operated by former employees or owners of companies that GrineTec had purchased. Their lead counsel had further communicated a statement from GrineTec's CEO who said, "They will be begging for food in the streets when I finish with them." In the past, most of the small businesses sued by GrineTec went bankrupt because they could not afford the costs associated with defending a lawsuit. Sarah and Ben pondered whether TriCove would suffer a similar fate and if the whole ordeal was a frivolous lawsuit against them. At the end of July, they had accrued almost $45,000 in legal fees. By October 2013, they had accumulated over $200,000 in legal fees and court costs.

Integrity or Finances?

GrineTec continued to press forward. Frustrated about missing the bid deadline and the amount of legal fees, Sarah and Ben were emotionally and mentally drained. In early October, Conrad called Ben and stated that he was flying to Columbus to discuss the case in person. Sarah and Ben informed their attorneys about the upcoming meeting and were advised to listen but not to agree to any offers from Conrad; their counsel believed that Conrad might offer to purchase TriCove. Conrad agreed to meet with Ben and Sarah at their attorneys' law office. Without their attorneys

present, the three individuals met to try to settle the case. In their discussions, Conrad made one point extremely clear. He said, "If you fire Tony, then I'll drop the lawsuit." As Sarah and Ben contemplated Conrad's offer, they thought, "The lawsuit is stressful, mentally, emotionally, and physically. We are a small business. All of our assets, resources, everything is tied into this company. So if something happens to it, it is our livelihood at risk." As they conveyed their varying responsibilities to their family, company, and employees, Ben further expressed, "Our reputation is on the line, but our reputation in the community is solid."

For the couple, lingering questions existed as to why the lawsuit hinged on TriCove's employment of Tony. Had they violated any noncompete or nonsolicitation covenants? Should they fire Tony or continue to fight the lawsuit? Based on what was revealed in the hearing, they felt like they were caught in the middle of a more personal disagreement between Conrad and Tony. Should they countersue and try to prove that GrineTec was bringing a frivolous lawsuit? Regardless of its source, the litigation jeopardized TriCove's long-term reputation and its very existence. After the meeting with Conrad, Sarah and Ben had to make the most important business decision that they had ever encountered. Should they fire Tony or continue to retain him as an employee?

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A SOLUTION TECHNIQUE FOR A FACILITY LAYOUT PROBLEM

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ABSTRACT

The unequal-area facility layout problem (UA-FLP) is the problem of locating rectangular facilities on a rectangular floor space such that facilities do not overlap while optimizing some objective. The objective considered in this paper is minimizing the total distance materials travel between facilities. This paper presents a mathematical model and a genetic algorithm for locating facilities on a continuous plant floor at the Toyota Motor Manufacturing West Virginia (TMMWV) plant in Buffalo, WV. In other words, a genetic algorithm, which consists of a boundary search heuristic (BSH) and the dual simplex method, is developed for an UA-FLP. The results obtained demonstrate the effectiveness of the heuristic.

INTRODUCTION

This research was motivated by the investigation of layout options for the machining department within the transmission production area of the Toyota Motor Manufacturing West Virginia (TMMWV) plant in Buffalo, West Virginia. The plant manufactures automobile engines and automatic transmissions for specific Toyota models. TMMWV made modifications to one of its products, which required an investigation of the layout of the machining department within the transmission production area. The layout had a combination of two different types of machines used for machining the older product, called model A and model B machinery. For the production of the newer product, the model A machines will be reused. However, the model B machinery will not be used and will be removed from the layout. Other additional machines used to support production will be removed and replaced. For example, two pieces of equipment used to clean products will be replaced by a single piece of equipment. As a result, this requires a re-layout of the machining department which consists of cells and other pieces of equipment, which are called facilities. Since the facilities are of unequal-area and are rectangular shaped, this problem is defined as the unequal-area facility layout problem (UA-FLP).

The UA-FLP is the problem of locating rectangular facilities on a rectangular floor space such that facilities do not overlap while optimizing some objective. According to **Tompkins et al. [1]**, between 20 and 50% of the total operating expenses within manufacturing is attributed to material handling, and it is generally agreed that effective facilities layout planning can reduce these costs by at least 10 to 30%. Therefore, the most commonly used criterion to determine the efficiency of layouts is the minimization of material handling cost. Material handling cost is the sum of the product of the flow of materials, distance, and transportation cost per unit per distance unit between each pair of facilities. Since the transportation cost is difficult to obtain, this paper considers minimizing the total weighted distance (i.e. the sum of the product of the flow of materials and distance between each pair of facilities).

In the TMMWV plant, the addition and deletion of products as well as the replacement of pieces of equipment cause the existing layout of one of its machining departments to be less efficient with respect to material handling costs. Therefore, the modification of the layout was necessary. **Francis et al. [2]** presented these and additional factors which may cause the modification of a layout, and they are as follows.

1. The addition or deletion of a product from the product line.
2. The replacement of equipment.
3. Significant increase or decrease in the demand of a product.

4. Changes in the product design.
5. Changes in the process design.
6. The adoption of new safety standards.
7. Bottlenecks in production.
8. Unexplainable delays and idle time.
9. Excessive temporary storage space.

In this paper, a mathematical formulation and a genetic algorithm (GA) are presented for the UA-FLP. In section 2, the definition, assumptions, and mathematical formulation for the UA-FLP are given. A GA for the UA-FLP is presented in Section 3. In Section 4, some computational results of the proposed techniques on a set of randomly generated test problems are given. Finally, Section 5 provides conclusions.

THE UNEQUAL-AREA FACILITY LAYOUT PROBLEM

Problem Definition

As stated earlier, the UA-FLP considered in this paper is defined as the problem of locating rectangular facilities on a rectangular floor space such that facilities do not overlap while minimizing the total distance materials travel between facilities (i.e. minimizing total weighted distance). The rectangular floor space considered is the machining department space within the transmission production area of the TMMWV plant. The facilities are defined as the manufacturing cells and pieces of equipment used to support production (e.g. washers). The manufacturing cells consist of groups of machines with their material handling system (e.g., conveyor system). Recall, the model A machines discussed earlier will be reused, and the model B machines will be removed from the existing layout. Since the model B machines form separate cells from the model A machines, the model A-machine cells will remain in the layout, and the model B-machine cells will be removed. In other words, the cells remaining in the machining department will not change (i.e. the internal layout of the cells will not change) and their dimensions are known. Since the dimensions of the cells and other pieces of equipment are known, the facilities have fixed dimensions (i.e. fixed areas). Next the assumptions are presented for the UA-FLP.

Problem Assumptions

The assumptions for the UA-FLP are as follows.

1. Facilities may have unequal-areas and are rectangular in shape.
2. Floor space available for the facilities is rectangular in shape. Also, it is continuous and constrained (i.e. available floor space has fixed dimensions).
3. The dimensions of the facilities are fixed and known.
4. Facilities may have free orientations.
5. The objective of the UA-FLP is to obtain a layout such that total weighted distance is minimized.
6. The rectilinear distance measure is used to obtain the distances between the centroids of two facilities.

Note in assumption (2) that the floor space dimensions are fixed (i.e. constrained). Oftentimes this is the case, since most FLPs require re-layout of an already existing department or production area with fixed dimensions (i.e. fixed length and width of layout area), as in the TMMWV layout problem. However, the FLP becomes more complex, since heuristics may oftentimes produce infeasible layouts, especially when the layout area is tightly constrained (i.e. percentage of free space available is low). Some papers in the literature consider an unconstrained rectangular floor space where infeasible layouts are not an issue.

Assumption (3) added with assumption (2) adds even more complexity, since facility dimensions are fixed, and are not allowed to vary as in many of the FLPs in the literature. Therefore, for FLPs with tightly constrained floor space, it becomes extremely difficult to find good feasible solutions. As stated previously, TMMWV wanted to keep the internal layouts of the cells (i.e. some of the facilities). As a result, the dimensions of these cells (facilities) are fixed. Also, they know the dimensions of the additional machines (i.e. other facilities) purchased. It is important to note that fixed facility dimensions are very uncommon in the UA-FLP literature.

Assumption (4) states that facilities may have free orientations. That is, facilities may be either horizontally or vertically oriented. If the longer side of the facility is parallel to the *x*-axis, the facility is horizontally oriented. Otherwise, it is vertically oriented.

Montreuil [3] presented a mixed integer programming (MIP) model for the UA-FLP based on the continuous representation of the floor space, but the areas of the facilities were equal. A similar model was developed by **Heragu and Kusiak [4]**. However, the facility areas are unequal with fixed dimensions. Since only small-size problems can be solved optimally using exact methods, heuristic methods were developed to solve the UA-FLP. For two good reviews of the FLP literature see **Kusiak and Heragu [5]** and **Meller and Gau [6]**.

Based on the assumptions defined above, there are only a few papers in the literature which consider the UA-FLP with facilities specifically with fixed facility dimensions such as **Dunker et al. [7]**, **McKendall and Hakobyan [8]**, and **Hakobyan and McKendall [9]**. **Dunker et al. [7]** presented a co-evolutionary algorithm for the UA-FLP. **McKendall and Hakobyan [8]** presented a heuristic which consisted of a boundary search heuristic (BSH) with a tabu search (TS) heuristic for the static and dynamic UA-FLP. **Hakobyan and McKendall [9]** presented a hybrid heuristic for the dynamic UA-FLP. The hybrid heuristic consisted of a TS heuristic and a dual simplex method. Next, a mathematical model is presented for the UA-FLP.

Mathematical Model

The indices, parameters, and variables for the UA-FLP are defined as follows.
Indices:
$i, j = 1, \ldots, N$ where N is the number of facilities.
Parameters:
$f_{ij} = f_{ij} + f_{ji}$ = units of materials which flow from facility i to facility j (consider only upper triangular matrix)
a_i = shorter side length of facility i
b_i = longer side length of facility i
L = length of the plant floor space available for layout
W = width of the plant floor space available for layout
Variables:
(x_i, y_i) = the centroid (or location) of facility i
l_i, w_i = the length and width of facility i
dx_{ij}, dy_{ij} = horizontal and vertical distance between the centers of facilities i and j
o_i = 1 if facility i is horizontal oriented and zero otherwise
$left_{ij}$ = 1 if facility i is to the left of facility j and zero otherwise
$below_{ij}$ = 1 if facility i is below facility j and zero otherwise

Next, a mixed integer linear programming (MILP) formulation is presented for the UA-FLP.

$$\text{Minimize } z = \sum_{i=1}^{N} \sum_{j>i}^{N} f_{ij} (dx_i - dy_i) \qquad (1)$$

Subject to

$$x_i \geq 0.5l_i \quad \forall\, i \tag{2}$$
$$x_i \leq L - 0.5l_i \quad \forall\, i \tag{3}$$
$$y_i \geq 0.5w_i \quad \forall\, i \tag{4}$$
$$y_i \leq W - 0.5w_i \quad \forall\, i \tag{5}$$
$$x_i + 0.5l_i - x_j - 0.5l_j \leq L(1 - left_{ij}) \quad \forall\, i, j \neq i \tag{6}$$
$$y_i + 0.5w_i - y_j - 0.5w_j \leq W(1 - below_{ij}) \quad \forall\, i, j \neq i \tag{7}$$
$$left_{ij} + left_{ji} + below_{ij} + below_{ji} \geq 1 \quad \forall\, i, j \neq i \tag{8}$$
$$l_i = a_i o_i + b_i(1 - o_i) \quad \forall\, i \tag{9}$$
$$w_i = b_i o_i + a_i(1 - o_i) \quad \forall\, i \tag{10}$$
$$dx_{ij} \geq x_i - x_j \quad \forall\, i \tag{11}$$
$$dx_{ij} \geq x_j - x_i \quad \forall\, i \tag{12}$$
$$dy_{ij} \geq y_i - y_j \quad \forall\, i \tag{13}$$
$$dy_{ij} \geq y_j - y_i \quad \forall\, i \tag{14}$$
$$x_i, y_i, l_i, w_i, dx_{ij}, dy_{ij} \geq 0 \quad \forall\, i, j \neq i \tag{15}$$
$$o_i, left_{ij}, below_{ij} = 0 \text{ or } 1 \quad \forall\, i, j \neq i \tag{16}$$

Objective function (1) minimizes the sum of the weighted distances. Constraints (2)-(5) ensure that the facilities are within the boundary (area) of the plant floor space available for layout. Constraints (6)-(8) are used to ensure that facilities do not overlap. Constraints (9)-(10) control the orientation of the facilities. For example, if facility i is horizontally (vertically) oriented, set $o_i = 1$ ($o_i = 0$). If o_i is not set to 0 or 1, the model will determine the orientation of facility i such that total weighted distance is minimized. Constraints (11)-(14) are used to obtain the rectilinear distances between the centers of facilities. Last, the restriction on the variables are given in constraints (15) and (16). Since the MILP model presented above can only be used to solve small-size problems, a heuristic technique is presented next for the UA-FLP.

A GENETIC ALGORITHM (GA) FOR THE UA-FLP

A GA is developed for the UA-FLP presented in the previous section. The proposed GA consists of a BSH and the dual simplex method. The GA consists of the following five stages.

1. Randomly generate a set (or population) of solutions (P_0).
2. The BSH presented in **McKendall and Hakobyan [8]** is used to construct the layout and determine the total weighed distance (TWD) for each solution in P_0.
3. Improve layout for chromosomes in P_0 (obtained in stage 2) or P_g using the dual simplex method.
4. Perform crossover and mutation operations on best set of solutions from stage (3) to produce a new population of solutions (P_g).
5. Repeat stages (3) and (4) on P_g until a stopping criterion is met.

The main components of the proposed GA are the solution representation, BSH, and the crossover and mutation operations. Each of these components are discussed below.

Solution (Chromosome) Representation

For the proposed GA, the solution or chromosome is represented as a permutation of the facilities {1, 2, …, N}. For example, randomly generating a chromosome for a UA-FLP with 6 facilities ($N = 6$) may produce the following chromosome.

$\pi = \{2, 3, 6, 5, 1, 4\}$

In other words, facility 2 is in position 1 (i.e. $\pi(1) = 2$), facility 3 is in position 2 (i.e. $\pi(2) = 3$), and so on.

In stage 1 mentioned above, a set of chromosomes are generated randomly for the initial population P_0. Note, the solution representation (chromosome) does not specify the location (x_i, y_i, l_i, w_i) and orientation (o_i) of each facility i. The BSH presented in **McKendall and Hakobyan [8]** is used to construct the layout and determine TWD for each chromosome in P_0.

Boundary Search Heuristic (BSH)

The BSH presented in **McKendall and Hakobyan [8]** is a construction algorithm used to produce the layout and determine TWD for each chromosome in P_0. Given a solution (chromosome) π a placement procedure is used to assign facilities to locations on the plant floor. First, facility in position 1 (i.e. $\pi(1)$) of π is placed at the center of the plant floor. Next, facility in position 2 (i.e. $\pi(2)$) of π is placed on the boundary of facility $\pi(1)$. Note, the best location on the boundary is selected for the location of facility $\pi(2)$ with respect to minimizing TWD. The facility in position k (i.e. $\pi(k)$), is place on the boundary of already placed facilities (i.e. $\pi(1)$, $\pi(2)$, …, $\pi(k-1)$) such that TWD is minimized and layout is feasible (i.e. facilities placed are within the boundary of the floor space). See **McKendall and Hakobyan [8]** for details.

At the end of stage 2, once BSH is used to generate a layout for each chromosome in P_0, the variables for the MILP model (i.e. x_i, y_i, l_i, w_i, dx_{ij}, dy_{ij}, o_i, $left_{ij}$, $below_{ij}$) are obtained for each layout. In stage 3, the chromosomes are improved using the MILP model presented earlier for the UA-FLP. More specifically, the binary variables for the relative locations (i.e. $left_{ij}$, $below_{ij}$) and orientations (i.e. o_i) obtained by BSH for each layout are used as input data in the MILP for the UA-FLP. The resulting formulation is a linear programming (LP) model. Each LP model for each chromosome in P_0 is solve using the dual simplex method. These layouts often improve the layouts constructed in stage 2. Afterward, each layout is improved using the crossover and mutation operations on the best set of solutions from stage 3. Next, the proposed GA is presented for the UA-FLP.

Genetic Algorithm (GA)

The propose GA generates a number of solutions (chromosomes) and adds them to the new generation of chromosomes P_g, where g is the current generation (iteration) of the GA. At the initial iteration ($g = 1$), the GA starts by randomly generating the initial population of chromosomes (P_1). More specifically, each chromosome in P_1 is generated randomly, and the TWD and *plant floor feasibility* status is evaluated by constructing the layout using BSH. On the other hand, each solution in P_g, for $g > 1$, is either randomly generated (i.e. mutation operation is used), or it is generated from two solutions, randomly selected from population P_{g-1} (i.e. crossover operation is used). The chromosomes obtained by applying crossover operation inherit features from both parent chromosomes. At each generation g of the GA, *Max_Num_Cross* chromosomes are generated using crossover operation, but only *Gen_Size* (*Gen_Size* < *Max_Num_Cross*) best chromosomes are kept in the new generation P_g. The generated chromosome is added to P_g, only if it is better than the worst chromosome in P_g and a chromosome similar to π has not already been added to P_g. After the new population P_g, for $g > 1$, is generated, *Num_Rand_Chrom* (*Num_Rand_Chrom* < *Gen_Size*) chromosomes are randomly generated (mutation operation), and replace the worst chromosomes in P_g. The chromosomes in each generation P_g are stored in such a way, that higher quality chromosomes precede lower quality chromosomes (as in Drezner, 2003). The stopping criterion for the proposed GA is the maximum amount of time *Max_Duration*, to run the heuristic.

As in most GAs, where the chromosome represents a permutation of numbers, as in the proposed GA, the crossover operation may produce infeasible chromosomes, if a technique is not used to generate feasible chromosomes. The following technique is used to generate feasible chromosome π, when performing the crossover operation to parents π^1 and π^2:

Step 0: Set $k1 = 0.2N$, $k2 = 0.5N$, *cross_point* = 1, and *num_cross_points* = 0.

Step 1: Set *num_cross_points* = *num_cross_points* + 1.
Add crossover point *cross_point* to vector *cross_points*.
Set *cross_point* = *cross_point* + Random number between *k1* and *k2*.
If *cross_point* ≥ *N*, then go to Step 2.
Else go to Step 1.
Step 2: Set *cross_point* = *N* and *num_cross_points* = *num_cross_points* + 1.
Add crossover point *cross_point* to vector *cross_points*.
Set *r* = 1.
Step 3: Copy the genes (facilities) $cross\_points_r$ through $cross\_points_{r+1}$ from chromosome π^1 to the same positions in chromosome π.
Set *r* = *r* + 2.
If *r* < *num_cross_points*, go to Step 3.
Else go to Step 4.
Step 4: Copy all the facilities in chromosome π^2 which have not been copied from π^1 into positions in π which have not been filled.

The steps of the proposed GA are given below.
π*_worst* = worse solution in current population *g* (P_g)
Recall, in P_g, chromosomes are ordered in ascending order based on TWD.

Step 1: *Initialize parameters*.
Initialize parameters *Gen_Size*, *Max_Num_Cross* > *Gen_Size*, *Num_Rand_Chrom*, *Max_Duration*.
Set *g* = 1;
Set *curr_parents_offspr_count* = 0 (number of chromosomes generated from current pair of chromosomes using the crossover operator).
Set TWD* = large number.
Step 2: *Start new population*.
Set *chromosome_count* = 0 (number of chromosomes generated at iteration *g*).
Step 3: *Generate chromosome*.
If *chromosome_count* ≥ *Max_Num_Cross* then go to step 5;
Else
If *g* = 1, then
Randomly generate chromosome π.
Else
If *curr_parents_offspr_count* = 0 then
Randomly pick two chromosomes π' and π'' from the generation P_{g-1} and set $\pi^1 = \pi$' and $\pi^2 = \pi$''.
Set *curr_parents_offspr_count* = *curr_parents_offspr_count* + 1;
Else
Set $\pi^1 = \pi$'', and $\pi^2 = \pi$'.
Set *curr_parents_offspr_count* = 0.

Generate chromosome π from π^1 and π^2 by applying crossover operation.

Generate the layout corresponding to chromosome π using BSH.
Step 4: *Add chromosome* π *to new population, and run BSH with* π *as a starting solution*.
Set π*_worst* = P_{g,Gen_Size};
If *chromosome_count* < *Gen_Size* or TWD(π) < TWD(π*_worst*)
If TWD(π) < TWD*

Initialize TWD*, x^*_i, y^*_i, l^*_i, and w^*_i from the values TWD(π), x_i, y_i, l_i, and w_i, respectively.

Add chromosome π to new generation P_g. When adding the chromosome to the generation, make sure that the higher quality solutions precede lower quality solutions. Also, if *chromosome_count* ≥ *Gen_Size*, then drop the worst (*Gen_Size*-th) chromosome from P_g.

Run the dual simplex method to improve the chromosomes. This TS will modify the values of TWD*, x^*_i, y^*_i, l^*_i, and w^*_i, if it finds a better solution, than the best solution found thus far.
Set *chromosome_count* = *chromosome_count* + 1, and go to Step 3;

Step 5: *Check stopping criterion and add random chromosomes to the new population*.
If the heuristic has been running for more than *Max_Duration* minutes, then
go to Step 6.
Else
Remove the last *Num_Rand_Chrom* (worst) chromosomes from P_g, and add *Num_Rand_Genes* randomly generated chromosomes to the generation. While adding new chromosomes to the generation, make sure that higher quality solutions precede lower quality solutions.
Set $g = g + 1$, and go to Step 2.

Step 6: Output the best solution (i.e. x^*_i, y^*_i, l^*_i, w^*_i for all $i = 1, \ldots, N$), and terminate the heuristic;

COMPUTATIONAL RESULTS

A set of test problems are used in this paper in order to test the performance of the proposed GA. More specifically, the first problem, P6, is a 6-facility UA-FLP, the second, P8, is an 8-facility problem, and the third, P10, is a 10 facility problem. All of which were generated randomly. The fourth and fifth problems (i.e. P20 and P50) are 20- and 50-facility problems available in the literature from the commercial software VIP-PLANOPT. For the last two problems, the floor space is unconstrained, and the Euclidean distance measure is used in problem P50. In this paper, the rectilinear distance measure is used on all the test problems. Also, in all experiments, a Pentium IV 3.6 GHz was used to solve the problem instances, and the proposed GA was coded using the C++ programming language.

Recall, the GA parameters are *Gen_Size*, *Max_Num_Cross*, *Num_Rand_Chrom*, and *Max_Duration*. The number of random solutions, *Num_Rand_Chrom*, generated at each generation was set to 0.1*Gen_Size*. The values used for parameters *Gen_Size*, *Max_Num_Cross*, *Max_Duration* are shown in Table 1.

Problem Instance	Gen_Size	Max_Num_Cross	Max_Duration (minutes)
P6	30	60	1
P8	10	20	1
P10	30	60	1
P20	25	50	5
P50	30	60	5

Table 1. GA heuristic parameter setting.

Each test problem were solved five times, since the GA is stochastic, and the outcome can be different for different runs. The TWDs and the runtimes are shown in Table 2. Note, problems P6 and P8 were solved using the MILP model presented earlier and the CPLEX solver, and the optimal solutions were obtained. Problem 6 obtained the optimal solution in 11.6 seconds. However, problem P8 obtained the optimal

solution in approximately 28 hours. Note, the proposed GA were unable to obtain the optimal solutions within 1 minute for both problems P6 and P8. Even with five different runs, the GA produced the same TWD for each run for both problems. This is not surprising, since GA is a stochastic heuristic, and oftentimes it may obtain solutions in the vicinity of a good local optima without ever converging to the local optima. This was observed after running a simple tabu search heuristic on the solution obtained by the proposed GA for problems P6 and P8. After a few iterations, the optimal solutions were obtained.

Problem Instance	Run 1	Run 2	Run 3	Run 4	Run 5	CPLEX Solver
P6	19009.81	19009.81	19009.81	19009.81	19009.81	18744.59
P8	5667.17	5667.17	5667.17	5667.17	5667.17	5637.16
P10	10426.24	10463.54	10463.57	10450.05	10450.05	--
P20	1155.98	1180.33	1148	1151.13	1141.79	--
P50	90279.73	91695.33	91099.32	92111.88	90518.35	--

Table 2. Summary of results for proposed GA and CPLEX Solver.

CONCLUSIONS

In this paper, a GA was developed for an UA-FLP encountered at the TMMWV plant. The proposed GA consisted of the BSH and the dual simplex method. BSH was used to construct layouts, and the layouts were improved using the mathematical model and the dual simplex method. Instead of solving the problem from scratch, from one iteration to another, some of the right hand side values of the LP model were updated/modified, and the model is quickly solved using the dual simplex method. In order to conclude that the proposed GA is effective for solving the UA-FLP, more computational experiments need to be performed. However, as stated previously, in some cases the GA may have difficulty converging to the local optimum. As a result, for future research, the tabu search heuristic can be used to search for the local optimum for each chromosome during each generation (i.e. develop a memetic heuristic for the UA-FLP).

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Title: Adapting key learnings from learning analytics to online public administration education

Abstract: In this study, the researcher sought to determine predictors of (a) student success in learning tasks and (b) efficiency in student task attempts necessary to achieve success for at-risk students in an online public administration learning environment. The study was informed by archival (de-identified) data gathered in the United Kingdom from students in an online education setting, which bears many similarities to public administration students in the US, aseptically in online settings: namely, non-traditional student demographics, less restricted enrollment, and a completely online education structure. A series of logistic regressions yielded two findings. First, the only statistically significant predictor of student success is the number of course attempts. Therefore, since number of attempts is a more statistically significant predictor of student completion than student demographics, understanding what influences how many course attempts students need in order to be successful can be more useful for targeted educational policy-making. Second, for those who only required one attempt to be successful, the number of previously studied credits was the only significant predictor. For those who required more than one course attempt, age was also a significant predictor. Thus, the number of credits students had prior to taking an online course is a useful predictor of whether a student is successful the first time they attempt an online learning module. For those who seem to need numerous attempts before being successful, age seems to be more of a statistically significant predictor than any other demographic factor.

Advice for Addressing Multicollinearity in Regression Models used for Analytics

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ABSTRACT

Multicollinearity can occur when performing a multiple regression analysis with a set of predictor variables that are interrelated rather than being truly independent variables. If one can design an experiment or study so that the predictor variables are independent (zero correlated), then multicollinearity will not be of any concern when building a multiple regression model. However, data for analytics studies typically are not obtained by a designed experiment or study. As a result, the predictor variables for almost all analytics studies are correlated to some degree and multicollinearity should be addressed when building a multiple regression model. This paper gives advice for addressing multicollinearity when building a regression model for analytics.

INTRODUCTION

Multicollinearity, like many other afflictions, may not be immediately obvious to the untrained observer. Hence, it is important that analysts building regression models for analytics studies be knowledgeable of multicollinearity and how it can affect model results.

To provide a definition of multicollinearity we use the following description obtained from Wikipedia, 6-2-2019. "In statistics, multicollinearity (also collinearity) is a phenomenon in which one predictor variable in a multiple regression model can be linearly predicted from the others with a substantial degree of accuracy. In this situation, the coefficient estimates of the multiple regression may change erratically in response to small changes in the model or the data. Multicollinearity does not reduce the predictive power or reliability of the model as a whole, at least within the sample data set; it only affects calculations regarding individual predictors. That is, a multivariate regression model with collinear predictors can indicate how well the entire bundle of predictors predicts the outcome variable, but it may not give valid results about any individual predictor, or about which predictors are redundant with respect to others."

To better understand the issue, we look to how the vector of regression coefficients is calculated using matrix algebra. Suppose that the analyst has n rows of data for a response variable y and n rows of data for p different predictor variables (say x_1, x_2, … x_p). Y denotes an n by 1 vector of response values. X will denote an n by (p+1) matrix, where the first column has n values of 1

and the remaining columns will be the values for the predictor variables x_1 through x_p. B will denote the vector of ordinary least squares coefficients for the regression model with $\hat{Y} = b_0 + b_1 \bullet x_1 + b_2 \bullet x_2 + \ldots + b_p \bullet x_p$. Using matrix operations, $B = (X' \bullet X)^{-1} \bullet (X' \bullet Y)$. If one of the x variables can have its values calculated using a linear function of other x variables, which means that one x variable is the linear combination of one or more of the other x variables, then the matrix inverse of $X' \bullet X$ cannot be calculated. If none of the predictor variables are precisely linear combinations of other variables, but there is a high degree of interrelatedness among two or more predictor variables, then this creates what is termed as an ill-conditioned $X' \bullet X$ matrix. The process for inverting the matrix and calculating the regression coefficient estimates becomes unstable increasing the likelihood of unreasonable coefficient estimates.

INDICATORS OF A POTENTIAL MULTICOLLINEARITY PROBLEM

There are is no statistical test to be able to test *H_0: There is No Multicollinearity Problem* versus *H_A: There is a Multicollinearity Problem*. Hence, to detect the likelihood of a multicollinearity problem with a multiple regression model, one must use one or more measures of interrelatedness among the predictor variables. The likelihood of a multicollinearity problem increases as the level of interrelatedness among the predictor variables increases. We present three interrelatedness measures typically used to evaluate the likelihood of a multicollinearity problem with a given set of predictor variables.

- **Bivariate Correlations** measure the degree of linear relationship between two variables. If two variables that are included as predictor variables in a multiple regression analysis and are highly correlated (positively or negatively) then these variables clearly violate the assumption of independence making the Ordinary Least Squares process for estimating their regression estimates unstable. However, using bivariate correlations alone may not detect a linear relationship between multiple variables.
- **Tolerance** is a measure calculated for each variable relative to the other predictor variables. Its represents the proportion of variability that is not explained by the other predictor variables in the regression model. To calculate the value of Tolerance for a variable, first calculate an R^2 value with multiple regression using that variable as the response variable and all of the other x values as predictor variables. Then Tolerance = $1 - R^2$. When tolerance is close to 0, there is a strong linear relationship with the other predictor variables. This translates into having a high likelihood of a multicollinearity problem when performing a multiple regression with this set of predictor variables.
- **Variance Inflation Factor,VIF**, is also a measure calculated for each variable and is calculated by simply finding the reciprocal of Tolerance. Hence, VIF = 1 / Tolerance. It measures the degree to which the interrelatedness of the variable with other predictor variables inflates the variance of the estimated regression coefficient for that variable. Consequently, the square root of the VIF is the degree to which the collinearity has increased the standard error for that variable. Therefore, a high VIF value indicates a high likelihood of a multicollinearity problem for that variable's coefficient estimates. This is because a high variance indicates instability of the regression coefficient estimation process. VIF=1 is an ideal value for a variable indicating that the variable is not linearly related to any of the other predictor variables. VIF=10 is often a suggested limit for indicting a multicollinearity problem for an individual variable (VIF=10 inflates the Standard Error by 3.16). Some would consider VIF=4 (doubling the Standard Error)

as a minimum for indicated a possible multicollinearity problem. If one wants to put the risk of having a multicollinearity problem for a given set of predictor variables then we suggest this VIF guideline:
VIF $\geq$ 10, a multicollinearity is highly likely
$4 \leq$ VIF $<$ 10, a multicollinearity is moderately likely.

MULTIPLE REGRESSION FOR ANALYTICS

We are focusing on building a multiple regression model for analytics. We will use the definition of analytics provided by Davenport and Harris [2], "By Analytics we mean the extensive use of data, statistical and quantitative analysis, exploratory models, and fact-based management to drive decisions and actions." In this context, we need to ask what estimates from the regression output will be used to drive decisions. We advocate that analytics decisions are most likely based on either

1. a predicted value for the outcome or response variable or
2. value(s) of one or more specific variable coefficients.

If the primary goal of the analysis is to predict a value for a response variable, then as the Wikipedia statement says, "Multicollinearity does not reduce the predictive power or reliability of the model as a whole, at least within the sample data set." As long as the model is used for data that are similar to the data set used to create the model, then the reliability of this model prediction would not be affected by multicollinearity. The analyst building the model could assume that they do not need to be concerned about multicollinearity for this situation.

If one or more specific variable coefficient values will be used for the decision making, then multicollinearity is extremely important to assess. This is true because the regression coefficient estimates become unstable when there is a high degree of relatedness among the predictor variables.

One might conclude that the analyst building a regression model only needs to be concerned about multicollinearity when a decision will use variable coefficients directly for making the decision. However, there is another important point to consider. In many situations, the analyst is not the decision maker. Even if the model will predict the value of a response variable well, the analyst will have to sell the model to a decision maker. If one or more of the variable coefficients has a positive or negative sign that is counter to what the decision maker thinks the influence should be on the response, then the analyst must now sell a model that does not make sense to the decision maker. Even if the analyst is the decision maker, a situation may arise when the analyst has to defend the model. It is difficult to defend a model that has one or more coefficients that do not make sense.

We argue that multicollinearity is always important when building regression models for analytics. The bottom line is that it does not make sense to have regression model with variable coefficients that do not make sense.

SUGGESTIONS FOR BUILDING A REGRESSION MODEL FOR ANALYTICS

There are multiple criteria that should be considered for deciding what is the best model to use for a particular situation when building a multiple regression model. We present four

guidelines/criteria used in teaching regression modeling. We do not attempt to assign any weighting for the importance of these individual criteria since that would depend on the specific situation.

1. **Choose a model that explains as much of the total variability of Y as possible.**
   Bigger R^2 is better.
2. **Choose a simple model (Remember the KISS principle).**
   Keep **I**t **S**imple for **S**tatistics. A smaller number of predictor variables is simpler. A simpler mathematical function is easier to explain to a decision maker.
3. **Only include variables with coefficients that make significant contributions to the model.**
   For analytics modeling, the analyst must consider practical significance of a variable rather than merely considering statistical significance when deciding whether to include a variable or not. Regression modeling computational packages report a 2-tail p-value for each variable in the model. For some variables to make sense in a model, the variable should only have a positive or negative effect on the response variable. For such variables, the test must be a 1-sided or 1-tail test rather than 2-tailed. Practical significance should also be considered in addition to statistical significance. Is the amount of change in the response variable for a unit or multiple units of change in the predictor variable one that a decision maker would consider to be of practical significance?
4. **Make sure the model makes sense relative to your understanding of the situation.**
   This a final important check that the analyst must perform. It is important to be able give a definite yes as your answer to this question. Can this model be explained satisfactorily to the decision maker?

Analytics problems often have a very larger number of potential predictor variables. Rather than beginning the modeling process by trying to put all of them into the model, the analyst may want to do some preliminary screening to select variables to be potential predictor variables initially in the model building process. To avoid the possibility of multicollinearity induced problems with the model, it would be ideal if all of the predictor variables were truly independent of each other (zero correlated) or at least close to that.

One way to get a set of truly independent predictors using all of the predictors is to use principal component analysis to create a set of new variables (principal components) that are linear combinations of the original variables. The values for these new variables (scores) can be used as predictor variables in a multiple regression and the VIF values for these variables will all be 1.

To understand what the principal components represent, consider a sequential process of defining new dimensions (directions) that determine the principal components in the space defined by the values of p variables. The coefficients for each principal component are calculated to determine the direction in the unexplained variable space that explains the maximum amount of variability in this unexplained space. The component's values or scores for each observation can be determined by projecting each observation perpendicularly onto the line describing the direction. The variability of these scores is the maximum possible. Once one direction (principal component) has been determined then another is determined with the constraint that it is perpendicular to all previously determined directions (principal components). Each time a principal component is defined, the dimension of unexplained space decreases by

one and the dimension of the explained space increases by one. This is a dimension reducing procedure with the number of retained dimensions (principal components) being less than the number of original variables. The values or scores for each component are zero correlated with (independent of) all previously determined directions (principal components) that define the explained space.

However, the linear combination created by the principle components analysis may not pass the "Does it make sense?" hurdle. In some cases, the created principal components may be similar to an average of other variables, but that is not always the case and trying to explain what each principal component represents can be difficult. By using principal components as the solution method for a factor analysis one may rotate the solution space so that the factors (components) better align with the original variables. This may improve the interpretability of the factors/components. Also, one can use the factor loadings to select the variable with the largest absolute value of the loading to obtain a variable to represent that dimension. This should provide a set of variables to use as potential predictors that should not have a multicollinearity problem.

Another way to get a set of variables is to cluster the variables into sets of variables that have similar values. Then a variable can be selected from each cluster. JMP actually has a procedure for clustering variables and it will select the "Most Representative Variable" from each cluster.

There is no magic formula for building the best model. Generally it is obtained through some trial and error until the model builder arrives at a model that explains a satisfactory portion of the variability of the response variable and is a model that can be explained satisfactorily to the decision maker. When there is no one model that clearly stands out as being "the best one," then the analyst may want to use more than one model. Using multiple models will give multiple values for the characteristic or characteristics of interest. The standard error of a predicted value of the response variable or the standard error of a coefficient estimate can be calculated, but these measures of uncertainty (variability) are based on the population values being determined by a linear relationship with the variables in the model. If the analyst has not arrived at a single model as being the best one then there is clearly uncertainty relative what variables would be in a population model. Observing the variability of the characteristics of interest for multiple models would help give a measure of variability that included the variability due to the uncertainty associated with not knowing what variables would be in a population model. The analyst should not underestimate the uncertainty associated with the predicted values for the characteristics of interest.

SUMMARY

We will follow the KISS principle for the summary, **K**eep **I**t **S**imple for **S**ummaries.

- Do not ignore multicollinearity when building a multiple regression model for analytics.
- Make sure that the final model or models make sense.
- Consider using multiple models to get a better understanding of the true variability associated with characteristics of interest that will be used by the decision maker.

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PANEL - AI and the future of Business School Curriculum

Abstract

This panel will discuss the impact of AI (artificial intelligence) on future business school curriculum. Just has data analytics has become an important part of today's business school curriculum, in the coming years AI will play an even bigger role. In the near future AI will assist everyone in business. Decisions will seldom be made without AI assistance.

Rick Weible - Chair & Moderator (Marshall University)

Avinandan Mukherjee (Marshall University)
Edward Aractingi (Marshall University)
Caleb Bradberry (Radford University)

Ten years ago the IT literature was full references to big data, business intelligence, data scientists and data analytics. Today the headlines are artificial intelligence and machine learning. It took several years for business school curriculum to recognize the importance of data analytics. But if we are to prepare for the future of when need to look at upcoming technologies that are being introduced at Internet speed.

Technological development happens at an accelerating pace. There are many studies that have shown technological growth is exponential. Exponential meaning that technology is just not an incremental improvement, but a doubling. Gordon Moore, one of the founders of Intel, identify this trend and it is now known as Moore's law. Moore on observed the number of transistors that could be placed on an integrated circuit doubles every 18 months. This means computer power doubled and the price was cut in half every 18 months. Incremental increases would have been 1, 2, 3, 4 etc. Moore observed, the actual rate of change was 1, 2, 4, 8, 16, 32, etc.

The human side of technology development, i.e. software and programming have continued to march along incrementally. So although the technology side has grown rapidly our ability to exploit the technology improvements have been limited.

In the near future, artificial intelligence or machine learning will be achieved. Meaning the computer programming will be able to think for itself. Meaning you will be able to develop its own software and write its own programs.

What this means is the end of incremental programming and the introduction of exponential programming. Electronic circuits are a million times faster than biological or human circuits. This means artificial intelligence systems will be millions of times faster than human programmers. One estimation is that an artificial intelligence machine will do 20,000 years of human thinking in one week for 500,000 years of human thinking and six months. This means the computer will be able to examine every possible combination of problems solutions in a very

short period of time to choose the optimal solution. This has very significant consequences for future. But the ethical and moral implications of these consequences are different discussion.

The focus of this discussion is how do we better prepare our students to work with artificial intelligence or as Ken Jennings, Jeopardy's second all-time highest winning players, said when he was defeated in a game of Jeopardy against Watson, IBM's latest general thinking machine stated, "I for one welcome our new computer overlords".

Today we're beginning to see AI assistants. Most of us use one frequently. The most common are Google search engine algorithms, Apple's "Siri", Amazon's "Alexa", Microsoft's "Cortana" and Google's "hey Google". These assistants are playing ever be able role in making our lives easier.

The rest of this paper will be completed before the conference.

A simple Google search for "ai assistants in business" found 11,000,000 results.

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ALERTING STUDENTS TO THE UNEXPECTED CONSEQUENCES OF ROUNDING

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A B S T R A C T

Often there are several acceptable procedures that can be used to successfully solve a textbook or exam problem. Some procedures, however, may be more vulnerable to rounding mishaps than others. Conversion of some fractions to decimals or the calculation of per-increment versus using total amounts are among the items that can leave one answer considerably more off-the-mark than another. Students should be alerted to the possibility of rounding mishaps and should be cautioned to avoid rounding whenever possible when working textbook problems, when taking exams, and especially later on when students enter the workforce. This paper details some of the unexpected consequences of rounding through examples which will hopefully encourage students to think twice before they study hard to learn the material and work the problem correctly – but then take a rounding shortcut that can lead to the wrong answer.

Title of Project: An Innovative Approach to Teaching Healthcare Marketing

In 2015, the Rollins College Department of Health Professions was established as part of the Hamilton Holt School. It has three graduate and one undergraduate program that focus on various aspects of health. The undergraduate program, Health Services Management and Leadership has a core course, Health and Social Marketing, which has two educational goals. Students learn how to develop both traditional marketing strategies to promote health organizations to encourage access to health care. Students also learn how to develop social marketing strategies by persuading individuals to change from unhealthy to healthy behaviors. During the first two years of teaching this course, students did not appreciate the importance of marketing in healthcare which resulted in lower evaluations. I understood their position because the discipline of marketing was not used in the healthcare industry until the 1980s which is late compared to other industries.

I decided to change the course to a community engagement course which means that each semester there is a collaboration with a community health organization on how to use marketing strategies to target high risk behaviors. Students would use their learning in the course to develop strategies that would impact lives.

We partnered with a national organization that had an established curriculum on how to develop social marketing strategies to reduce high risk behavior. The class and I selected childhood

obesity as the behavior and worked with educated volunteers on behavior modification strategies. We also taught the volunteers the concepts of social marketing. Our selected target group was middle school students that came from lower income families. We chose this group because healthy foods are often expensive, resulting in poor eating habits.

This presentation will discuss the implementation and results of the project.

AN INQUIRY INTO THE NATURE OF UNIVERSITY CURRICULA

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ABSTRACT

The modern society in which we now participate is characterized by a growing number of open-ended problems. Three of the situations that occupy the minds of influential scholars are how to keep pace with new social and technical innovations, the impact of global warming, and how to deal with the projected dangers of artificial intelligence. Other lesser problems involve the high cost of university studies, the excessive use of alcohol and opiates, the growing population, the deteriorating national infrastructure including roads and buildings, race relations, the trivialization of politics, the shrinking middle class, gun control, and the fear of terrorism. In some areas, even the quality of drinking water and affordable housing are problems that are not easily solved. This paper is presented as a simple dialog and addresses only one problem: the organization and presentation of simple college curricula, The subject matter is expected to be accompanied by a lively audience discussion.

Keywords: Social problems, business, management, education.

INTRODUCTION

The General started off. "Now that you are a highly educated professional in an important position, you probably should give some attention to national problems. When a person is awarded an honor such as a Nobel Prize, they are given center stage to express their opinion on a subject. This happens frequently to movie stars and musical performers. Now this doesn't happen all of the time, but it happens enough to warrant mentioning. They customarily rant on and on about their favorite cause instead of using the opportunity to further an important societal problem. Now that you are entering a new phase of your life, it time to start thinking about things that relate to a large number of people."

THE PROBLEM

"Here is what I have been thinking about. There is a diminishing exchange of practical information between the business world, including government, and the academic community. Unless we do something about it, we could find ourselves as a second-class country. Great things are being done in the business world, but the newly trained academic leaders are not tuned in to them."

The General continued, "So here is essentially a snapshot of what I have in mind. Take the College of Business in a traditional university. It is divided into departments, such as management, accounting, and marketing. Of course, there are other departments. At first in the development of business curricula, the departments called upon the business and government

leaders to teach courses as full time and adjunct faculty, so that the exchange of information on methods and processes proliferated. Then as time passed, the outside information diminished because the faculty's experience was limited. That's my view of the old fashioned P-H-D concept – piled higher and deeper. So my thinking is that degrees from sub-departments such as management should be developed wherein there could be specialties, such as aerospace management, commodities management, and financial management. The notion of a general specialty, such as business, is very good but it has ballooned into a large monstrosity of information that is possibly outdated. Just an idea, but then again, you do, in fact, have a specialty that could be what I'm conceptualizing about. Maybe these are just the ramblings of an old man. We are close to our destination, so we continue this at another time when I can listen to you."

A BRIEF REPLY

"I think I get a glimpse of what you are trying to express with your opinion on business education and sub-specialties, such as management. I once worked with a guy who got a PhD in computer science from major university. When working, I quickly realized that he didn't know much about some traditional subjects, such as operating systems and database systems, commonly regarded as the basis of the general subject matter of computer science. His specialty was computational mathematics, a valid subset of computer science. A more pertinent major for him should have been something like 'applied mathematics.' I've noticed that some major universities do in fact give masters and doctorates in management. But, there are not many. It makes sense since many disciplines, such as the military, animal behavior, academic institutional organizations, health care, law enforcement, housing and urban development, and many sports venues such as golf and tennis demand management knowledge. So management is not limited to business curricula, but that is where it is traditionally taught. In fact, the same thinking applies to other areas, such as accounting and marketing. All of this doesn't mean, at least in my mind, that the traditional MBA is out of vogue. Perhaps the problem is at the leadership level and it needs adjusting. In fact, just after World War II, there was a big spurt in new academic development."

AN ANSWER

The General replies, "I suppose you're correct, but how does society change, or even start to change. If any action is to take place, it has to start with university administration. They have it good. In the last ten years, the academic portion of the nominal university budget has gone from 70% to 40%. That means that the administration portion has gone the complementary amount, which is in fact from 30% to 60%. Listen to a typical example. The worker assigned to handle travel expense checks, typically just sits there and hands out checks that are generated in some other department, such as IT. There is a minor problem, what happens when he or she had to go to a meeting? He or she needs a manager to go to the meeting, so a manager is hired or the worker is promoted and a new check

handling person is hired. It is very difficult to hire a new professor, but it is a routine process to hire an administrative person. So that is where the money goes."

A SECOND REPLY

"Then I suppose it has to be handled through the budgetary process, or at the state level. That is, having budgets controlled. I admit that this is a sticky problem, but don't you think that all problems can be solved. Almost all theorems in mathematics are eventually proved, but some take years to develop because some underlying theorem needs to be proved, and that could take time also. Perhaps, mathematics is a good model for society, or vice versa, society is a good model for mathematics. But I really doubt the latter."

ANOTHER QUESTION

"Here is another question. Do online courses somewhat solve the financial problem? A full-time faculty member gets approximately $5000 to teach an extra course, but an adjunct gets less than $2000. The amount may vary but these numbers are good enough to make a point. This helps to solve the budgetary situation and assists with the flow of outside expertise into the university. Adjuncts are not substitute teachers. They are, in many, cases top notch people from local research labs that like to keep their fingers in the academic world."

"Some universities are totally online and they make a profit. Apparently, some students like online courses, but I suspect that an equal number of students feel just the opposite. I've heard that there are some problems with mixing online courses with ground courses."

THE FINAL SOLUTION

"Since I am in the academic world as a full-time professor, I can give my opinion of the online course situation. I emphasize that it is only my point of view. However, I suspect that most ground course faculty totally agree with what I have to say."

"Undergrad and grad students both complain that online courses are too hard and cost more than equivalent ground courses. In the latter case, GI students are engineered into online courses and they don't receive the benefits that they do with ground courses. One of my students was a colonel in the USAF and worked in cybersecurity. He attended a briefing by a general officers on some aspect of terrorism. He was forced by our system to take the course online. To continue, the student responded with some online classroom situation by citing actual data presented by the general officer and the teacher said he – i.e., the general – was wrong. His only qualifications, stated in the syllabus, was that he had spent 40 years in the CIA. The student, who is an a+ scholar, remarked that he was happy to get a B. Also in the course were three army captains and a sergeant major that concurred with the colonel's remarks on the situation. On the other hand, some online universities have such high requirements for teachers – such as a doctorate in cybersecurity – that it is

practically impossible to get faculty. Clearly, these are problems of administration, but then again, administration may not be part of the problem, but all of the problem."

"There is additionally the online problem of cheating ranging from course assignments to term papers. While almost everyone knows about buying term papers online, the big news was the extensiveness of the practice. The abundance of choices, levels, and prices are astounding. It has gotten so frustrating that I have tried a new approach. Here is what I tell the students: forget the form (ALA, Chicago style, or whatever), forget the spelling, forget the references, just have a conversation with me about the subject – say cryptography. 'Just tell me what you know about cryptography, but put it in writing.' It has been successful."

CONCLUSION

The introduction has been completed, now it is time for the audience to comment on the subject.

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APPLICATION OF INTEGRATED MULTIPLE CRITERIA DATA ENVELOPMENT ANALYSIS FOR DISASTER RELIEF SUPPLY CHAIN DESIGN

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ABSTRACT

This paper proposes an innovative procedure of integrating the multiple criteria data envelopment analysis (MCDEA), a goal programming (GP), and the cross-efficiency (CE) evaluation methods to apply for designing disaster relief supply chain (*DRSC*) system efficiently and effectively. To overcome a weak discriminating power of the traditional DEA method, MCDEA and CE DEA models have been proposed, but several issues/weaknesses of applying them still exist. The proposed procedure can eliminate these issues/weaknesses by integrating these DEA models through the GP model. Through numerical example, we demonstrate that the proposed method performs well in terms of designing efficient *DRSC* systems.

INTRODUCTION

Performance measurement or evaluation is one of the most emphasized elements in any performance management. To assess and evaluate different alternatives, data envelopment analysis (DEA) is one of several methodologies, which has been widely used to evaluate the relative efficiency of a set of peer organizations called decision-making units (DMUs). DEA has been accepted as an effective technique. DEA was proposed by Charnes et al. (1978) who demonstrate how to change a fractional linear measure of efficiency into a linear programming (LP) format. DEA defines relative efficiency as the ratio of the sum of weighted outputs to the sum of weighted inputs. The non-parametric approach solves an LP formulation for each DMU, and the weights assigned to each linear aggregation are the results of the corresponding LP. DEA eventually determines which of the DMUs make efficient use of their inputs and produce outputs effectively and which do not. Thus, the DEA models classify DMUs into two groups which would separate relatively efficient DMUs from inefficient DMUs. The highest ratio among all the DMUs would identify the most efficient DMU, and every other DMU would be rated by comparing its ratio to the highest one. However, a weakness of the DEA-based assessment is that a considerable number of DMUs are classified as efficient so that it may suffer from a lack of discrimination particularly.

As a DEA extension, the cross-efficiency (CE) method is suggested by Sexton et al. (1986) to rank DMUs with the main idea of using DEA to do peer-evaluation, rather than pure self-evaluation in DMU's usual DEA efficiency. Sexton et al. (1986) construct a CE matrix that consists of two evaluation results, both the self-evaluation and the peer-evaluation. It can usually provide a full ranking for the DMUs to be evaluated and eliminates unrealistic weight schemes without requiring the elicitation of weight restrictions from application area experts (see Anderson et al., 2002). But, the critical issue is that, as Doyle and Green (1994) note, the non-uniqueness of CE scores due to the often-present multiple optimal DEA weights.

Li and Reeves (1999) propose a multiple criteria DEA (MCDEA) model under the framework of multiple objective LP (MOLP) to improve the discriminating power of DEA methods and effectively yield more reasonable input and output weights. The MCDEA model involves a broader definition of relative efficiency that the classical one introduced by Charnes et al. (1978). But, Li and Reeves (1999) do not explain how to rank DMUs but merely show which DMUs are more efficient than other DMUs by solving the MCDEA sequentially with one objective out of three objective functions.

This paper combines these two separate DEA methods, CE evaluation method and MCDEA, by utilizing a goal programming (GP). The GP generates various optimal values of the three objective functions since they depend upon the value of the weight given to each objective function. The three objective function values can be classified into one output and two inputs. Thus, solving MCDEA by GP model would transform each DMU into a new DMU with one output and two inputs. Then, we apply the CE DEA method to compute CE scores (CESs) for these new DMUs for each solved set. Based on the average CESs and/or the average rankings of DMUs for each weight set, we can rank all DMUs. A new innovative procedure for integrating MCDEA, GP, and CE method for ranking efficient DMUs is proposed and called as the integrated MCDEA (IMCDEA) method in this paper.

Hong and Jeong (2018) study a *DRSC* design problem in a pre-disaster scenario, which consists of finding the optimal emergency response facility (*ERF*) locations and allocation scheme of humanitarian supplies through *ERFs*, where all *ERFs* are under the risk of disruptions. Following their mathematical model, this paper uses a proposed IMCDEA method for designing *DRSC* configures efficiently and effectively. A case study is given to show the procedure of applying IMCDEA method.

MULTIPLE CRITERIA DEA MODEL

Charnes et al. (1978) establish a CRS (Constant Returns to Scale) *m*-DEA model to find an efficiency score for DMU_k, which is formulated as the following LP problem:

$$max\ h_k = \sum_{r=1}^{s} u_r y_{rk}, \tag{1}$$

Subject to

$$\sum_{i=1}^{m} v_i x_{ik} = 1, \tag{2}$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0, \qquad \forall j, \tag{3}$$

$$u_r, v_i \geq 0, r = 1 \ldots, s; i = 1 \ldots, m$$

where

Ω = number of DMUs being compared in the DEA analysis
h_k = efficiency rating of the DMU_k being evaluated by DEA
y_{rj} = amount of output r generated by DMU_j , $j = 1, 2, \ldots, k, \ldots, \Omega$.
x_{ij} = amount of input i used by DMU_j
i = number of inputs used by the DMUs
r = number of outputs generated by the DMUs
u_r = coefficient or weight assigned by DEA to output r
v_i = coefficient or weight assigned by DEA to input i

Li and Reeves (1999) propose the following MCDEA model using the LP model in (1)-(3):

$$Max\ h_k = \sum_{r=1}^{s} u_r y_{rk}, \tag{4}$$

$$Min\ M_k \tag{5}$$

$$Min\ D_k = \sum_j\ d_j \tag{6}$$

Subject to

$$\sum_{i=1}^{m} v_i x_{ik} = 1, \tag{7}$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} + d_j = 0, \qquad \forall j, \tag{8}$$

$$M_k - d_j \geq 0, \forall j\ , \tag{9}$$

$u_r, v_i\ \geq 0, r = 1 \ldots, s; i = 1 \ldots, m$; and $d_j \geq 0$, j =1, 2, …, k, … Ω.

In the above MOLP model, there are three performance measures, (i) an efficiency score, h_k, given in (4), (ii) M_k given in (5) representing the maximum quantity among all deviation variables, d_j, and (iii) D_k given in (6), which is equivalent to the sum of deviation variables, d_j. But Li and Reeves (1999) do not explain how to rank DMUs, but merely show which DMUs are more efficient than other DMUs. They solve the MCDEA model given in (4)-(9) sequentially with one objective out of three objective functions, (4), (5), and (6). The DMUs, whose efficiency score (ES), h_k, remains the maximum value of 1 regardless of the objective function used, are considered more efficient than other DMUs whose ES does not remain one but depends on the objective function used. To rank the evaluated DMUs consistently and effectively, this paper utilizes a goal programming (GP) model. Solving the above GP for various sets of weights, $\boldsymbol{\gamma}$ $=\{\gamma_1^-, \gamma_2^+, \gamma_3^+\}$ yields various optimal values of three performance measures. But the question is how we rank the DMUs after the above GP model is solved for various values of $\boldsymbol{\gamma}$. Then, each DMU, after three performance measures generated by solving the GP model for a given set of $\boldsymbol{\gamma}$, is transformed into a new DMU with one output, h_k, and two inputs, M_k and D_k. Thus, for each new DMU for a given set of $\boldsymbol{\gamma}$, DEA method could be applied to find efficient DMUs. As explained before, the traditional DEA surely finds efficient DMUs, but is so weak in terms of discriminating the efficient DMUs. Thus, for a new DMU with one output and two inputs, we apply the CE DEA method for enhancing discriminating power to rank the efficient DMUs consistently.

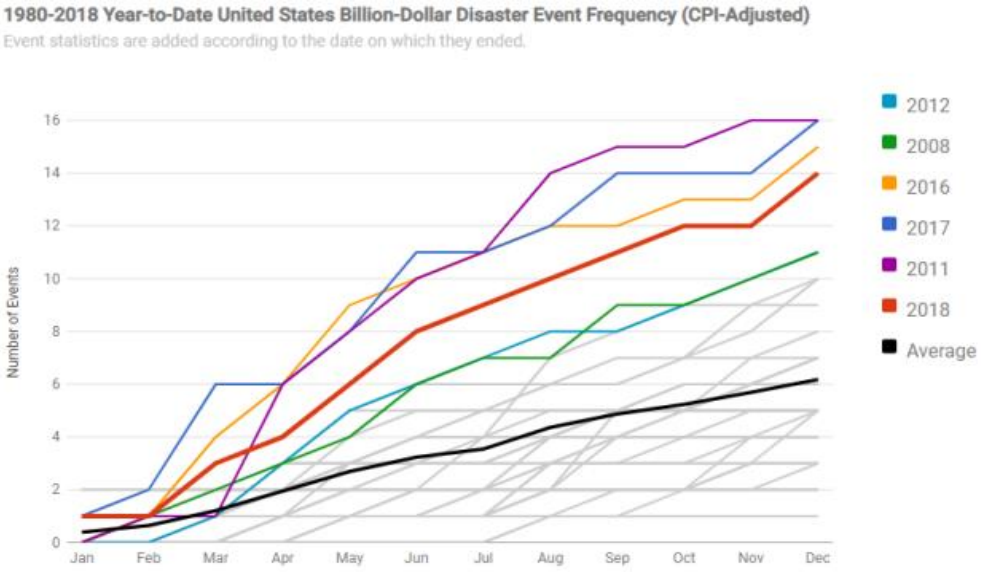
DISASTER RELIEF SUPPLY CHAIN NETWORK

DRSC plays a critical role in providing emergency relief items such as first aids, drinking water, food, and daily commodities to alleviate the suffering of people. In 2017, the U.S. experienced a historic year of weather and climate disasters. In total, the U.S. was impacted by 16 separate billion-dollar disaster events including three tropical cyclones, eight severe storms, two inland floods, a crop freeze, drought, and wildfire. During 2018, the U.S. experienced a very active year of weather and climate disasters. In total, the U.S. was impacted by 14 separate billion-dollar disaster events: two tropical cyclones, eight severe storms, two winter storms, drought, and wildfires. The past three years (2016-2018) have been historic, with the annual average number of billion-dollar disasters being more than double the long-term average

(see Figure 1). The number and cost of disasters are increasing over time due to a combination of increased exposure, vulnerability, and the fact the climate change is increasing the frequency of some types of extremes that lead to billion-dollar disasters (https://www.climate.gov/news-features/blogs/beyond-data/2018s-billion-dollar-disasters-context). The 1980–2018 annual average is 6.3 events (CPI-adjusted); the annual average for the most recent 5 years (2014–2018) is 12.6 events (CPI-adjusted). In 2019 (as of April 9), there have been two weather and climate disaster events with losses exceeding $1 billion each across the US. These events included one flooding event and one severe storm event. Overall, these events resulted in the deaths of 5 people and had significant economic effects on the areas impacted. In early 2019, a wild March headlined by abnormal warmth in the US's coldest state and a destructive and costly "bomb cyclone" in the central US. See Figure 2 showing a satellite image of the "Bomb Cyclone." By a landslide, Alaska posted its warmest March on record, and the powerhouse storm in the central US became the second billion-dollar weather disaster of 2019.

After emergencies, it is critical through emergency response facilities (*ERFs*) to distribute humanitarian aid to the affected areas efficiently and effectively for saving human lives and alleviating suffering, and for a rapid recovery. Van Wassenhove (2006) emphasize that since the disaster relief is 80% logistics, it would follow that the only way to achieve this is through slick, efficient and effective logistics operations and more precisely, supply chain management. Logistics planning in emergencies involves the quick and efficient distribution of emergency supplies from the emergency response facilities to the affected areas via supply chains. The *ERFs* considered in this paper are three distinctive ones as shown in Habib et al. (2016). They are (i) Central Warehouses (*CWHs*) or Distribution Warehouses (*DWHs*), where emergency relief commodities are stored, (ii) intermediate response facilities termed Relief Distribution Center (*RDC*) or Commodity Distribution Point (*CDP*), where people can more effectively gain access to relief goods, and (iii) neighborhood sites (*NBSs*) in need of humanitarian items. See Figure 3 depicting a distribution framework of *DRSC* (see Habib [4]).

Figure 1. 1980-2018 Year-to-Date U.S. Billion-Dollar Disaster Event Frequency



A *DRSC* design problem is an inherently strategic and long term in nature. The primary objective of the strategic level is to strengthen emergency preparedness as well as to select the most cost/distance-effective location of *CWHs* and *CDPs* among a set of candidate locations, to establish the distribution of emergency supplies throughout the *DRSC*, and to assign *NBSs* to *CDPs* and *CDPs* to *CWHs*. In fact, determining such locations/allocations is a critical area in the design of an effective *DRSC*. However, traditional cost-based

facility location models implicitly assume that located facilities will always be in service or be available and do not consider an associated risk of disruption. In fact, all facilities are susceptible to disruptions due to natural disasters, accidents, breakdowns, weather, or strikes. Effects of disruptions could be aggravated as a result of a lack of flexibility and interdependency in the *DRSC*.

Figure 2. A Bomb Cyclone Storm in the US, 2019

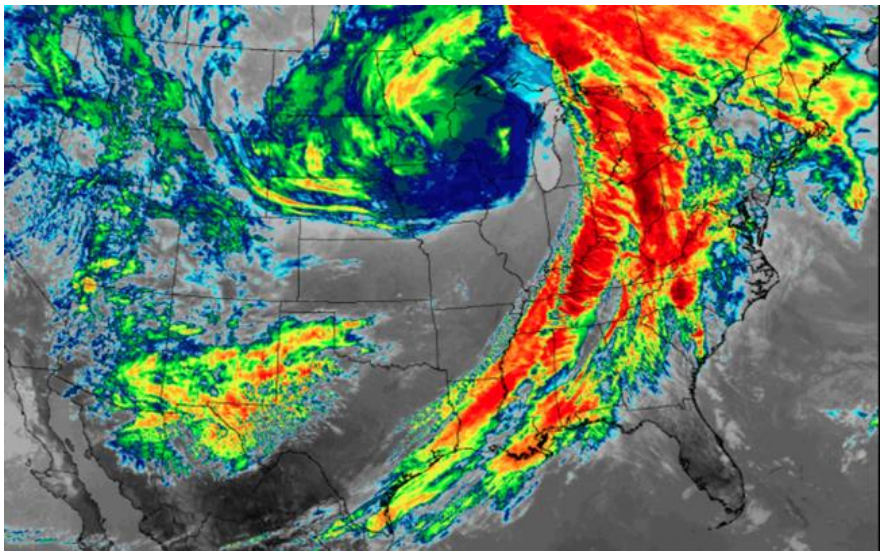
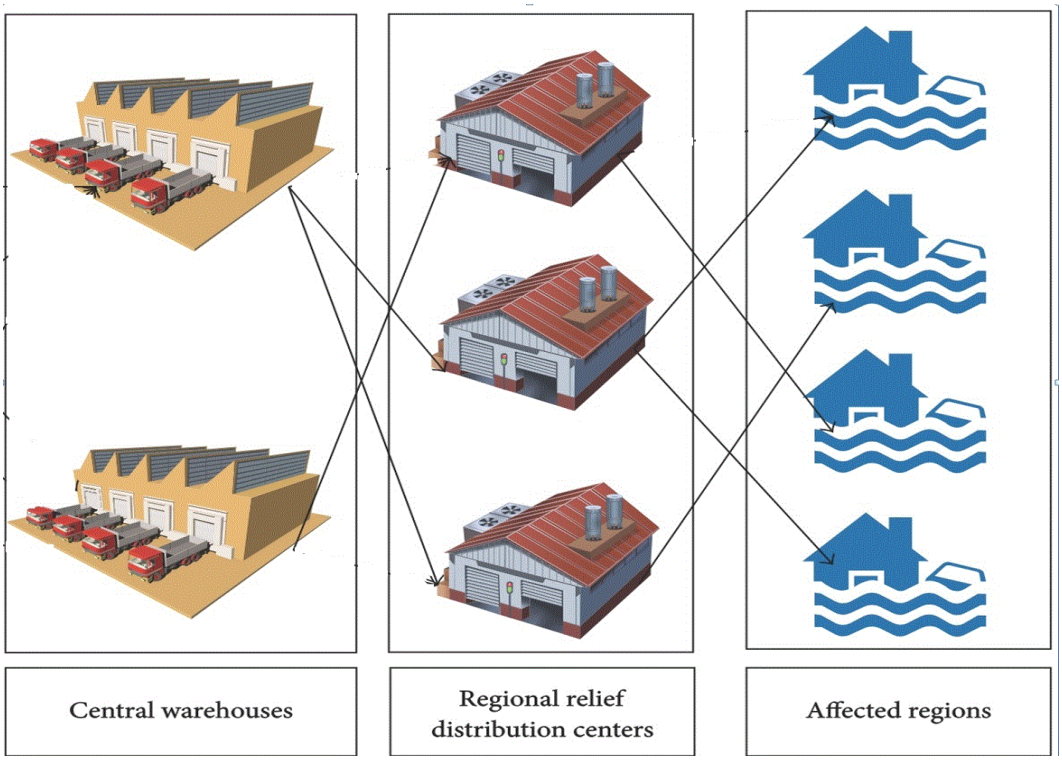


Figure 3. Distribution Framework of Disaster Relief Supply Chain



CASE STUDY AND OBSERVATIONS

This study uses the case study in Hong and Jeong (2018) who consider major disaster declaration records in South Carolina (SC). Forty-six counties are clustered based on proximity and populations into twenty counties. Then, they choose one city from each clustered county based on a centroid approach and assume that all population within the clustered county exists in that city. The distance between these cities is considered to be the distance between counties. According to the Federal Emergency Management Agency (FEMA) database (FEMA, 2015), SC has experienced sixteen (16) major natural disaster declarations from 1964 to 2014. The database also provides a list of counties where a major disaster was declared. They (2018) assume that when a major disaster is declared, the emergency facility in that county is damaged and shut down. Based on the historical record and the assumption, the risk probability for each neighborhood (a county or a clustered county) is calculated in Table 1. The potential five locations for *CWHs* were selected based upon population, the proportion of area that each location would potentially cover, and the proximity to Interstate Highways, I-95, I-26, and I-20, in SC.

Table 1: Data for Locations of *ERFs*.

No	City	County	Population (K)	Risk Probability
1	Anderson	Anderson/Oconee/Pickens	373	0.125
2	Beaufort	Beaufort/Jasper	187	0.063
3	Bennettsville	Marlboro/Darlington/Chesterfield	96	0.375
4	Conway	Horry	269	0.375
5	Georgetown	Georgetown/Williamsburg	93	0.438
6	Greenwood	Greenwood/Abbeville	92	0.125
7	Hampton	Hampton/Allendale	33	0.188
8	Lexington	Lexington/Newberry/Saluda	318	0.313
9	McCormick	McCormick/Edgefield	35	0.250
10	Moncks Corner	Berkeley	178	0.313
11	Orangeburg	Orangeburg/Bamberg/Calhoun	123	0.375
12	Rock Hill	York/Chester/Lancaster	321	0.313
13	Spartanburg	Spartanburg/Cherokee/Union	367	0.313
14	Sumter	Sumter/Clarendon/Lee	157	0.375
15	Walterboro	Colleton/Dorchester	135	0.250
16	Aiken†	Aiken/Barnwell	184	0.313
17	Charleston†	Charleston	350	0.250
18	Columbia†	Richland/Fairfield/Kershaw	461	0.375
19	Florence†	Florence/Dillon/Marion	203	0.438
20	Greenville†	Greenville/Laurens	521	0.125

†potential locations for *CWH*

The numbers of *CDPs* and *CWHs* to be built are pre-specified most of the cases. Also, the following parameters are pre-determined for our case study. The maximum numbers of *CDPs* and *CWHs* that can be built, C^{max} and W^{max}, are set to 5 and 2, respectively. The minimum and maximum number of *CDPs* that a *CWH* must handle, k_i and K_i, are set to 1 and 10, respectively. Each *CDP* must handle at least 2 ($\ell_j = 2$) and at most 7 ($L_j = 7$) *NBSs*. The capacities of *CDPs* and *CWHs*, CAP_j^{max} and $CAP_i^{max}, \forall j \; and \; \forall i$, are set to 1,500 K and 2,500 K in terms of the quantity of humanitarian items. They consider four goals as major performance measures. The first goal is to minimize the total logistics cost (*TLC*). The second goal is to

minimize the maximum coverage distance (MCD), which attempts to minimize the longest delivery distance between ERFs. The third goal is to maximize the expected amount of satisfied demands (*ESD*), whereas the fourth goal is to maximize the covered demands in case of emergency (*CDE)*. The goal programming model for the case problem is solved for various values of the weight, $\boldsymbol{\alpha}=\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$, where each weight assigned to each goal changes between 0 and 1 with an increment of 0.1.

The GP model for the case problem is solved for various values of the weight set, $\boldsymbol{\alpha}=\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$, where each weight changes between 0 and 1 with an increment of 0.1. There are 286 configurations for each model arising out of the combinations of the setting of $\boldsymbol{\alpha}$ under the condition $\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 = 1$. After 286 runs, we reduce 286 configurations into 71 consolidated configurations, based upon the values of the four-performance metrics. Each of the 71 configurations is considered as a DMU, which represents the optimal locations of *ERFs* and their supply chain schemes. The CRS m-DEA model given in (1)-(3) is applied to find efficient DMUs with a perfect efficiency score (ES) of 1.000. In Table 2, we present 27 DMUs out of 71 DMUs along with the value of each performance metric and CRS (constant returns to scale) ES.

Then, we solve MCDEA by the GP model using the performance metrics of these 27 efficient DMUs for various values of the weight set, $\boldsymbol{\gamma} = \{\gamma_1^-, \gamma_2^+, \gamma_3^+\}$, where each weight changes between 0 and 1. We solve the model twenty-one (21) times generated by all combinations of the three weights. Note that each solved model generates one output, $h_k$in (4), and two inputs, M_k in (5) and $D_k$in (6), for k = 1, 2,…, 27, for the efficient 27 DMUs. CES for each of the 21 solved MCDEA models is obtained. In Table 2, we report the two rankings of 27 efficient DMUs. The first rankings are based on the average value of CESs, while the second ones are based on the average rankings of the ranks of DMUs for each case of the weight set, $\boldsymbol{\gamma}$. The correlation coefficient between the two rankings turns out to be 0.9743, which implies the two rankings are very correlated. We observe that both rankings find DMU #81 as the #1 DMU and actually find the same top four DMUs, DMU #90, DMU #172, and DMU #169, with a slightly different order. In Figure 4, these two most efficient DMUs (DRSCs) are depicted.

As shown in Figure 4, all two DRSCs find {Greenville, Charleston} for the *CWH* locations. No. 1 DMU #81 finds {Anderson, Lexington, Spartanburg} for *CDPs*, which is covered by the *CWH*{Greenville} and finds {Walterboro, Conway} for *CDPs* covered by the *CWH* {Charleston}. DMU #90 ranked No. 2 finds almost same supply chain network as DMU #81. The only difference between these two supply chain networks is which of {Lexington, Columbia} is selected as *CDP* and feeds the other one. DMU #81 selects {Lexington} as *CDP* which will feed the site {Columbia}, while DMU #90 selects {Columbia} as *CDP* feeding the site {Lexington}. From Table 2, we see that DMU #81 yields {$327,393, 107, 2854, 2827}, whereas DMU #90 {$328,484, 104, 2811, 2827} as the four performance metrics. DMU #81 yields slightly better performances regarding both *TLC* and *EASD* while DMU #90 has the edge over DMU #81 regarding *MCD* only.

SUMMARY AND CONCLUSIONS

To assess and evaluate different alternatives, DEA is one of the methodologies that have been widely used and accepted as an effective technique. However, several problems have also appeared as DEA has been applied to a wide variety of evaluation areas. Basically, DEA evaluates DMUs in terms of self-evaluation. The self-evaluation allows each DMU to rate its efficiency score with the most favorable weights to itself. Consequently, problems related to weak discriminating power have arisen as the applications of DEA advance. To enhance the discrimination power, various evaluation methods with the concept of peer-evaluation have been introduced. Two eminent approaches are the CE DEA method and the multiple criteria DEA (MCDEA) method. But there is no explicit procedure of ranking the efficient DMUs generated by DEA or MCDEA.

To demonstrate the proposed procedure, this paper uses the *DRSC* design problem, whose goal is to efficiently relieve and minimize the effects of a disaster. Through the case study, we identify the most efficient DRSC schemes among the efficient ones and demonstrate the applicability of the new proposed approach. It would be common for the supply chain network system to use multiple inputs to produce multiple outputs. This paper shows that the proposed approach could be used as an important tool for designing such supply chain network systems efficiently and effectively.

ACKNOWLEDGMENTS

This material is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Evans-Allen project number SCX-313-04-18.

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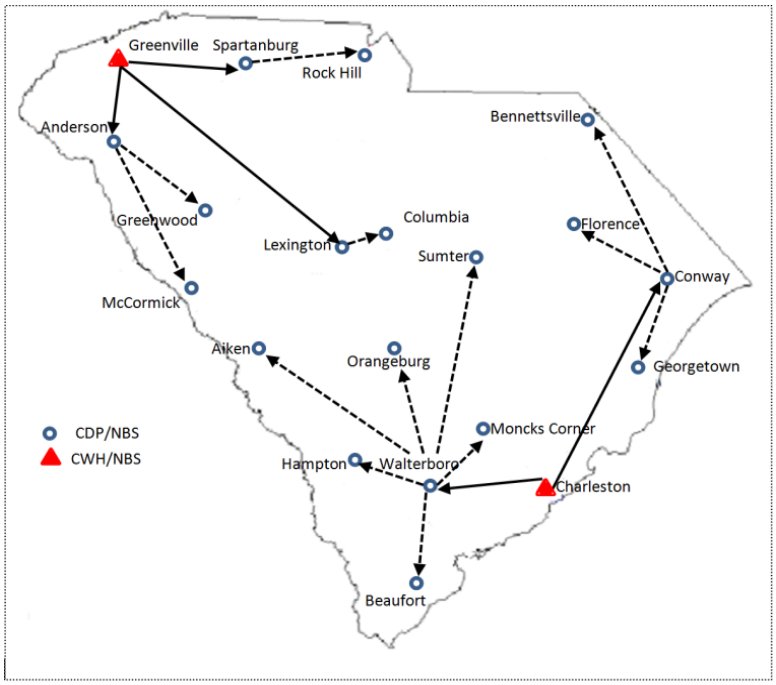
Table 2. Ranking Table Based on the Cross-Efficiency Score (CES) and Rankings within Each Weight Group

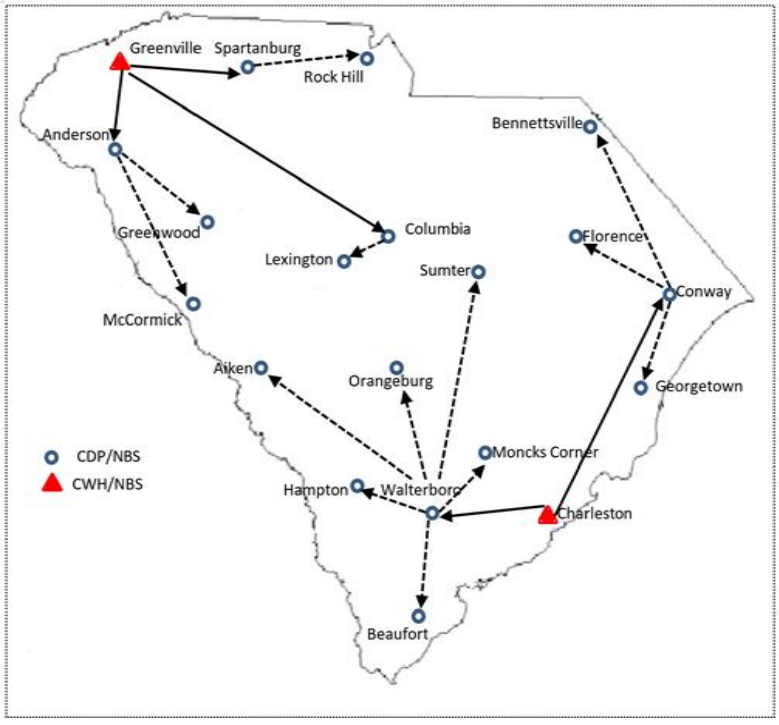
No	DMU #	CES		Ranking	
		Average	Ranking	Average	Ranking
1	25	0.9344	11	9.62	8
2	26	0.9444	9	10.29	9
3	28	0.9126	16	13.71	13
4	35	0.9192	14	15.48	16
5	38	0.8669	22	21.43	21
6	39	0.8639	25	22.43	24
7	40	0.8820	20	20.52	20
8	42	0.8607	26	22.29	23
9	43	0.8659	23	22.00	22
10	**81**	**0.9975**	**1**	**1.24**	**1**
11	87	0.9098	18	18.05	19
12	88	0.9409	10	11.29	11
13	89	0.9625	6	7.57	7
14	**90**	**0.9883**	**2**	**2.62**	**2**
15	91	0.9120	17	16.24	17
16	97	0.8690	21	24.10	26
17	98	0.8653	24	23.43	25
18	125	0.9624	7	4.52	4
19	133	0.9505	8	10.57	10
20	143	0.8477	27	25.71	27
21	168	0.9223	12	12.48	12
22	169	0.9822	4	5.62	5
23	172	0.9829	3	3.48	3
24	174	0.8968	19	17.76	18
25	180	0.9195	13	15.29	15
26	203	0.9130	15	14.24	14
27	236	0.9628	5	6.05	6

Figure 4. Two Most Efficient DRSC Schemes

DMU #81



DMU #90



BLOCKCHAIN REVISITED

Harry Katzan, Jr., Webster University, USA

ABSTRACT

This paper gives an overview of blockchain concepts for persons not actively engaged in actual blockchain operations on a daily basis. Blockchain is a storage structure that mirrors how information is represented in a traditional ledger. The methods have become popular in a modern world of cloud storage. With cloud operations, block data is stored in the cloud, but actual computer processing is executed in the usual manner on local facilities. Innovation and leadership in the areas of computer and information systems have traditionally been associated with the business world in general and to the major corporations in particular. That conjecture has definitely been the case with blockchain technology that has heretofore been the province of cryptocurrency applications, such as the well-known Bitcoin networks. Bitcoin technology has been available since 2009, and it has attracted considerable attention, even though it is considered by some to be obfuscatory and hubristic. Actually, nothing can be farther than the truth, since Bitcoin is not blockchain even though it does in fact use blockchain architecture. This paper gives an introduction to blockchain data management and identifies some blockchain design concepts. The notion of basing computer applications on blockchains may, in fact, alter the direction of certain aspects of computer technology. The appendix gives a list of companies that are leading the way in adapting decentralized ledgers to their operating needs.

Keywords: Blockchain, Bitcoin

INTRODUCTION

What is Blockchain? It is a collection of data blocks that are connected to form a chain. The attributes that characterize a blockchain include, but are not limited to, the following items: size of the blocks, how the blocks are connected, where the blocks are stored, whether the contents of the blocks can be modified, the structure of the chain of blocks, who can access the blockchain, the contents of the data block in the blockchain, and so forth. So far in the history of time, blockchains have been used for security, privacy, and trust. In the future – perhaps the near future – blockchains will be used to store and access data on almost all platforms and for almost all applications.

The most widely known application of blockchain technology involves the cryptocurrency known as Bitcoin in which security, privacy, and trust are of prime importance. Bitcoin is not a blockchain, per se. Bitcoin uses a blockchain, and that blockchain is not representative of all blockchains.

In general, there are three types of blockchains: public blockchain, permissioned blockchain, and private blockchain. Public blockchains are typically large distributed networks that are open to all users at all levels. With public blockchains, the data is immutable and multiple copies of the blockchain exist at various locations. Usually the blocks in a blockchain are local, but the general definition permits the blocks in a single blockchain to be distributed. In a permissioned blockchain, users have roles and those roles may address functions that can be performed locally or in a distributed fashion. In a private blockchain, the blocks tend to be local and permissions are granted on a confidential basis.

A block chain is composed of three parts: the block, the chain, and the network.

BLOCKS

During the course of everyday affairs, participants exchange information, and, in most cases, that information must be stored for future reference. The medium for information of this type is a ledger placed in a book or digital record in a computer database. Typically, agreed upon items are recorded for security, privacy, and integrity. With blockchains, information of this type must be immutable and transparent. The objective is to place the agreed upon information in a block that is connected to other blocks in a particular domain, similar in fact to the pages in a ledger book. In order to achieve immutability, transparency, and privacy, the blocks and the chain must be constructed in such a fashion that users can observe the information without being able to alter the blocks and the chain while at the same time preserving the identities of the persons involved. The means that the blocks are chained together is such a fashion that they are prevented from being altered, deleted, or having a block inserted between two existing blocks.

The blockchain concept is not a single idea, but an architectural design principle that can be modified to satisfy the needs of a specific problem domain. Because it seems as though Bitcoin is the only example known to many people, some of the information necessarily relates to that application.

Here is the information that should be available in a block:

- Block ID
- Block size
- Hash of the previous block in sequence
- Number of transactions in the block
- The actual transactions contained in the block
- Reference data contained in the block, such as date, time, encryption information, owner information, etc.

The *block ID* is a sequence number of the form 0, 1, 2, … . The block numbered 0 is the beginning, often referred to as the genesis block. In general, any method can be used for blockchain. The *block size* is limited to 1000 characters in Bitcoin, but theoretically, it can be fixed or variable, based on the data architecture. A block sequencing mechanism is needed and one method that has been used is to compute the *hash* of all of the characters in the preceding block. The method known as SHA-256, a secure hash algorithm developed by the National Security Agency that maps any sequence of characters into a random 256 bits or 32 characters, has characteristically been used in blockchain applications. The number of transactions in a block is typically variable, even though some systems have limited the length in bytes of a transaction to 40 characters.

THE BLOCKCHAIN

The transparency of a blockchain network is achieved through decentralization and multiplicity in order to provide functionality and verifiability. What this implies is that a blockchain contains all of the transactions in a given domain, such as the ordering, shipping, and payment for goods in a business-to-business (B2B) network or, perhaps, the transfer of land ownership documents in a government office. What this means, however, is that the blocks are not decentralized, but the whole network of blocks is distributed, such that each user computer system contains a complete copy of the chain of blocks. This is the design philosophy of Bitcoin. It does not preclude, however, that a system could have a centralized blockchain with distributed access. Thus, a blockchain could be centralized, decentralized, or distributed. The blockchain concept permits the elimination of intermediaries.

SHARED LEDGER

Many organizations share documents through an intermediate facility such as a database system. A typical scenario is that two users can access the same document, but one of them is locked out while the other is performing an update operation. This is a common operation in data processing. So, what's the problem? The problem is that once the document is changed, it's changed for both parties unless some special operation is performed – like saving an extra copy beforehand. With a ledger system, each operation to the transaction is a separate page to the ledger document, whether it is a book or its database equivalent. This is the precise visualization of a shared leger facility available with blockchain. As an example, consider a collection of legal documents in which each version involves passing copies between participants.

POINT OF FAILURE

In a data repository, organized as a blockchain, identical blocks of data are stored across a network so there is not single point of failure, as well as no point of control. Because of the

nature of distribution, privacy is assured through crypto-technology. Data and transactions are transparent because of the design specifications of blockchain. Khan had the following to say on the subject of blockchain: "Blockchain truly is a mechanism to bring everyone to the highest degree of accountability. No more missed transactions, human or machine errors, or even an exchange that was not done with the consent of the parties involved. Above anything else, the most critical area where Blockchain helps is to guarantee the validity of a transaction by recording it not only on a main register but on a connected distributed system of registers, all of which are connected through a secure validation mechanism. [Ian Khan, TEDx Speaker (http//www.iankhan.com/)]

SUMMARY

The use of Blockchain technology reduces the complexity of ordinary transactions in a business environment. Transactions are recorded as versions of documents, orders, payments, deposits, and almost any interaction normally experienced in everyday activity. In blockchain, transactions are stored in blocks and connected in a chain representing a particular application. Transactions are transparent, immutable, private, and secure.

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APPENDIX

Blockchain 50

Big companies with minimum revenues of $1 billion

Name of Company	*Location*	*Blockchain Software*
Allianz SE	Munich	Hyperledger Fabric, Corda
Amazon	Seattle	Hyperledge Fabric, Ethereum
Anheuser-Bush Inbev	Leuven	Ethereum, Corda
Ant Financial	Hangzhou	Ant Blockchain
BBVA	Bilbao	Hyperledger Fabric, Corda, Ethereum
Bitfury	Amsterdam	Exornum, Bitcoin
BNP Parabas	Paris	Corda, Hyperledger Fabric, Ethereum
BP PLC	London	Ethereum, Cardano, Quorum
Broadridge	New York City	Hyperledger Fabric, DAML, Quorum
Bumble Bee Foods	San Diego	Multichain
Cargill	Wayzata	Hyperledger Fabric Sawtooth, Hyperledger Grid
Ciox Health	Alpharetta	Ethereum
Citigroup	New York City	Ethereum
Coinbase	San Francisco	Bitcoin, Ethereum, XRP, Lumen
Comcast	Philadelphia	Bitcoin, Ethereum, Hyperledger Fabric, Quorum
CVS Health	Woonsocket	IBM Blockchain, Hyperledger Indy, Hyperledger Sawtooth
The Depository Trust & Clearing Corporation	Jersey City	Axcore
Facebook	Menlo Park	Unknown
Fidelity	Boston	Bitcoin, Ethereum
Foxconn	Taipei	Ethereum
Golden State Foods	Irvine	IBM Blockchain
Google	Mountain View	Bitcoin, Ethereum, Bitcoin Cash, Ethereum Classic, Litecoin, Zcash, Dogecoi, Dash
HPE	San Jose	Corda, Ethereum, Quoorum, Sia, Hyperledger Fabric
HTC	Taoyuan	Bitcoin, Ethereum

IBM	Armonk	IBM Blockchain, Stellar, Hyperledge Burrow, Sovrin
ING	Amsterdam	Corda, Quorum, Hyperledger Fabric, Hyperledger Indy
Intel	Santa Clara	Corda, Etherum, Hyperledger Fabric, Hyperledger Sawtooth
JP Morgan Chase	New York City	Quorum
Maersk	Copenhagen	IBM Blockchain, Corda
Mastercard	Purchase	Its own platform built from scratch
Metlife	New York City	InsureChain built on Ethereum
Microsoft	Redmond	Ethereum, Parity, Quorum, Hyperledger Fabric
NASDAQ	New York City	Symbiont, Corda, Hyperledger Fabric
Nestle	Vevey	IBM Blockchain
Northern Trust	Chicago	Hyperledger Fabric
ORACLE	Redwood Shores	Oracle Blockchain Platform
Overstock	Midvale	Bitcoin, Ethereum, RVN, Florin
PNC	Pittsburgh	Hyperledger Fabric, DAML, Corda, Ripple
Ripple	San Francisco	KRP Ledger
Samsung	Seoul	Nexledger, Ethereum
Santander	Madrid	RippleNet, Hyperledger Fabric
Sap SE	Walldorf	Hyperledger Fabric, MultiChain, Quorum
Seagate Technology	Cupertino	Hyperledger Fabric
Siemens	Munich	Ethereum, Hyperledger Fabric, Corda
Signature Bank	New York City	A private Ethereum-based blockchain
State Farm	Bloomington	Hyperledger Fabric, Corda, Quorum
UBS	Zurich	Hyperledger Fabric, Ethereum, Quoru, Corda
VISA	San Francisco	Hyperledger Fabric
VMware	Palo Alto	Project Concord, a new blockchain which supports multiple frameworks such as Ethereum
Walmart	Bentonville	Hyperledger Fabric

Adapted from Del Castillo, M. Blockchain Goes to Work, *Forbes,* April 30, 2019, pp. 82-91.

Panel: Challenges in Online Teaching

For those of us who teach online, we realize that this mode of instruction is most challenging. Contrary to novice thinking about online teaching, the task can be daunting at times and the struggle not to become roadkill on the information highway is a constant consideration. This panel will discuss some of the challenges outlined below and discuss how they have attempted to overcome those.

Panelist: Sharynn Tomlin, Angelo State University

1. **Motivation**– this is typically the biggest challenge students face. They start off extremely enthusiastic but after a week or two, the online course is usually relegated to the bottom on the list of their priorities and the faculty member must reiterate, in some fashion, the importance of staying engaged. What means does the faculty member employ to promote motivation and engagement?
2. **Time Management** – The definition of time management is the act or process of planning and exercising conscious control over the amount of time spent on specific activities, especially to increase effectiveness, efficiency or productivity. How does the faculty member promote time management skills as a tool for the successful completion of the class?
3. **Accountability** – Of particular importance in online classes with teams or group activities or projects, how does each team member demonstrate their input to the success of the task?
4. **Organization of the class** –Does the organization of the online materials help or hinder the student from understanding the course requirements?
5. **Lacking technical skills** – While there are not excessive technical skills usually required for the successful completion of an online course, what basic skills are required? If students are lacking in those basic skills, what resources does the faculty member provide the student to overcome those deficiencies?
6. **Persistence** – While in a face-to-face class, it is fairly easy to read students lack of interest in a particular subject or course, how does the faculty member receive that feedback?

While the above is certainly not an all-inclusive list of challenges, it is the objective of the panel to provide examples to these questions, and propose others for discussion.

Panelist: Richard Mills, Robert Morris University

This discussion will be focused on outlining the on-line and on-ground hospitality and tourism programs at Robert Morris University. Both the challenges and the benefits will be presented from the lens of the professor and the format of Institutional offerings regarding the successes

and failures of both formats.

Panelist: Peggy Johnson, Lander University

Discussion will include a discussion of the accreditation evolution of fully online healthcare management education. Past perceptions of these online programs were that online programs were proprietary competitors taking market share from face-to-face programs in local markets and they did not provide adequate curriculum or pedagogical approaches. The AUPHA's Board of Directors, however, has decided there is no barrier to membership based on mode of delivery, and the goal of the organization is to "drive excellence and innovation in healthcare management education wherever it may be occurring" (Middleton, 2012). This has been a process as fully online degree programs were not eligible for CAHME accreditation because of a criterion that a program must include a minimum of 120 hours of face-to-face, in-person instruction until January 2015. Even now, this 120-hour requirement has only been replaced with alternative options such as synchronous virtual sessions, face-to-face internships, or practica that have as yet not been clearly defined. Some research has been done that helps create a framework for assessing quality and outcomes of fully online programs which will be the focus of my discussion.

Panelist: John Dyer, Georgia Southern University

Online learning is full of challenges not as common in a traditional classroom since online students are separated from their instructor and classmates by technology. How can we engage our students in the content, learning activities, and assessments? How can we prevent feelings of frustration or isolation and keep them motivated? These questions are frequently asked by online instructors looking to maintain the same levels of engagement they see and feel in their face-to-face classrooms.

Understanding Academic Dishonesty: An Empirical Study in Two Undergraduate Business Colleges

Peggy Johnson, Lander University, Greenwood, SC
Joseph Krupka, Florida State University, Panama City, FL
David Simmons, Savannah State University, Savannah, GA

ABSTRACT

The purpose of this study is to (i) identify the extent of student academic dishonesty in colleges of business at two AACSB accredited universities in the southeastern United States, (ii) to empirically test a model of factors that influence student cheating, and (iii) explore recommendations for the faculty and administration of these institutions to reduce the incidence of academic dishonesty. A questionnaire was administered to business students in each college during spring semester 2019. Common factors that are explored in this study include individual behavior, situational vs planned behavior, environmental factors, and institutional components.

An ordinary least squares regression statistical modeling was used for data analysis. The Theory of Planned Behavior started as the Theory of Reasoned Action in 1980 to predict an individual's intention to engage in a behavior at a specific time and place. The theory was intended to explain all behaviors over which people have the ability to exert self-control. The key component to this model is behavioral intent; behavioral intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome. Behavioral intention refers to the motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed.

INTRODUCTION

Academic Dishonesty (AD) is any type of cheating or dishonesty that occurs in relation to a formal academic exercise. A large body of research dating back 70 years indicates that AD is and has been pervasive in universities throughout the world. The prevalence of AD on college campuses in the United States has reported that on average more than 70% of students have engaged in some form of AD during their college career (Whitley, 1998). An early study of cheating among business students by Bowers (1964), recorded higher levels of cheating among business students compared to students in other disciplines. McCabe and Trevino (1997) found similar differences in a study of 16 schools with science and engineering programs and business programs, affirming that 84% of business students reporting one or more serious cheating incidents within the prior year compared to 72% of engineering students and 66% of all other participating students. Nearly all full-time faculty in the universities in this study describe numerous incidences of cheating each semester; this anecdotal evidence was the impetus for this study.

Prevalent factors that have been identified as having been empirically linked to AD include demographic characteristics, behavioral characteristics, situational factors and institutional factors. Demographic characteristics include factors such as age, gender, grade point average, and field of study. Behavioral characteristics include behaviors such as alcohol consumption, club membership, and participation in extracurricular activities. Situational factors include such things as peer behavior, class size, course delivery methods, instructor surveillance and institutional factors such as honor codes. One of the most important determinants of student cheating is the belief or perception that everyone else is already cheating, "An institution's ability to develop a shared understanding and acceptance of its academic

integrity policies has a significant and substantive impact on student perception of their peer's behavior, the most powerful influence on self-reported cheating." (McCabe and Trevino, 1993)

Reviews of factors related to cheating have been studied and identified by (Crown and Spiller, 1998); (McCabe, Trevino, and Butterfield, 2001); and (Simha and Cullen, 2012). The large multi-school studies of the attitudes of students concerning cheating have recognized that the factors mentioned here have been established as playing a critical role regarding the inclination of students to cheat. However, the newest situational factor, online learning and the dissemination of information technology has not been studied systematically to the degree previous learning environments have. It is commonly accepted that information technology has lowered barriers to cheating according to Etter, Cramer, and Finn (2006). Previous studies imply that cheating occurs when opportunities are enhanced (Michaels & Miethe, 1989; Perry, Kane, Bernesser, & Spicker, 1990). Additionally, anecdotal evidence indicates that information technology allows students to participate in AD to a greater degree than has been previously recognized. This study investigates both in-class and on-line cheating among participants.

Previous research (Jackson, Levine, Furham, & Burr, 2002; Whitley, 1998) indicates that students who are more likely to engage in AD in a university setting are male, young (Klein, Levenburg, McKendall, & Mothersel, 2007) and members of fraternities or sororities (Baird, 1980; Burrus, McGoldrick, & Schuhmann, 2007). They also have a tendency to consume alcohol, are more likely to cheat if they believe their peers cheat, and have low grade point averages (Wray, Jones, Schuhmann, and Burrus, 2016).

A considerable amount of the data collected in prior research has been self-reported by students, this data is easy to obtain but may result in underestimation of the actual cheating due to the lack of incentive for honesty and the fear of reprisal (Wray, Jones, Schuhmann, and Burrus, 2016). After the data is collected, the usual methods of analysis such as statistical tests for differences in cheating between groups (i.e. Accounting majors vs Marketing majors) along with tests for differences in characteristics of students (i.e. age, gender, grade-point average) between students who cheat and those who do not will be employed. Examples of these statistical tests include t-tests for differences in means, chi-square tests for differences in proportions or analysis of (co) variance, additionally correlation and regression analysis will be employed to assess factors associated with cheating.

The Theory of Planned Behavior (TPB) started as the Theory of Reasoned Action in 1980 to predict an individual's intention to engage in a behavior at a specific time and place. The theory was intended to explain all behaviors over which people have the ability to exert self-control. The key component to this model is behavioral intent; behavioral intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome. Behavioral intention refers to the motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed.

The TPB has been used successfully to predict and explain a wide range of health behaviors and intentions including smoking, drinking, health services utilization, breastfeeding, and substance use, among others. The TPB states that behavioral achievement depends on both motivation (intention) and ability (behavioral control). It distinguishes between three types of beliefs - behavioral, normative, and control. The TPB is comprised of six constructs that collectively represent a person's actual control over the behavior.

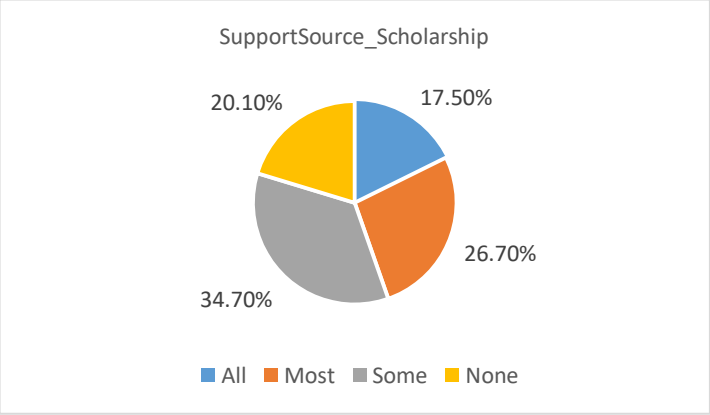
The study presented here has the combined total surveys completed by 571students from both Lander and Savannah State universities. There were 351 completed surveys from Savannah State and 221 from Lander. We conducted analysis of variance and regression analysis using the dependent variables of intention to cheat this term and will cheat given the opportunity. The independent variables include: I

have the skills to cheat, cheating is not morally wrong, I cheated during the previous term, my support source is scholarships, and love ones expect cheating.

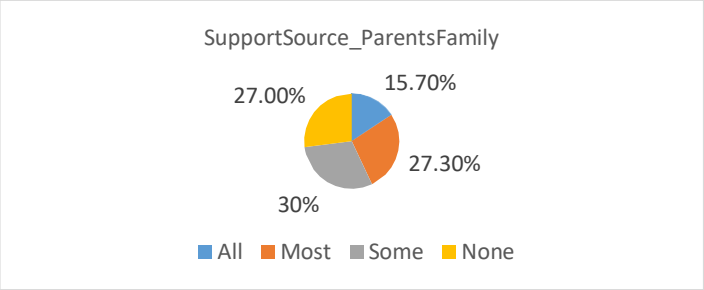
DEMOGRAPHIC FACTORS

The demographic factors that stood out from our survey are shown below.

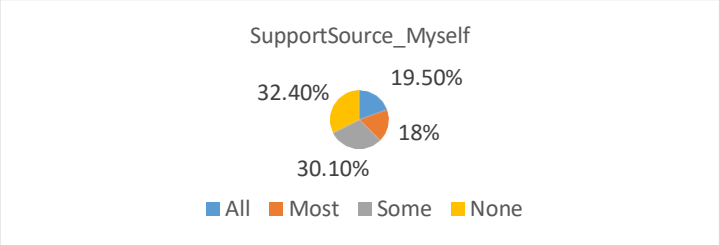
44.2 % of the sample were receiving either full or mostly scholarships to fund their financial expenses. Meaning scholarships have an important impact on the funding for our sample.



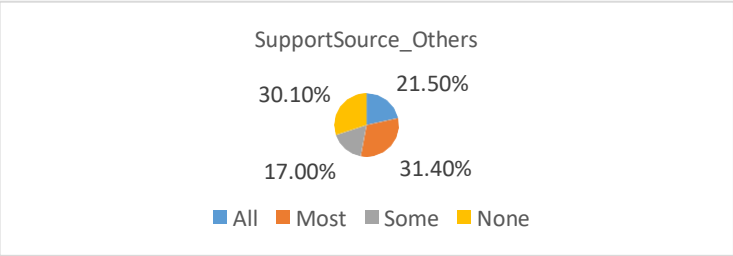
43% of the responses showed parental support either in full or mostly. Only 27% did not receive any parental financial support.



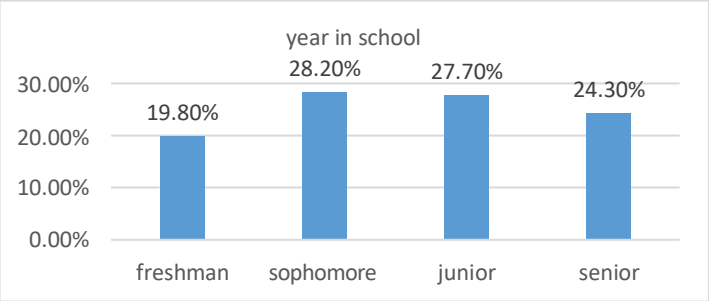
67.6 % of the students contributed at least some to their own financial support.



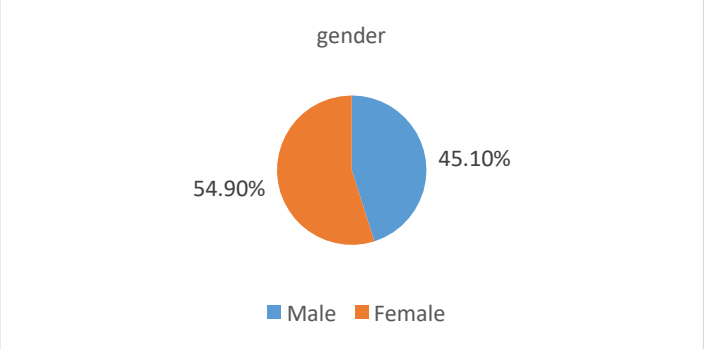
32.4% responded that they did not contribute at all to their financial support receiving all their support from others such as parental or scholarship support.



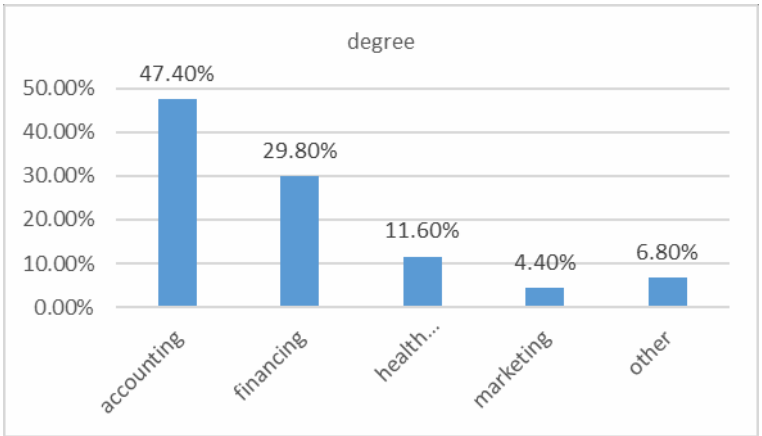
Our sample was representative of students from each year in school and we were able to gather substantial data from students in all four years.



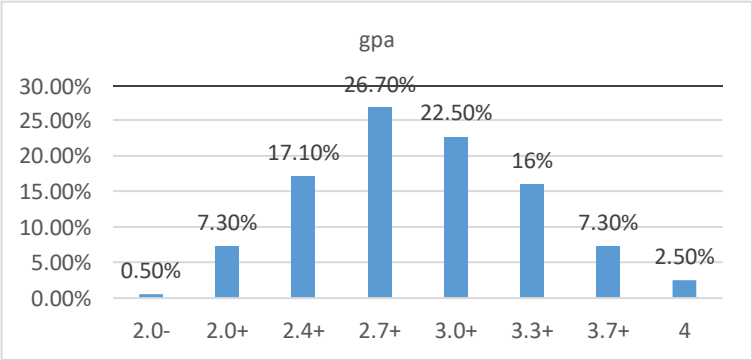
The mix between male and female students were 55.9 % female and 45.1 % male. Again, this demographic contributed a solid gender mix in our sample.



47.4 % , almost half of our sample were accounting majors. The other noteworthy major from our sample was finance which was 29.8% of the sample.



Our sample showed a true bell curve of GPA's . We gathered data from all sides of the GPA spectrum.



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HYPOTHESES

H1a: I_Have_SkillsTo_Cheat will positively affect WillCheat_GivenOpportunity VS
H1b: I_Have_SkillsTo_Cheat will positively affect IntendTo_Cheat_ThisTerm

H2a: Cheating_NotMorallyWrong will positively affect WillCheat_GivenOpportunity
H2b: Cheating_NotMorallyWrong will positively affect Intend To CheatThisTerm

H3a: LovedOnes_Expect_Cheating will positively affect WillCheat_GivenOpportunity
H3b: LovedOnes_Expect_Cheating will positively affect IntendTo_Cheat_ThisTerm

H4a: SupportSource_Myself will positively affect WillCheat_GivenOpportunity
H4b: SupportSource_Myself will positively affect IntendTo_Cheat_ThisTerm

H5a: SupportSource_Scholarship will positively affect WillCheat_GivenOpportunity
H5b: SupportSource_Scholarship will positively affect IntendTo_Cheat_ThisTerm

H6a: PreviousTerm_FrequencyCheating_HW will positively affect WillCheat_GivenOpportunity
H6b: PreviousTerm_FrequencyCheating_HW will positively affect IntendTo_Cheat_ThisTerm

METHODOLOGY

Model 1- WillCheat_GivenOpportunity VS I_Have_SkillsTo_Cheat
The actual behavior control of an individual, according to the theory of planned behavior, depends on the extent to which a person has the skills, resources, and other prerequisites needed to perform a behavior. Skill sets are both an asset and an investment. Skills to cheat are like any other skill, the perception of having them makes it more likely an individual will use them according to past studies (Atmeh & Khadash, 2008). Whether their skills to cheat are real or perceived, the more skills they have or believe they have, the more likely they are to cheat. Again, we see no difference between intentional and opportunistic cheating. Skills to cheat drives them both.

Model-1a: WillCheat_GivenOpportunity VS I_Have_SkillsTo_Cheat				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	-0.0038	-0.015	0.9877	
Year4Transfer	0.3649	1.08	0.2811	
International	0.5333	1.817	0.0702	.
Gender	0.2765	2.041	0.0421	*
I_Have_SkillsTo_Cheat	0.4022	7.361	1.4E-12	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-1a suggested that higher levels of I_Have_SkillsTo_Cheat would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f=**16.35, **p=**1.945e-14) and **Hypothesis-1a** was supported since I_Have_SkillsTo_Cheat was significant in the regression against WillCheat_GivenOpportunity (**β=**0.4022, **t=**7.361, **p=**1.425e-12).

Model-1b: IntendTo_Cheat_ThisTerm VS I_Have_SkillsTo_Cheat				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.2824	1.634	0.103	
Year4Transfer	-0.1790	-0.745	0.457	
international	0.1645	0.788	0.431	
Gender	0.4091	4.249	2.8E-05	***
I_Have_SkillsTo_Cheat	0.4271	11.019	< 2E-16	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-1b: suggested that higher levels of I_Have_SkillsTo_Cheat would result in increased IntendTo_Cheat_ThisTerm. Overall, model-Nb was significant (**f=**32.65, **p=**4.052e-27). And **Hypothesis-1b** was supported since I_Have_SkillsTo_Cheat was significant in the regression against IntendTo_Cheat_ThisTerm (**β=**0.4271, **t=**11.02, **p=**2.608e-24).

Model 2-WillCheat_GivenOpportunity VS Cheating_NotMorallyWrong
Moral obligation as a predictor of academic dishonesty has been demonstrated in several studies (Harding et al., 2007; Whitley, 1998). Beck and Ajzen (1991) showed that moral that moral obligation was a precursor of intent to cheat and also a significant predictor of actual cheating behavior. Since our actions

are a combination of motivation (being a better grade with less effort here), and inhibition (being the possibly of being caught as well as guilt over the immorality), if one of the inhibitions are removed, then the student may be more likely to carry out acts of cheating. Guilt about doing immoral acts is certainly one of the checks and balances which prevent immoral behavior. Removing the moral factor makes it all about the temptation (which the large majority of people will feel) against only the prospect of getting caught. Again both sides of the hypothesis were supported showing that immorality will allow people to cheat given the opportunity, and also cause them to plan to cheat.

Model-2a: WillCheat_GivenOpportunity VS Cheating_NotMorallyWrong				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	-0.0108	-0.044	0.9651	
Year4Transfer	0.5377	1.588	0.1132	
International	0.6874	2.087	0.0376	*
Gender	0.2435	1.769	0.0777	.
Cheating_NotMorallyWrong	0.4025	7.382	1.3E-12	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-2a suggested that higher levels of Cheating_NotMorallyWrong would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f=**15.67, **p=**7.714e-14). And **Hypothesis-2a** was supported since Cheating_NotMorallyWrong was significant in theregression against WillCheat_GivenOpportunity (**β=**0.4025, **t=**7.382, **p=**1.284e-12.

Model-2b: IntendTo_Cheat_ThisTerm VS Cheating_NotMorallyWrong				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.2785	1.443	0.15003	
Year4Transfer	0.1482	0.558	0.57723	
international	0.4391	1.699	0.09023	.
Gender	0.4207	3.904	0.00012	***
Cheating_NotMorallyWrong	0.2686	6.332	7.9E-10	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-2b suggested that higher levels of Cheating_NotMorallyWrong would result in increased IntendTo_Cheat_ThisTerm. Overall, model-N was significant (**f=**14.52, **p=**7.275e-13). And **Hypothesis-2b** was supported since Cheating_NotMorallyWrong was significant in the regression against IntendTo_Cheat_ThisTerm (**β=**0.2686, **t=**6.332, **p=**7.89e-10).

Model 3- WillCheat_GivenOpportunity VS LovedOnes_Expect_Cheating
Subjective norms have been found to be a key factor in the model for determining behavioral intentions (Alleyne, et al,). They found that the subjective norms had an impact on the student's attitudes toward academic dishonesty. In measuring subjective norms with respect to academic dishonesty was measured by using the following questions, 1) People whose opinions I value (e.g. my family, friends, colleagues, teachers, etc.) expect me to cheat on a test or exam. 2) Most people who are important to me (e.g. my family, friends, colleagues, teachers, etc.) will look down on me if I cheat on an exam or assignment. Prior studies also found support that attitudes of students and the influence of significant others and peers would endorse the practice of academic dishonesty (Chapman et al, 2004).

Model-3a: WillCheat_GivenOpportunity VS LovedOnes_Expect_Cheating				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	-0.0807	-0.337	0.7362	
Year4Transfer	0.5421	1.651	0.0996	.
international	0.8714	3.1	0.0021	**
Gender	0.1021	0.749	0.4541	
LovedOnes_Expect_Cheating	0.5049	8.135	8.1E-15	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-3a suggested that higher levels of LovedOnes_Expect_Cheating would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f=**18.92, **p=**1.424e-16). And **Hypothesis-3a** was supported since LovedOnes_Expect_Cheating was significant in the regression against WillCheat_GivenOpportunity (**β=**0.5049, **t=**8.135, **p=**8.125e-15).

Model-3b: IntendTo_Cheat_ThisTerm VS LovedOnes_Expect_Cheating				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.2069	1.188	0.23556	
Year4Transfer	0.0012	0.005	0.99587	
international	0.5490	2.687	0.00756	**
Gender	0.2476	2.516	0.01235	*
LovedOnes_Expect_Cheating	0.4915	11.024	< 2E-16	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-3b suggested that higher levels of LovedOnes_Expect_Cheating would result in increased IntendTo_Cheat_ThisTerm. Overall, model-Nb was significant (**f=**32.57, **p=**4.294e-27). And **Hypothesis-3b** was supported since LovedOnes_Expect_Cheating was significant in the regression against IntendTo_Cheat_ThisTerm (**β=**0.4915, **t=**11.02, **p=**2.396e-24).

Model 4- WillCheat_GivenOpportunity VS SupportSource_Myself

Many students, both graduate and undergraduate work while attending school today, which according to prior research increases the pressures on them to perform well. (Macabe, et al, 2006). Finally, many business students have less time to study and complete assignments, and graduate students may be under pressure to keep their grades up in order to continue getting financial support from their employers.

Model-4a: WillCheat_GivenOpportunity VS SupportSource_Myself				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	-0.1143	-0.376	0.70715	
Year4Transfer	1.1100	3.035	0.00263	**
international	0.9661	2.689	0.00759	**
Gender	0.1254	0.787	0.43166	
SupportSource_Myself	0.0682	1.052	0.29391	
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-4a suggested that higher levels of SupportSource_Myself would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f=**4.046, **p=**0.001453). But **Hypothesis-**

4a was not supported since SupportSource_Myself was not significant in the regression against WillCheat_GivenOpportunity (**β**=0.06822, **t**=1.052, **p**=0.2939).

Model-4b: IntendTo_Cheat_ThisTerm VS SupportSource_Myself				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.3963	1.753	0.08073	
Year4Transfer	0.4069	1.548	0.12274	
international	0.8318	3.113	0.00204	**
Gender	0.2564	2.168	0.03097	*
SupportSource_Myself	0.1854	3.839	0.00015	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-4b suggested that higher levels of SupportSource_Myself would result in increased IntendTo_Cheat_ThisTerm. Overall, model-N was significant (**f**=6.708, **p**=6.248e-06). And **Hypothesis-4b** was supported since SupportSource_Myself was significant in the regression against IntendTo_Cheat_ThisTerm (**β**=0.1853, **t**=3.839, **p**=0.000152).

Model 5 - SupportSource_Scholarship will positively affect WillCheat_GivenOpportunity

Model-5a: WillCheat_GivenOpportunity VS SupportSource_Scholarship				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	-0.1804	-0.642	0.52154	
Year4Transfer	0.8359	2.375	0.01815	*
international	1.1059	3.549	0.00045	***
Gender	0.2386	1.573	0.11684	
SupportSource_Scholarship	0.1185	-1.642	0.1016	
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-5a suggested that higher levels of SupportSource_Scholarship would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f**=4.546, **p**=0.0005176). But **Hypothesis-5a** was not supported since SupportSource_Scholarship was not significant in the regression against WillCheat_GivenOpportunity (**β**=0.1185, **t**=-1.642, **p**=0.1016).

Model-5b: IntendTo_Cheat_ThisTerm VS SupportSource_Scholarship				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.1446	0.713	0.47665	
Year4Transfer	0.3228	1.27	0.20497	
international	0.7378	3.279	0.00116	**
Gender	0.3406	3.113	0.00203	**
SupportSource_Scholarship	0.2130	-4.107	5.2E-05	***
**** p < 0.05, ** p < 0.01, *** p < 0.001***				

Hypothesis-5b: suggested that higher levels of SupportSource_Scholarship would result in increased IntendTo_Cheat_ThisTerm. Overall, model-N was significant (**f**=7.697, **p**=7.828e-07). And

Hypothesis-5b: was supported since SupportSource_Scholarship was significant in the regression against IntendTo_Cheat_ThisTerm (**β**=0.213, **t**=-4.107, **p**=5.146e-05).Again we see a difference between these two sides of this hypothesis since scholarship-support drives intention to cheat but not opportunistic cheating. Again, suggesting that with a scholarship at stake, the student is more likely to cheat and will not leave it to chance, since there is a lot riding on it.

Model-6a: WillCheat_GivenOpportunity VS PreviousTerm_FrequencyCheating_HW				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.1348	0.528	0.59814	
Year4Transfer	0.9380	2.716	0.00694	**
international	1.0424	3.513	0.00051	***
Gender	0.3472	2.458	0.01449	*
PreviousTerm_FrequencyCheating_HW	0.4056	4.71	3.6E-06	***
**** p** < 0.05, ** **p** < 0.01, *** **p** < 0.001*				

Hypothesis-6a suggested that higher levels of PreviousTerm_FrequencyCheating_HW would result in increased WillCheat_GivenOpportunity. Overall, model-N was significant (**f**=9.496, **p**=1.749e-08). And **Hypothesis-6a** was supported since PreviousTerm_FrequencyCheating_HW was significant in the regression against WillCheat_GivenOpportunity (**β**=0.4056, **t**=4.71, **p**=3.628e-06).

Model-6b: IntendTo_Cheat_ThisTerm VS PreviousTerm_FrequencyCheating_HW				
Independent Variables	**Beta**	**t**	**p-value**	
Year2Transfer	0.3582	1.784	0.07536	.
Year4Transfer	0.2823	1.075	0.28324	
international	0.7409	3.176	0.00163	**
Gender	0.4727	4.278	2.5E-05	***
PreviousTerm_FrequencyCheating_HW	0.2270	3.403	0.00075	***
**** p** < 0.05, ** **p** < 0.01, *** **p** < 0.001*				

Hypothesis-6b suggested that higher levels of PreviousTerm_FrequencyCheating_HW would result in increased IntendTo_Cheat_ThisTerm. Overall, model-N was significant (**f**=8.607, **p**=1.087e-07). And **Hypothesis-6b** was supported since PreviousTerm_FrequencyCheating_HW was significant in the regression against IntendTo_Cheat_ThisTerm (**β**=0.227, **t**=3.403, **p**=0.00075).
The fact that both intentions to cheat and cheating given opportunity is not surprising, since more time is spent on homework. So, if students cheat on homework, in which they have more time, can get guidance and have all the resources (literally in the world) at their disposal, then it is a part of their work ethic. And certainly, must be considered a part of their considered behavior, happening at a higher, planned behavior level, and so, it is to be expected that if they cheat on homework, they will likely intend to cheat. And naturally, they will also cheat given the opportunity.

ANALYSIS

Hypotheses were tested using Ordinary Least Squares (OLS) regression in R. All models included Year-2-Transfers, Year-4-Transfers and International-student as control variables.

Dependent Variables

Dependent Variables for all models were IntendTo_Cheat_ThisTerm & WillCheat_GivenOpportunity

Independent Variables

Dependent Variables were: I_Have_SkillsTo_Cheat, Cheating_NotMorallyWrong, LovedOnes_Expect_Cheating, SupportSource_Myself, SupportSource_Scholarship,

Data Collection

Data was collected by Survey data which had 40 questions including 15 Demographic Questions. The questionnaire was distributed at both universities during the spring semester of 2019. Several Faculty members were enlisted to collect the survey data during their classes at the two universities. There was a total of 571 surveys completed, 350 completed surveys collected from one university, while 221 results were collected from the other.

DISCUSSION

The theory of planned behavior may explain why individuals when given certain opportunities, pressures, and reasons, act on their motivation to cheat when they believe the can get away with it. A person's ethical code has a large part to play in deciding to follow through with this behavior. Encouraging ethical decisions and reinforcing positive behaviors begins with the administration and faculty. There is no single solution for minimizing the risk of AD, but as demonstrated in the studies of the TPB, there are foundational behaviors and motivations that if addressed in advance may significantly diminish the probability of this happening. TPB helps us to understand the probability that students will cheat given certain factors are present, permitting us to predict how they will perform in each situation. What can be done by universities to encourage ethical behaviors for students? Foremost, developing a culture of integrity and taking steps to eliminate many of the opportunity's students have to cheat. To dissuade students from unethical behaviors, universities can implement "zero tolerance policies" toward unethical behavior and have persistent reiteration of this expectation. Also, another component to address would be to mitigate some of the pressure's students perceive that prompt students to cheat. Perhaps through creating an infrastructure of support services which could address the personal pressures that today's students face such as work-school balance among others.

The overall academic climate at an institution can be critical in the effectiveness of academic integrity by limiting opportunities for AD which can include strict adherence to policy, use of honor codes and a sense of ethical intellectual purpose.

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COMPONENTS OF EQUITY

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ABSTRACT

Equity and its components were measured through a questionnaire in a sample of 73 restaurant employees. Components of equity, superior's recognition, monetary reward, personal accomplishment and security were found to be correlated significantly with overall equity score. In addition, various components were significantly correlated with each other.

Employee satisfaction with pay and other rewards is critical for job satisfaction and performance. Equity theory was proposed by Adams [1] to explain the implications of an exchange between an employee and an employer. Employees exert effort and use their skills and abilities in performing a job with the expectation that they will be fairly rewarded. What an employee brings in is considered as an input and the reward received as an output. The ratio between input and reward may not always be favorable or equitable as perceived by the employee. One of the ways input-output ratio is considered unfavorable or inequitable when the reward does not match the effort. The employee may believe that his/her effort is greater than the reward. Another way this ratio may be unfavorable or inequitable when an employee compares his/her input-output ratio with that of others. An employee may believe that he/she is putting in greater effort or performing at a higher level than others but the reward for everyone is the same or reward for others is greater. Weather an employee looks at the ratio between input and output for himself or the same ratio compared with others and perceives it to be unfavorable; it results in tension or distress. This view of pay equity focuses on individual inputs and outputs ratio as compared to others in same job categories and not on other forms of horizontal or vertical pay variations and inequities. Nor does it focus on jobs outside the organization.

Perception of negative equity influences the work behavior of an employee in various ways. It may result in lowering performance, leaving the situation in the form of higher absenteeism or turnover, negatively affect pay satisfaction and attitudes towards supervisor. Reviews of studies on equity theory as discussed by Ambrose and Kulik [2] have called it a useful theory [18] and other reviewers also concluded that research evidence supported the theory [9] [15]. As predicted by equity theory, research found that workers who were undercompensated lowered their performance [9]. Goodman and Friedman [8] reviewed a large number of empirical studies on the effects of inequity on performance and allocation of rewards. They concluded that there was some support for equity theory. However, evidence from studies on overcompensated workers have not been as strong as that on undercompensated workers [15].

Several studies have shown that inequity results in lowering performance in an effort to make input-output ratio favorable to the employee [9]. Other studies have also shown that pay variation may be related to individual performance [4] [13]. Perceived inequity may also be related to satisfaction. Hallock, Salazar and Venneman [11] found that perceived pay equity was correlated with satisfaction

with employee stock ownership plan. Summers and Denisi [14] found that among restaurant employees who perceived that they received lower pay as compared to others had lower satisfaction with pay. On the other hand, among the employees of a large utility the perception that their pay was fair as compared to others was not related to organizational commitment. However, the employees felt that the compensation they received matched their educational qualification and their occupation was associated with commitment (Johnson and Johnson, 1991). Several studies have investigated the relationship between equity and overall satisfaction. General practitioners [16] and nurses [17] perceived that their rewards did not match their efforts in their relationship to patients resulting in negative attitudes. In a comparison of equity and job satisfaction, Dittrich and Carrell [6] found that equity was more closely associated with absenteeism and turnover. Pay satisfaction and job satisfaction were found to be moderating the effect of positive affectivity on work motivation [5]. Hallock, Salazar and Venneman [11] found that perceived pay equity was correlated with satisfaction with employee stock ownership plan.

Based on the assumption that all individuals do not react to inequity the same way, Blakely, Andrews and Moorman [3] explored the effect of three types of individuals based on their equity sensitivity on organizational citizenship behavior. These three types include benevolents who have higher level of tolerance for inequity, entitleds who disregard inputs and focus more on outcomes, and sensitives who focus on input-output ratio as conceptualized by equity theory. They found that benevolents preformed more organizational citizenship behaviors than entitleds.

Perceived inequity is also related to absenteeism and turnover [7]. The subjects in the equity subsample demonstrated less dissonance, more favorable attitudes toward their work and the organization, and a lower propensity to terminate voluntarily employment. Griffeth and Gaertner [10] examined the role of equity theory in the context of the contemporary turnover process. A model was developed and tested with 192 hospital employees using structural equation modeling (SEM), which placed satisfaction and intention to quit **as** mediators of employee turnover.

Inequity may take various forms. The effort or performance by an employee may not result in receiving equitable rewards in terms of recognition from superior, monetary compensation, personal accomplishment and job security. Present study explores the relationship between these components of equity and their relationship to an employee's overall feelings of inequity.

Method

The sample of the study included 73 employees of a restaurant. They responded to a questionnaire that consisted of 14 items on various components of equity.

Results and Discussion

Table 1 presents the correlations between scores on various components of equity and overall equity. Cronbach Alpha for the scale was .78.

Table 1-Correlations between components of equity with overall equity

N=73

	Overall Equity	Superior Recognition	Monetary Reward	Personal Accomplishment	Security
Overall Equity	-	.594**	.685**	.751**	.666**
Superior Recognition		-	.117	.231*	.310**
Monetary Reward			-	.380**	.220
Personal Accomplishment				-	.446**
Security					-

As shown in Table 1, components of equity, superior's recognition, monetary reward, personal accomplishment and security were all significantly correlated with overall equity. Superior's recognition was significantly correlated with personal accomplishment and security but not with monetary reward. Monetary reward was significantly correlated with only personal accomplishment but not with other components. Personal accomplishment was significantly correlated only with security.

It seems that all the components of equity play an important role in reducing inequity in an organization. The present study should help a superior in enhancing a feeling of equity among subordinates and increase work motivation.

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DIFFERENCES IN STUDENT PERORMANCE AMONG ONLINE SECTIONS AND BETWEEN ONLINE AND TRADITIONALLY TAUGHT SECTIONS OF PRINCIPLES OF ACCOUNTING

Abstract

We examine the difference in student performance for all sections of Principles of Financial Accounting taught by one professor during the three academic years – 2017, 2018, and 2019. During each of the semesters the professor taught one section online and one traditionally. We plan on exploring the differences in student performance using student grades as the study variable among the online sections and between the online sections and the traditionally taught classes. We also explore the role of demographic factors (gender, race/ethnicity and age) and other factors that may explain differences in student performance. We expect this study to give insights and recommendations that administrators and faculty should heed in designing accounting online classes and more importantly implementing admission standards to online courses.

Engaging Students to Learn Collaboration and Diversity on Entrepreneurial Projects through Self-Directed Teams

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An agile methodology of collaborative design thinking can engage students of all disciplines of a college on entrepreneurial projects. The methodology can be engaging especially if the students are functioning on entrepreneurial projects as members of cross-disciplinary teams. The author of this paper describes a customized design of this methodology based on a European design factory learning model that is focusing on collaborative and diverse design thinking.

The design is engaging cross-disciplinary students in a cooperative co-creator culture of a curricular program of developing ideation for product prototypes as entrepreneurial projects of self-directed teams and of introducing the projects in investor pitch presentations. The methodology is designed for non-profit and profit organizations and for non-technical and technology projects. The methodology is deliberatively designed for fostering learning of not only a distinct methodology but critically divergent – business, computer science and humanities - perspectives of students by including a diversity of students on the self-directed teams. Most of the students on the teams have not encountered face-to-face other students on their teams prior to the program, nor have most of them engaged on self-directed teams in their tenure in the university. The program is engaging interactions of the students in exercises and games of sharing and of teambuilding in initial teams. The program is also engaging international students on self-directed virtual teams with dispersed hybrid tools of the Web. Importantly, the learning process is resident with the students, as the professor is not a lecturer but a mentor to the student teams. Project resolutions and responsibilities for results are resident with the students. The project results are disruptive and non-disruptive strategies presented as pitch presentations of the student teams at the end of the semester. The benefits of the methodology offer opportunities for the students as members of the teams to learn interdisciplinary and non-hierarchical investigatory processes through collective critical thinking and team playing as if they are in new organizational ventures.

The paper presents preliminary findings from focus groups of the students, highlighting qualitatively from the reflections of the students as members of the teams and from the reflections of the professor, in a pilot semester. The benefits of the findings from the methodology, as applied by the author, may benefit professors considering collaborative and cross-disciplinary design thinking of self-directed student teams as an enhanced pedagogy in their institutions. Overall, the paper provides a methodology not in the service of cultural idealism but in the service of interdisciplinary learning for professors and students.

ESTIMATING THE SCORING OUTPUT OF NATIONAL FOOTBALL LEAGUE TEAMS DURING A SEASON USING ECONOMIC PRODUCTION FUNCTIONS

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ABSTRACT

The objective of a team in a football game is to score more points than its opponent. If it does so, it wins the game. The purpose of this paper is to develop and estimate a series of economic models that allow an interested person to predict the number of points a National Football League (NFL) team will score during a season based on various measures related to its offensive performance during the season. Six different variables are used to measure a team's performance. The models that are estimated are traditional microeconomic linear and Cobb-Douglas production functions. The models are estimated using data for each team for each season from 2000 to 2018. Data for pre-season and post-season (i.e., playoff games and the Super Bowl) games are excluded from the analysis to avoid introducing possible biases that such games might introduce, due to possible differences between such games and regular season games. Additionally, separate production functions are estimated for the 2000-2009 and 2010-2018 sub-periods to determine whether the production functions vary over time. An accuracy check is performed at the end of the paper, where the actual number of points each team scored during the 2018 season is compared to its predicted points that are estimated from the production functions.

INTRODUCTION

One of the most commonly used production functions in microeconomic theory is the Cobb-Douglas production function [1, pp. 291-292], [2, pp. 318-319], [3, pp. 276-278]. This production function typically estimates a firm's output during a particular time period as a function of the amount of two inputs, capital and labor, it uses and takes the following general form,

$$Q = A\, K^{\alpha}\, L^{\beta} \qquad (1).$$

This function can be transformed into the logarithmic equation,

$$\ln Q = \ln A + \alpha \ln K + \beta \ln L \qquad (2).$$

Q represents the amount of output produced per time period by the firm, A is a shift factor, K represents the amount of capital utilized by the firm, and L represents the amount of labor employed by the firm. The elasticity of output with respect to capital, E_K, is given by the value of α, and the elasticity of output with respect to labor, E_L, is given by the value of β.

An alternative to the Cobb-Douglas function is the linear production function, which takes the following general form,

$$Q = A + \alpha K + \beta L \qquad (3).$$

The term "A" represents the intercept, and Q, K, and L are defined as before. The marginal product of capital, MP_K, is given by the value of α, and the marginal product of labor, MP_L, is given by the value of

β. The marginal product of an input and the elasticity of output with respect to the input are related as follows:

Labor: $E_L = MP_L (L/Q)$

Capital: $E_K = MP_K (K/Q)$

In the same way that a firm produces output using capital and labor, a football team scores points through its ability to possess and advance the football. Ceteris paribus, the more chances a team has to advance the football, and the more yards it gains through either running or passing the ball, the more points it will score. For purposes of estimating a football production function, the number of points scored by a team during a season is treated as output, and the number of plays attempted by the team during the season, along with the number of yards it gains, is treated as its inputs.

This paper utilizes eight production functions, four that are linear and four that are of the Cobb-Douglas form. Each of the four linear production functions utilizes a different set of inputs. There is a corresponding Cobb-Douglas function for each linear function. The functions are estimated using data for all National Football League (NFL) teams for each season from 2000 through 2018. To determine whether the production functions are relatively stable over time, the functions are also estimated separately for the 2000-2009 and 2010-2018 sub-periods.

THE DATA AND THE PRODUCTION FUNCTIONS

The underlying theory of the production functions that are estimated in this paper is that a football team scores more points during a season when it has more chances to advance the ball and when it gains more yards, either through running or passing the ball. As such, the variables utilized in this paper are listed and defined in Table 1.

Table 1
Definitions of the Variables Used in the Football Production Functions

Variable	Definition
Points	The number of points scored by the team during the season.
Total Plays	The team's number of offensive plays during the season.
Rush Plays	The number of offensive plays where the team attempted to run (i. e., rush) the ball during the season.
Pass Plays	The number of offensive plays where the team attempted to pass the ball during the season.
Total Yards	The number of total yards the team gained during the season, either through running or passing the ball.
Rush Yards	The number of yards gained by the team during the season on running (i.e., rushing) plays.
Pass Yards	The number of yards gained by the team during the season on passing plays.

Notes:
Data for all variables are obtained from www.footballreference.com

The mean and standard deviation of each of these variables is reported in Table 2. In the table it can be seen that the average number of points scored by a team during a season is approximately 350, or roughly 21.8 points per game. Further, an average team attempts about 1,012 plays during a season, and it attempts about 23 percent more passing plays than running plays. An average team also gains about 93 percent more yards on passing plays than on running plays during a season.

Table 2 also reveals that there are some differences between the 2000-2009 and 2010-2019 sub-periods. First, the average team ran slightly more plays per season during the 2010-2018 period than during the 2000-2009 period, but the difference amounts to a little more than one play per game. Second, the number of total yards gained per season, on average, was higher during the 2010-2018 period. A third difference, perhaps the most interesting difference, is that the average number of running plays *decreased* from the earlier period to the later period, while the number of passing plays *increased*. This difference indicates that the NFL has become a more pass-oriented league over time. Corresponding to this difference, the average number of yards gained on running plays decreased and the number of yards gained on passing plays increased.

Table 2
Means and Standard Deviations of the Production Function Variables
(Standard Deviations are in Parenthesis)

Variable	All Seasons	2000 – 2009	2010 – 2018
Points	349.51 (71.57)	338.20 (70.73)	361.99 (70.53)
Total Plays	1,011.87 (46.85)	1,003.05 (44.38)	1,021.60 (47.64)
Rush Plays	436.65 (51.62)	444.64 (52.50)	427.82 (49.22)
Pass Plays	538.50 (59.50)	522.32 (55.01)	556.37 (59.24)
Total Yards	5,350.32 (634.97)	5,178.84 (624.93)	5,539.65 (591.62)
Rush Yards	1,820.64 (331.33)	1,837.49 (341.75)	1,802.05 (318.99)
Pass Yards	3,529.67 (624.44)	3,341.36 (592.24)	3,737.61 (593.18)
N	606	318	288

Notes:
Each team played 16 games per season during the period examined in this study. Thus, any differences in the means between the two sub-periods are not caused by differences in the number of games played per season.

ESTIMATING THE PRODUCTION FUNCTIONS

As mentioned previously, both linear production functions and Cobb-Douglas production functions are estimated in this paper. The four linear production functions that are estimated are as follows:

$$\text{Points} = a + b\ \text{Total Plays} \qquad (4).$$

$$\text{Points} = a + b\ \text{Rush Plays} + c\ \text{Pass Plays} \qquad (5).$$

$$\text{Points} = a + b\ \text{Total Yards} \quad (6).$$

$$\text{Points} = a + b\ \text{Rush Yards} + c\ \text{Pass Yards} \quad (7).$$

The four Cobb-Douglas production functions that are estimated are as follows:

$$\ln \text{Points} = \ln a + b \ln \text{Total Plays} \quad (8).$$

$$\ln \text{Points} = \ln a + b \ln \text{Rush Plays} + c \ln \text{Pass Plays} \quad (9).$$

$$\ln \text{Points} = \ln a + b \ln \text{Total Yards} \quad (10).$$

$$\ln \text{Points} = \ln a + b \ln \text{Rush Yards} + c \ln \text{Pass Yards} \quad (11).$$

All eight production functions are estimated with ordinary least squares (OLS) with the covariance matrix corrected for heteroscedasticity (using the White correction in the LIMDEP econometric software package). It is expected that all explanatory variables will have a positive effect on the number of points scored by a team during a season. It is also expected that the values of the coefficients in both the linear production functions and Cobb-Douglas production functions will be approximately equal in the 2000-2009 and 2010-2018 sub-periods.

The regression results for the full period (2000-2018) models are shown in Table 3. The coefficients in the linear models indicate the increase in the number of points scored by a team during a season that results from a one unit increase in an independent variable, while the coefficients in the Cobb-Douglas models are elasticities, which indicate the *percent* increase in the number of points scored by a team during a season that results from a one *percent* increase in an independent variable. The R-squared values are quite large in in Models 3 and 4 (the models that utilize yards, rather than plays, as independent variables), for both the linear and Cobb-Douglas models, but are relatively small in Models 1 and 2 (the models that utilize plays, rather than yards, as the independent variables). This indicates that the models that utilize yards as the independent variables have more explanatory power than the models that utilize the number of plays as the independent variables. As such, Models 3 and 4 serve as better football production functions than Models 1 and 2.

Model 1 of the linear models indicates that each additional offensive play causes a team to score an additional .63 points, ceteris paribus. Model 2 indicates that each additional running play leads to more points scored than each additional passing play, .78 points compared to .64 points, ceteris paribus. Model 3 indicates that each additional yard a team gains, either by running or passing the ball, causes an increase in .09 points scored, and Model 4 indicates that each additional yard gained by running causes a slightly larger increase in points scored than each additional yard gained by passing, .11 compared to .09.

In the Cobb-Douglas models, the results of Model 1 indicate that a one percent increase in a team's number of offensive plays during a season increases its number of points by 1.9 percent. Model 2 indicates a one percent increase in a team's number of passing plays during a season increases the number of points it scores by about one percent, which is approximately the same affect that running plays has on a team's scoring. Model 3 indicates that when a team increases the total yards it gains during a season by one percent, its scoring increases by roughly 1.4 percent. Model 4 indicates that a one percent increase in a team's passing yardage increases its scoring by about .9 percent, while an increase in a team's running yardage of one percent increases its scoring by a much smaller .6 percent. Thus, the only two factors that are relatively *elastic* are a team's total number of plays and the total number of yards it gains during the season. The remaining variables are either inelastic or unit elastic.

Table 3
Football Production Function Regression Results

	Linear Models				Cobb-Douglas Models			
Variable	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Intercept	-285.414 (-5.00)	-338.556 (-7.10)	-147.400 (-10.60)	-166.100 (-11.70)	-7.259 (-6.35)	-6.562 (-7.60)	-6.470 (-18.41)	-5.892 (-17.62)
Total Plays	.6275 (11.12)				1.8926 (11.47)			
Rush Plays		.7807 (13.72)				1.0163 (13.49)		
Pass Plays		.6447 (12.36)				.9910 (12.41)		
Total Yards			.0929 (35.35)				1.4345 (35.11)	
Rush Yards				.1087 (23.19)				.5869 (22.88)
Pass Yards				.0900 (31.79)				.8992 (30.77)
N	606	606	606	606	606	606	606	606
R-Squared	.169	.242	.679	.686	.175	.243	.677	.677

Notes:
The t-statistics are shown in parenthesis. All coefficients are statistically significant at the .01 level. There were 30 teams in the NFL during the 2000 and 2001 seasons, and 32 teams each season thereafter.

Table 4 reports the regression results of Model 4 for both the linear production function and the Cobb-Douglas production function for two specific sub-periods, 2000-2009 and 2010-2018. In both production functions the coefficients in the latter period are larger than those in the former period, indicating that a yard gained by a football team, either by running the ball or by passing the ball, had a larger positive effect on the points it scored in a season during the 2010-2018 period than during the 2000-2009 period. The differences in the magnitudes of the coefficients are relatively small, however, with a particular coefficient being less than 9.0 percent larger in the 2010-2018 regressions than in the 2000-2009 regressions. As such, the production functions are relatively constant between the two periods.

Table 4
Football Production Function Regression Results: Model 4, by Sub-period

	Linear Model		Cobb-Douglas Model	
Variable	**2000-2009**	**2010-2018**	**2000-2009**	**2010-2018**
Intercept	-158.391 (-8.43)	-196.339 (-8.56)	-5.823 (-12.69)	-6.499 (-12.87)
Rush Yards	.1049 (16.62)	.1144 (16.62)	.5894 (16.68)	.5915 (16.26))
Pass Yards	.0909 (22.66)	.0942 (21.04)	.8896 (21.55)	.9674 (21.31)
N	318	288	318	288
R-Squared	.690	.671	.678	.662

Notes:
The t-statistics are shown in parenthesis. All coefficients are statistically significant at the .01 level.

COMPARING THE PREDICTIVE ACCURACY OF THE LINEAR PRODUCTION FUNCTION TO THE COBB-DOUGLAS PRODUCTION FUNCTION

The final part of the analysis involves comparing the predictive accuracy of Model 4 of the linear production function to Model 4 of the Cobb-Douglas production function. For this comparison the regressions for Model 4 are re-estimated for both production functions using data from the 2000-*2017* period, rather than from the 2000-2018 period. The coefficients from these re-estimated regressions are then used to predict the number of points each of the 32 teams will score during the 2018 season, given the number of yards the team actually gained on passing plays and the number of yards it actually gained on running plays during the 2018 season. The re-estimated regression equations for the two production functions are:

Linear Production Function Points = -164.65 + .1079 Rush Yards + .0901 Pass Yards.

Cobb-Douglas Production Function Points = .00279 x Rush Yards$^{.5857}$ x Pass Yards$^{.8988}$.

Table 5 reports the actual number of points and the predicted number of points for each NFL team during the 2018 season. The absolute error is the absolute value of the team's actual points minus its predicted points.

Table 5
Actual vs. Predicted Points, 2018 by Team

		Linear Function		Cobb-Douglas Function	
Team	**Actual Points**	**Predicted Points**	**Absolute Error**	**Predicted Points**	**Absolute Error**
Arizona Cardinals	225	207.3	17.7	216.8	8.2
Atlanta Falcons	414	424.1	10.1	412.4	1.6
Baltimore Ravens	389	419.1	30.1	419.1	30.1
Buffalo Bills	269	301.0	32.0	298.7	29.7
Carolina Panthers	376	411.2	35.2	414.7	38.7
Chicago Bears	421	365.4	55.6	366.7	54.3
Cincinnati Bengals	368	313.1	54.9	314.1	53.9
Cleveland Browns	359	400.4	41.4	401.8	42.8
Dallas Cowboys	339	365.7	26.7	367.0	28.0
Denver Broncos	329	373.8	44.8	375.2	46.2
Detroit Lions	324	336.5	12.5	335.9	11.9
Green Bay Packers	376	396.8	20.8	392.3	16.3
Houston Texans	402	393.9	8.1	396.3	5.7
Indianapolis Colts	433	422.4	10.6	418.1	14.9
Jacksonville Jaguars	245	301.2	56.2	302.7	57.7
Kansas City Chiefs	565	481.7	83.3	480.6	84.4
Los Angeles Chargers	428	405.6	22.4	406.7	21.3
Los Angeles Rams	527	481.9	45.1	491.7	35.3
Miami Dolphins	319	284.0	35.0	285.8	33.2
Minnesota Vikings	360	359.9	0.1	352.0	8.0

New England Patriots	436	438.5	2.5	443.0	7.0
New Orleans Saints	504	417.8	86.2	421.3	82.7
New York Giants	369	377.8	8.8	374.1	5.1
New York Jets	333	295.3	37.7	296.9	36.1
Oakland Raiders	290	348.8	58.8	346.7	56.7
Philadelphia Eagles	367	389.7	22.7	381.7	14.7
Pittsburgh Steelers	428	442.2	14.2	419.2	8.8
San Francisco 49ers	342	388.8	46.8	390.3	48.3
Seattle Seahawks	428	390.0	38.0	380.0	48.0
Tampa Bay Buccaneers	396	461.2	65.2	441.4	45.4
Tennessee Titans	310	321.9	11.9	320.0	10.0
Washington Redskins	281	298.8	17.8	300.1	19.1
Total			**1,053.2**		**1,004.3**

The last row of the table is the sum of the absolute errors and it indicates that the Cobb-Douglas model has slightly more accurate predictions regarding a team's scoring that the linear model. The total of the absolute errors is larger for the linear model, 1,053 compared to 1,004 for the Cobb-Douglas model. Since there were 32 teams in the NFL in 2018, the average difference in the predictive error of the two models is about 1.5 points per team. This is a very small error, considering the average team scored nearly 374 points during the 2018 season.

CONCLUSION

This paper has estimated two general forms of football production functions, using data from all National Football League teams for the 2000 through 2018 seasons. The two general production functions are the linear production function and the Cobb-Douglas production function, one of the most commonly used production functions in microeconomic theory. The production functions obtained in this study indicate that the number of points a team scores during a season is positively affected by the number of plays it runs and by the number of yards it gains on both running plays and passing plays. The results of the study also suggest that the Cobb-Douglas form of the production function yields slightly more accurate predictions of how many points a team will score during a season than the linear production function, but the difference in the predictive accuracy of the two functions is very small.

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Examination and Analysis of Cyber Threats and Risks in the Financial Messaging Network: An Investigation on SWIFT Data Breaches

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Abstract

Today, banking has become increasingly global and largely electronic. However, numerous electronic transactions are still plagued by cyber breaches frequently being traced to ineffective security procedures that expose customers' data to cybercriminals. Cyber attacks do not require physical proximity nor are they deterred by national borders in which perpetrators can easily remain undetected for a long period of time. Such breaches inevitably result in losses of reputation, customer confidence and in some instances, productivity. The purpose of this study is to take a deeper look into various breaches of the SWIFT (Society for Worldwide Interbank Financial Telecommunication) messaging network to gain better understanding of vulnerabilities inherent in the international banking system and the mechanisms through which a series of advanced, persistent threats (APT) can take place. The authors discuss different opportunities for banks to embrace new security mindsets and change their risk management and mitigation processes as it relates to information protection, data retention, and network architecture. The paper concludes with the lessons learnt and the future research directions.

EXPLORING STUDENT PREFERENCES AMONG ONLINE, TRADITIONAL, AND HYBRID CLASSES

Have you ever taken an online class? Did you like it? Do you prefer online or traditional in the classroom education? Likewise, is there an "in between" referred to as hybrid which may be more for you? Obviously, online education is here to stay. It is a means of education which allows students to take classes without actually being on campus. Some believe that it can be easier than traditional classes. But, do students really prefer having to teach themselves the material using the tools given? Additionally, is online better "suited" for certain majors? For instance, does it work better for Management or Accounting majors? The authors explored these questions in this paper via their teaching environment which is the College of Business in a small, public school in the southeastern United States. Based on total surveys of 246 students across four emphases areas, students were asked about their preferences among online, traditional, and hybrid classes. Statistical analysis was conducted to determine if significant differences exist. You may be surprised with the results!

HOW DO PROSPECTIVE STUDENT-ATHLETES CHOOSE THEIR SCHOOLS?

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ABSTRACT

The paper examines the processes used by prospective student-athletes to decide which college to attend. Becoming an NCAA athlete is no small feat. Typically, fewer than 10% of high school athletes play their sport in college. These prospective student-athletes want to find the best-fit school for their circumstances (which are highly specific to that student). They segment schools under consideration the same way marketers segment consumer markets. And, they engage in an individualized problem-solving process to choose their schools. College recruiters can benefit by organizing their recruiting efforts to 'sell into' these consumer processes.

INTRODUCTION

There were approximately 20 million students graduating from high school in the United States in 2018. Of this group, it is estimated that approximately 70% of these students will enroll in college immediately following high school [11]. These students face an important decision for themselves (and their families) as they seek to identify the best-fit-school for their needs. For high school student-athletes (SA's), the college decision has a second element as these athletes seek to find an opportunity to extend their athletic careers in college in addition to finding a good fit academically.

According to the NCAA, there are approximately 8 million high school student-athletes. Currently, there are approximately 495,000 student-athletes competing at the Division I, II, and III levels. The number of opportunities to compete in college range from 1,047 spots for men's water polo to 73,557 spots for football players. With few exceptions (Ice Hockey, Field Hockey, and Lacrosse), fewer than 10% of high school athletes go on to compete in their sport in college [14]. And, of the $2.7 billion awarded in scholarships each year, only about 2% of high school students will receive any athletic aid to play their sport in college [3].

Not every student-athlete who aspires to compete in college is able to do so. Some fail to qualify academically. Others lack the necessary athletic talent to compete after high school. Still, others (particularly at the Division II and III levels) may have the required athletic ability but may not have the financial resources to pursue their sport without the promise of an athletic scholarship.

The purpose of this manuscript is to examine the college selection decision faced by high school student-athletes. First, a look at the competition opportunities provided by college sports is provided to give context to the landscape faced by a high school student-athlete hoping to compete in college. Second, a model of market segmentation is applied to "school segmentation" by prospective student-athletes (or PSAs to borrow an NCAA compliance term). Third, a model of consumer decision-making is applied to the college decision of prospective student-athletes.

THE OPPORTUNITY TO COMPETE IN COLLEGE SPORTS

College sports is sanctioned by four major bodies: National Collegiate Athletic Association (NCAA); National Association of Intercollegiate Athletics (NAIA); National Junior College Athletic Association (NJCAA); and the NACA (National Association of Christian Athletes). The focus of this manuscript is NCAA sports. The NCAA is divided into 3 divisions. These divisions, and their associated member institutions, are profiled in **Table 1**. The reader will note the following breakdown among NCAA divisions: Division I (32% of member schools, 36% of student-athletes); Division II (28% of member schools, 25% of student-athletes); and Division III (40% of member schools, 39% of student-athletes). Further, it should be emphasized that approximately 40% of Division I and Division II student-athletes receive no athletic aid (but are eligible for other forms of aid).

TABLE 1 – A REVIEW OF NCAA DIVISION I, II, and III INSTITUTIONS

	Division I	**Division II**	**Division III**
Description	Division I schools, on average, enroll the most students, manage the largest athletics budgets, offer a wide array of academic programs and provide the most athletics scholarships	Division II provides growth opportunities through academic achievement, high-level athletics competition and community engagement. Many participants are first-generation college students.	The Division III experience provides an integrated environment that focuses on academic success while offering competitive athletics and meaningful non-athletics opportunities.
# of Student-Athletes	179,200 36% of SA's	121,900 25% of SA's	190,900 39% of SA's
# of Schools	351 32% of membership	308 28% of membership	443 40% of membership
Athletic Scholarships	59% of SA's receive athletic aid	62% of SA's receive athletic aid	80% of SA's receive some form of academic grant or need-based award
Graduation Success Rate (2017)	87%	72%	87%
Median Undergraduate Enrollment	9,629	2,485	1,748
Average Number of Teams per School	19	16	18
Average % of student body participating in NCAA sports	4%	9%	26%

Source: [12].

NCAA sports can be divided into two groups: (1) head count sports, and (2) equivalency sports. In head count sports, teams are restricted in the number of scholarships they can award for that sport. And, scholarships cannot be divided among student-athletes. NCAA head count scholarship sports include Football (DI FBS only), Men's Basketball (DI), Women's Basketball (DI), Women's Tennis (D1), Women's Gymnastics (D1), and Women's Volleyball (DI). These sports are considered the 'full-ride sports', meaning athletic scholarship recipients cannot receive (or stack) other forms of aid (such as academic merit awards) [2].

The remainder of sports are equivalency sports at the NCAA Division I level. And, all DII, NAIA, and Junior College sports are equivalency sports. In equivalency sports, the total number of scholarships is limited by the NCAA but teams are allowed to offer fractional (or partial) scholarships to student-athletes up to a certain number of based on NCAA limits [16]. For example, the NCAA allows 11.7 scholarships to be distributed over no more than 27 student-athletes [13, p. 188]. For student-athletes receiving partial athletic aid for an equivalency sport, other forms of academic and need-based aid can be added (or stacked) with the athletic award. Note, the minimum percentage of a scholarship that must be offered (such as 25% or 33%) can vary by sport. It must be noted that NCAA Division III schools cannot offer purely athletic scholarships. The number of scholarships able to be offered by sport is profiled in **Table 2**.

Table 3 provides a look at the percentage of high school student-athletes who actually compete in their sport on the college level broken down by Division I, II, and III. The reader should note that more student-athletes compete at DII and DIII schools (about 65% combined) compared to DI (about 34% of student-athletes). However, DI programs tend to have larger roster sizes, (i.e., more scholarship slots), enhanced facilities, enhanced infrastructure for student support, much larger media and fan attention, and other attributes attractive to prospective student-athletes.

TABLE 2 – NCAA SCHOLARSHIP LIMITS PER SPORT

Sport	NCAA Division I	NCAA Division II
Men		
Baseball	11.7	9
Basketball **(D1 Head Count)**	13	10
Cross Country / Track	12.6	12.6
Football (FBS) **(D1 Head Count)**	85	
Football (FCS)	63	
Football		36
Golf	4.5	3.6
Gymnastics	6.3	5.4
Ice Hockey	18	13.5
Lacrosse	12.6	10.8
Soccer	9.9	9.0
Swimming & Diving	9.9	8.1
Tennis	4.5	4.5
Volleyball	4.5	4.5
Water Polo	4.5	4.5
Wrestling	9.9	9.0
Women		
Basketball **(D1 Head Count)**	15	10
Beach Volleyball	6	5
Cross Country / Track	18	12.6
Golf	6	5.4
Gymnastics **(D1 Head Count)**	12	6
Ice Hockey	18	18
Lacrosse	12	9.9
Soccer	14	9.9
Softball	12	7.2
Swimming & Diving	14	8.1
Tennis **(D1 Head Count)**	8	6
Track & Field	18	12.6
Volleyball **(D1 Head Count)**	12	8
Water Polo	8	8

Sources: [13] [17].

TABLE 3 – NCAA SPORTS PARTICIPATION RATES (HIGH SCHOOL TO COLLEGE)

Men	High School Participants	College Participants	Overall HS % to College	% HS to NCAA Div. I	% HS to NCAA Div. II	% HS to NCAA Div. III
Baseball	487,097	35,460	**7.3%**	2.2%	2.2%	2.9%
Basketball	551,373	18,816	**3.4%**	1.0%	1.0%	1.4%
Cross Country	270,095	14,270	**5.3%**	1.8%	1.4%	2.1%
Football	1,036,842	73,557	**7.1%**	2.8%	1.8%	2.5%
Golf	144,024	8,609	**6.0%**	2.0%	1.6%	2.3%
Ice Hockey	35,060	4,229	**12.1%**	4.8%	0.6%	6.6%
Lacrosse	113,313	14,310	**12.6%**	3.0%	2.4%	7.2%
Soccer	456,362	25,072	**5.5%**	1.3%	1.5%	2.7%
Swimming	138,935	9,697	**7.0%**	2.7%	1.1%	3.2%
Tennis	158,151	7,838	**5.0%**	1.6%	1.0%	2.3%
Track & Field	600,097	28,698	**4.8%**	1.9%	1.2%	1.7%
Volleyball	60,976	2,163	**3.5%**	0.7%	0.6%	2.2%
Water Polo	22,501	1,047	**4.7%**	2.7%	0.8%	1.2%
Wrestling	245,564	7,239	**2.9%**	1.0%	0.8%	1.2%
Women	**High School Participants**	**College Participants**	**Overall HS % to College**	**% HS to NCAA Div. I**	**% HS to NCAA Div. II**	**% HS to NCAA Div. III**
Basketball	412,407	16,614	**4.0%**	1.2%	1.2%	1.6%
Cross Country	223,518	15,632	**7.0%**	2.7%	1.7%	2.6%
Field Hockey	59,856	6,103	**10.2%**	3.0%	1.4%	5.8%
Golf	78,781	5,375	**6.8%**	2.8%	2.0%	2.1%
Ice Hockey	9,609	2,400	**25.0%**	8.9%	1.2%	14.9%
Lacrosse	96,904	12,061	**12.4%**	3.8%	2.7%	6.0%
Soccer	390,482	27,811	**7.1%**	2.4%	1.9%	2.8%
Softball	367,861	20,316	**5.5%**	1.7%	1.6%	2.2%
Swimming	175,594	12,848	**7.3%**	3.3%	1.2%	2.9%
Tennis	190,768	8,608	**4.5%**	1.5%	1.0%	2.0%
Track & Field	488,592	30,018	**6.1%**	2.7%	1.5%	1.9%
Volleyball	446,583	17,471	**3.9%**	1.2%	1.1%	1.6%
Water Polo	21,954	1,216	**5.8%**	3.6%	1.0%	1.1%

Source: [12].

MARKET SEGMENTATION = SCHOOL SEGMENTATION

Marketers typically segment the broad market into smaller consumer market segments. Then, the organization chooses which segment types offer the greatest opportunity. Common segmentation variables include: benefits sought; geographic; demographic; psychographic (or life style); and behavioral (such as occasions or usage rates) [9, pp. 179-187]. It is suggested here that prospective students (athletes and non-athletes) complete some sort of school segmentation process when choosing their short-list of desired colleges or universities. One can easily imagine the following parameters used by high school seniors:

- "I want to go to a school with ''big time sports." – **BENEFITS SOUGHT**
- "I want to stay in-state and save money." – **GEOGRAPHIC**
- "I want to attend a smaller school with smaller class size." – **DEMOGRAPHIC**
- "I want to attend a church-affiliated school" – **PSYCHOGRAPHIC**
- "I want to attend a school that offers club sports." – **BEHAVIORAL**

The school segmentation categories for prospective student-athletes are discussed in greater detail in the sections that follow. This discussion is summarized in **Table 4**.

Benefits Sought

With approximately 500,000 NCAA student-athletes, their reasons for attending school and competing in their sport vary greatly. Yes, some seek a professional career in football, basketball, etc. But, less than 2% of NCAA athletes make it to a professional league [12]. Many view an athletic scholarship as a means to pay for their education. Others seek the team environment and competition they have come to know in high school, AAU, and travel league sports. Many international students seek the prestige of a U.S. diploma and the opportunity to travel the world, see new places, and meet new people.

Geographic

A school's location may influence a prospective student-athlete in a variety of ways. For example, a student from sunny Florida may not give full consideration to attending school in a colder northern climate. Or, a student from an urban area may not be initially interested in attending school in a rural setting. A school's proximity to family can also influence the school selection. Can my family come watch me play? The introduction of video services (ESPN+, ESPN3, and others) make it possible for family and friends to see more games online rather than in-person. The issue of geographic segmentation can also tie to the cost of attending a school as state universities typically have different in-state and out-of-state tuition rates. This may cause an in-state student to only look at in-state options for higher education. This is not an issue for private or independent colleges and universities.

Demographic

Prospective student-athletes seek a school profile that matches their preferences. Institutional demography includes the majors offered, average class size, NCAA classification (DI, DII, or DIII). Many student-athletes aspire for a Division I experience but must then pivot when such opportunities do not develop. Or, they find the cost of attending a DII or DIII with academic aid (and possibly some athletic aid) to be a better financial decision for their family.

Psychographic

The psychographics (or lifestyle) of a team are an important component for a prospective student-athlete. During recruiting visit, a PSA is trying to evaluate team chemistry, commitment to training, and other variables. A track athlete, for example, wants to know if people get faster by training with the coaching staff. Imagine a PSA who does not drink encountering a team party during a recruiting visit. Including that PSA in that party may actually discourage a recruit from attending that school projecting that the party during a recruiting visit is a lifestyle norm for the team.

Behavioral

Behavioral segmentation may cause some student-athletes to switch to club sports. One can imagine an engineering student who decides to not compete at the NCAA level given the 3-4 hour a day commitment that NCAA sports require. Conversely, a tennis player or swimmer who has been competing for over a decade in juniors may be unable to imagine NOT competing in college. Such students may look well-beyond the Division I schools to find an opportunity to continue their athletic career (and the associated fellowship and competition it provides) at DII and DIII schools.

In June 2019, Clemson University announced its intent to close its on-campus pool on August 1, 2019 (i.e., 7 weeks after the original public announcement). It is estimated it will cost $3.0 million to make the needed upgrades to the pool or about $12 million to build a replacement elsewhere on campus [18]. Now, students who have participated in the Clemson Club Swim Team (not an NCAA-sponsored sport) have lost their opportunity to complete in their sport at the club level, including in-bound Fall 2019 freshman students who purposefully chose to attend Clemson University with the opportunity to participate in club swimming rather than look at NCAA swimming opportunities (particularly at the DII and DIII levels). With this new information, one must wonder how many of these affected Clemson-bound club swimmers may have chosen to attend a different school had this impending closure been known to them at the time they finalized their college choice.

TABLE 4 – SCHOOL SEGMENTATION BY PROSPECTIVE STUDENT-ATHLETES

Segmentation Variable	Example Applications
Benefits Sought	• Continue Playing Your Sport • Pay for School • Access to Professional Leagues • Access to Training/Coaching • Social Connections Upon Arrival at School • Earning a US Degree (INT students) • Faith Component (Church Schools)
Geographic	• Desired Locations • Avoiding Undesired Locations • Proximity to Family/Friends
Demographics	• Presence of Desired Major • Average Class Size • DI-D3 • JUCO or 4-year school • School Profile (large/small; public/private)
Psychographic	• Training Philosophy of Coaching Staff • Behavioral Norms of Team (Partying, etc.)
Behavioral	• Commitment to Sport • Time Commitment (NCAA vs. Club)

Source: Original.

CONSUMER DECISION-MAKING BY PROSPECTIVE STUDENT-ATHLETES

A seminal model in the field of Consumer Behavior is the Engel, Kollat, and Blackwell (EKB) Model of Consumer Decision-Making [6]. Building on the work of John Dewey [5] the EKB Model proposes that consumer work through sequential steps when making consumer decisions [7]:

- Problem Recognition
- Information Search
- Evaluation of Alternatives
- Purchase (or Choice)
- Post-Purchase (or Post-Choice) Evaluation

Recent consumer behavior research has noted the continued relevance of the EKB Model [1]. The EKB model is applied to prospective student-athlete decision-making (i.e., school selection) in the pages that follow. This discussion is summarized in **Table 5**.

Problem Recognition

Much like the benefits sought can vary greatly among student-athletes selecting a college, so, too, can the definition of the problem to be addressed in the decision-making process. Imagine a soccer player defining her college choice as follows:

> *"I seek a church-affiliated school where I can grow as a young women and as an athlete. I want a small school where I can get to know my professors. I want to keep my cost of school as low as possible and avoid borrowing too much money for my undergraduate degree. I have plans to go to medical school."*

This example student is seeking the simultaneous benefits of a small, private, church-school at a reasonable price to her family. Division II and III schools may offer best-fit. Her problem differs from a 5-star football or basketball recruit who will receive a paid-for education (for as long as he chooses to remain in school) at a Division I school. As illustrated here, the problem to be solved (typically a multi-dimensional one) will vary from student to student.

Information Search

PSAs will collect information about interested (or targeted) schools from personal sources (coaches, fellow players, recruiters) and impersonal sources (such as university websites, school profiles, college profile books, etc.). With the advent of social media, student-athletes are sharing their recruiting journeys with others. This signaling process has information value. Imagine a high-profile quarterback who commits to a specific school on his social media accounts. That may trigger another high-profile quarterback to change his planned school choice and to shift his focus to other (competing) schools.

Two newer sources of information deserve more discussion here. First, many PSAs sign with a recruiting service to help them find best-fit schools (particularly at the DII and DIII levels). Once such company is Next Collegiate Student Athlete (NCSA). The company describes itself as follows:

> "NCSA is now the world's largest and most successful college athletic recruiting network. With a network of 35,000 college coaches and more than 700 employees, NCSA assists student-athletes in 34 sports find their best path to college.

NCSA promotes two-way communication between PSAs and institutions. Students get profiles of schools and contact information for coaches. Schools can reach out (typically via email and later phone calls) with PSAs. And, PSAs can reach out directly to coaches. NCSA alerts PSAs about possible roster spots at various schools. NCSA reports that over 100,000 student-athletes who have used their services have signed with a college team [16].

The second issue is the presence of online video review services such as HUDL, MaxPreps, NCSA player videos, and others. Now, a coach can evaluate a PSA from the comfort of their office. And, a recruiting staff can watch player-posted videos on their social media and get an instant evaluation. For example, a football coach looking for a long-snapper who can make a punt-snap in less than 0.80 seconds can time snaps on video to determine if this PSA deserves further attention. Such services have been transformative to the information search process for schools and student-athletes alike.

Evaluation of Alternatives

Similar to the issue of varying problems to be solved by each PSA, the variables used to evaluate each school, team, and coach option will vary from PSA to PSA. The variables of focus will include fit with team culture, skills needed by the team, facilities, school location, aid package (total cost of attendance), and others. And, clearly what is important to a PSA will vary from DI to DII to DIII. McCaw [10] argues the fit with the coaching staff is the most important variable followed by the related variables noted above. This supports earlier research that the head coach the most important variable when all NCAA classes are evaluated together. However, when the data was split out, Academic Services (DI) and Location (DII) were rated above the Head Coach [8].

Purchase (or Choice)

When making a consumer choice, a decision-maker will decide if they are using a compensatory or non-compensatory decision rule. In a compensatory model, the presence of something can compensate (or make-up for) the absence of something else. In a non-compensatory model, the presence of something cannot compensate (or make-up for) the absence of something else [9, pp. 122-123]. Let's assume a track-athlete felt a connection with a coach but did not like the track facilities. In a compensatory model, the well-liked coach can help overcome the liability of the poor facilities. In a non-compensatory model, the facilities would be a 'deal killer' and the PSA would look elsewhere (even though s/he liked the coach).

Additionally, the ranking of decision criteria will mesh with the use of a compensatory or non-compensatory model. Consider a student who thinks she found her dream school only to find her family cannot afford that option. Some DII athletes could have elected to attend a DI school but at a higher cost than their DII school when their academic and athletic aid is combined. And, a dream school 1,000 miles from home may be rejected by a PSA who fears becoming home-sick being so far away from her family and support network.

Post-Purchase (or Post-Choice) Evaluation

Choosing a college or university is a high-involvement decision. And, buyer's remorse (or cognitive dissonance) is more likely for high-involvement decisions [9, pp. 124-125]. Coaches and athletic staffs must be aware of this phenomenon. A student-athlete can be satisfied with the academic experience but not the athletic experience (or vice versa). Injuries do occur, which can end athletic careers. Some student-athletes elect to end their playing careers while still having eligibility remaining. And, they remain happy with their college choice.

The new NCAA transfer portal allows a student-athlete to 'undo' their college choice and transfer. It is interesting to note that student-athlete transfer rates have remained somewhat stable in recent years (15% for men, 10% for women at the DI level) [15]. Coaching changes do occur. This new fact set can cause original satisfaction to turn to dissatisfaction (and vice versa).

TABLE 5 – APPLICATION OF THE EKB MODEL TO PROSPECTIVE STUDENT-ATHLETES

Model Component	Discussion Points
Problem Recognition	Student Goals / Benefit Segmentation • Continue Playing Your Sport • Pay for School • Access to Professional Leagues • Access to Training/Coaching • Social Connections Upon Arrival • Location / Distance from Family
Search for Information	• People • College Coaches/Recruiters • HS/Club Team members • Club Coaches (and hangers-on) • Recruiting Services (NCSA profiles) • Social Media of Schools • Social Media of other Recruits
Evaluation of Alternatives	• Fit with Team – Athletically • Fit with Team – Behaviorally • Fit with Staff • Facilities • Location / Proximity to Family • Aid package (final cost of attendance)
Choice	Compensatory vs. Non-Compensatory • Full-scholarship vs. Partial Scholarship • Stacking of Aid (Academic, Athletic) • In-state or out-of-state
Post-Choice Evaluation	• What if Coaching Change? • Player Status • Academic Status and Satisfaction • Transfer Possibility • Terminate Playing Career

Source: Original.

DIRECTIONS FOR FUTURE RESEARCH

The two models advanced and applied here provide a framework to understand student-athlete school segmentation and school selection processes. The next step in this research effort is to identify existing empirical research to improve our collective understanding of this complex subject matter. From the marketing literature and practice, there are some relationships that deserve more attention.

Retaining loyal customers is one way to achieve a sustainable competitive advantage for an organization [9, p. 25]. And, it is less expensive to keep existing customers satisfied than to have to spend the marketing effort to replace them. Does this hold true for student-athletes? That is, can recruiting costs be lowered by increasing satisfaction among existing student-athletes (who are less likely to transfer and more likely to recommend their school to others)?

One key to customer retention programs is to look at lifetime value of a customer [9, p. 25]. Similarly, what is the 'lifetime value' of a satisfied student-athlete as they progress from student to graduate to donor? For example, former Duke University student-athletes donated $31.7 million to the university: $20.9 million for academics/student life and $10.8 million for athletics in 2017 alone [4]. This manuscript represents a beginning to a research effort to address such important questions.

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ABSTRACT

Academic dishonesty is not a new topic at the university level and the effects are wide-ranging and multi-disciplinary in nature. However, as technology is changing the environment, there is a pressing issue of improving the process of analyzing academic dishonesty as the educational process affects industry as a whole. Fields of education, analytics, process engineering and psychology can be part of any analysis as well as many other academic areas of higher education. The environment of academic dishonesty and even analyzing survey data is changing regardless of the field of education. Today, technology has caused the environment of traditional students to be much more of a "now" world than ever before. Teaching methods need to change over time that follow the change in the basic environment of students. However, university professors need information on the current state of research within the realm of academic dishonesty. They need reliable information that allows them to make better decisions within their specific academic environment. This work presents (i) a look at potential improvements in the testing methods reported in the literature of academic dishonesty and (ii) uses empirical data to test theories about improving the process of discovering academic dishonesty. Due to our rapidly changing world, studies are needed to maintain pace with the change in information technology to help with understanding of the entire process. Discussed are opportunities for improving the process of studying academic dishonesty using survey data while reducing bias. As a result, better information will follow in the future from an improved process that allows the academic industry to produce higher reliability for their decisions in their educational pursuits. Results are given for before and after scenarios on actual academic dishonesty data and implications for educators are explored.

Incorporating Program Courses with Community Events

Keely K. Clay, Kennesaw State University, Marietta, GA

Abstract/Research-in-Progress

Before the beginning of each semester professors begin the task of creating or revaluating classroom curriculum. Depending on the semester before or the year before, when the course was last taught, professors are able to tell what strengths and weakness an course has and how to build upon each. Community outreach is something that every University is involved. Community outreach combined with students and classroom, is usually something that is left to the professor to build upon. Some students whom are not involved within organizations will never have the opportunity for community outreach. Many students today have jobs, families or other priorities that keep their schedule not flexible for any other activities outside of the classroom. According to Astin, "the effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement" (Astin, 1999, p. 519). More employers are looking for what type of extracurricular activates students have fulfilled during their University involvement but also what community events did the student take partnership in while completing their degree. There have been many times in which I have overseen as an advisor for student organizations and it seems with each passing year students start to become less active. Wondering on how to bridge the gap between program courses and community events left me pondering how two similar goals could be achieved through one action. Reaching out to the community as an attainable idea was formed, combining both classroom and community together for one higher purpose.

This semester the courses that I instruct will incorporate two different community events, into the academic fall semester calendar. Students will work as a group on various projects for specific events while still working on the regular course subject matter throughout the semester. Students will also learn new curriculum within these junior, senior classes: while turning in homework, classwork, final projects, and being a part of these two different community events.

Two community events are set to take place this fall semester one during October, and another in November. Both events will be worked on by each junior, senior level students within their major course, as well as the same format used for each event. Each of the classes have a lecture portion of class as well as a lab portion of the class. During the semester students will: learn new material as related to the course, turn in homework, classwork and final term projects along with participation of the two scheduled events. Students will have a portion of each lab course to work in their committees for each event. Lecture material in class with correspond with information

that will be created as it corresponds to each event. Students will know the date of the community event on the first day of class. Students will plan their schedules accordingly to be present at each community event. On the first day of class, students will come up with five different subcommittees of their choice and choose which to be a part of. A few examples of subcommittees will consist of design, marketing, and logistics, just to name a few. By giving students freedom to choose their committee, this should peek their interest and hopefully have them inspired while also being involved. Students will also sign a contract that states: the rules of each committee, attending date of event, and abide by the rules of the contract for the semester.

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Market Research on the Oil & Gas Industry

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ABSTRACT

In October 2018, *The Client* engaged the Wall Fellows to conduct market research and competitor analysis of the oil and gas industry regarding cement integrity and zonal isolation to identify potential opportunities for a new product offering data logging in a small, reliable sensor. The Team collected qualitative and quantitative data from interviews conducted with professionals within the field, online resources, and information found in the Coastal Carolina University library database.

The deliverables for this project were:

a) an estimation of the market size, characteristics of the market, and needs/potentials of the market;
b) an evaluation of direct and indirect competition and potential clients; and
c) an understanding of the use of Baker Hughes Incorporated Worldwide Rig Count.

The research led to the following conclusions:

1) When drilling wells, it is in the best interest of both the producer and consumer to spend ample time in the engineering phase of well drilling. By doing so, it is more likely for the completed well to be more stable, reliable, and have an extended life.
2) Companies in the oil and gas industry are looking towards a more innovative future in utilizing renewable sources for energy production.
3) The Baker Hughes Worldwide Rig Count can benefit *The Client* in understanding where rigs are in the world, determining the climate of the industry, and gauging the willingness of buyers to support the market.
4) There are a variety of large competitors providing loggers who are established in the oil and gas industry.

From the research conducted through the course of this project, three areas of opportunity were identified for *The Client* that would allow them to effectively and successfully enter the U.S. market with the new product that focused on the oil and gas industry. Of the three opportunities, the Team recommends that *The Client* focus its efforts on U.S. startup companies in the oil and gas industry because of the risk-taking nature of startups and the current competitive saturation among existing large companies.

INTRODUCTION

Erica Evans, Morgan Goodall-Scott, and Emily Towne (the Team) are students from Coastal Carolina University (CCU) and members of a leadership development program called The Wall Fellows Program, a program that selects high achieving students for unique professional development opportunities that include organizational skills, effective communication, and leadership training to prepare them to work with international organizations. Working with the Team were Class of 2019 Wall Fellow Trevor Greene, Coastal Carolina CoBE Associate Megan Colagrande, and faculty advisors Gina Cummings, MBA, Peter Gasca, MBA, and Michael Latta, Ph.D.

One of the opportunities presented by the program is a consulting project with various companies in Iceland. This year the Team were retained by *The Client* to conduct a market entry consultation project with a focus on the oil and gas industry in the U.S.. The Team was tasked with understanding the market and competitors in the U.S. for a sensor that tests cement integrity in the cementing phase of drilling an oil and/or gas extraction well, currently being developed and tested by *The Client*.

In order to better understand the market and competitors in the U.S., the Team conducted research on the history and current status of the oil and gas industry in the U.S., providing them with a better understanding of current conditions of the market. The Team was then able to determine its course of action and methodology for collecting data and research.

Through qualitative and quantitative research, the Team identified three areas of opportunity for *The Client* to enter the oil and gas industry with the new logger:

- startup and early-stage companies
- direct-to-market with investor support
- partnership or licensing deals with larger companies

HISTORY OF OIL & GAS IN THE U.S.

In 1859, in Titusville, Pennsylvania, the first American oil rig began producing oil. This inland well was built by Pennsylvania Rock Oil Company under Edwin Drake and was about 21 meters deep. The oil extracted from this well was commonly used for lamps to be used by households at night (American Oil and Gas Historical Society). Oil wells remained on land until the late 1890's when companies began building wooden piers just offshore to drill into the oceans.

Offshore drilling in the U.S. began in 1937 when Pure Oil and Superior Oil ventured out off the coast of Southern Louisiana into the Gulf of Mexico. About a mile-and-a-half offshore, Pure Oil and Superior Oil built the first freestanding offshore oil well. This well stood in 4.27 meters of water and began to produce the first offshore oil in March of 1938 (*The History of Offshore Oil and Gas in the U.S.*, p.1-2). The new discovery led companies further offshore, reaching underwater levels as deep as 2.9 kilometers (Newcomb).

The late 1940's to the early 1950's brought political strife between stage governments and the U.S. federal government. The federal government filed suits against the states for drilling offshore on "their land" without proper permits and leases. This debate was settled in the U.S. Supreme Court, giving the states jurisdiction up-to three miles from their respective coastlines. Beyond three miles was under federal authority per the Outer Continental Shelf Lands Act of 1953, signed into law by President Dwight D. Eisenhower (*The History of Offshore Oil and Gas in the U.S.*, p.4-5).

A staggering 7 million barrels of oil were purchased daily by Americans alone in 1954. At the same time, the U.S. made agreements with Iran, under the ruling of the Shah, to allow U.S. companies to manage oil productions in Iran (Council on Foreign Relations).

By the 1960s, oil drilling was 100 years old, but far from perfect. In 1969, the industry experiences one of the first major oil spills of the shore of Santa Barbara, CA, a result of pressure build-up after a drill pipe had been removed and capped. Environmentalists and conservationists called for regulation. In 1989, another major oil spill occurred off the shores of Alaska, resulting in a $2-billion cleanup effort. As a result, the Oil Pollution Act was passed by the U.S. Congress shortly after, creating a three-tiered plan for handling spills in the future.

More recently, the BP oil spill of 2010, commonly referred to as Deepwater Horizon, resulted in a ban of offshore drilling in the U.S. as citizens called for new safety measures to be implemented and enforced (Council on Foreign Relations).

With a better understanding of where the oil and gas industry started, the Team developed a course of action to collect data about the market and competitors to *The Client*. This course of action can be found in the following section labeled "Methodology".

METHODOLOGY

To collect data and information for the project deliverables, the Team conducted qualitative and quantitative research from primary and secondary resources. The Team's primary resources of qualitative data were interviews conducted with industry professionals.

The interview process for data collection began with the following five-question interview script:

1. In your role or in prior roles, what experiences have you had with fracking and the creation of boreholes?
2. What material or materials does your company use after a borehole has been made to create the walls of the well?
3. Has your company been able to identify any preventative measures to avoid breaches in well integrity?
4. Have you noticed any trends or changes in your company's methods to maintain zonal isolation?
5. What safety precautions are involved in these methods?

This script was used to produce qualitative data relating to the use of cement integrity and zonal isolation. In order to secure interviews, potential respondents were contacted via email, LinkedIn and through web searches of articles and company websites. The candidates were chosen based on job descriptions and listed work experiences. The targeted job descriptions included:

- cement consultants
- project engineers and managers
- senior executives
- drilling engineers
- cement educators

During the interviews, the Team asked potential respondents to answer the questions above concerning their experience and expertise in the oil and gas industry.

The Team was able to connect with a total of nine respondents. Interviews were scheduled and conducted via phone and Skype or completed through email correspondences. A more detailed profile of these nine respondents can be found in the "Respondent Profile."

Throughout this process, the Team discovered that, due to company privacy policies within the industry and coupled with the level of ambiguity that had to be maintained surrounding specific details of this project, some interviewees were unable or unwilling to comment on some questions posed. These factors also impacted the number of respondents the Team was able to secure for the purposes of our research. Many companies within the oil and gas industry are hesitant to provide anyone outside of their companies with information regarding their processes and potential problems faced within their companies. Additionally, if information were to be

leaked to government agencies by sources outside of their organizations, respondents risked facing potential litigation or public relations challenges. Since there is an increased focus and sensitivity within the oil and gas industry after major spills like Deepwater Horizon, sharing private company information or trade secrets could be detrimental to the company and to the employee's job.

Beyond conducting interviews, the Team utilized secondary resources to gather more quantitative data from academic journals, reports, and company websites. These written resources were found through CCU's library database and through searches of public information from numerous online sources. From these resources, the Team was able to gather data pertaining to the market's needs and potentials, rig counts, and current product offerings from competitors.

The Team then compiled interview responses along with the data found through written resources. The data collected was then analyzed based on the scope of the project, which can be found in the Executive Summary of this report. The outcome of the Team's analysis can be found in the following pages, concluding with the Team's recommendation to *The Client*.

RESPONDENT PROFILE

The Team gathered insight from a total of nine individuals. These 9 respondents have an average of about 24 years of experience in the oil and gas industry. Out of these 9 respondents, 5 had over 20 years of experience. Two of the respondents had 40 years or more experience and are now retired or primarily working as consultants.

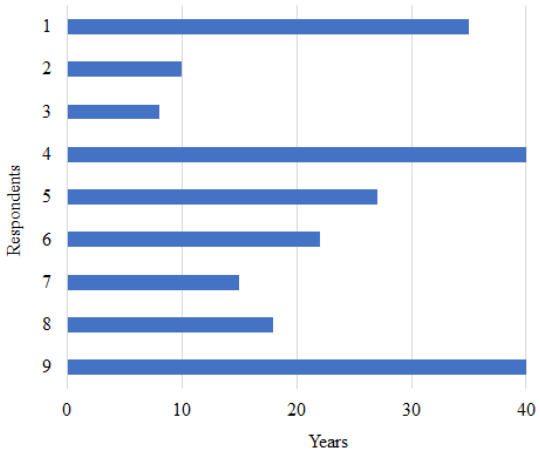

Figure 1: Respondents' Years of Experience

Three out of the nine respondents have predominately worked throughout the U.S., including Louisiana, Texas, and California. The remaining six respondents have worked in the industry on an international level in regions including England, Syria, India, and Brazil.

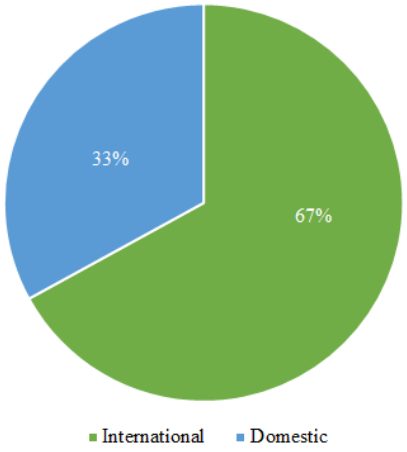

Figure 2: Respondents' Geographic Experience

Respondents have work experience in the following positions:

Interviewee #	Title
1	Cement Educator
2	Senior Drilling Engineer
3	Project Manager
4	Independent Consultant
5	Senior Professional Global Research and Thought
6	Cement Educator
7	Drilling Application Engineer
8	Natural Gas Rig Manager
9	Former Senior Oilfield Executive

All nine of these individuals have had extensive experience within the oil and gas industry in various roles and locations. Due to the amount of diversity among the respondents' experiences, our Team was able to gather valuable insight into the industry from various angles.

INTERVIEW RESULTS

After analyzing the information gathered throughout the nine interviews conducted, the Team organized the information based upon similarities in the responses. This included responses to the Team's scripted questions as well as information provided candidly during interviews. These similarities include the following points:

- Casing and cement are core factors in the structuring of wells.
- There is no standard way to drill a well. Numerous factors surrounding each specific project influence the best way to go about the drilling process of each well.
- The pressure of the well is a deciding factor in what precautions are necessary during drilling.
- The oil and gas industry prioritizes efficiency and safety during the drilling process. Therefore, proper testing and research is a vital portion of the preparation process prior to construction of a well.

A. Current Drilling Methods, Materials, and Preventative Measures

Based on analysis of responses from interviewed experts, common responses were grouped and the frequencies at which specific, relevant responses were recorded.

In response to the Team's scripted question #2, five out of the nine interviewees responded with casing being a key component in the structure of the well. The casing serves to provide isolation in the well-bore; it is one of the first steps in the process of drilling a well. These five correspondents also revealed that cementing is critical to support the structure of a well as it seals the space between the casing and the pipe.

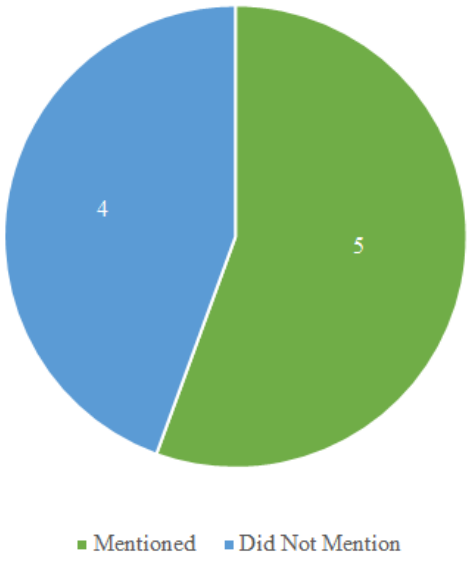

Figure 3: Casing and Cementing Importance

Two of the interviewees directly expressed how the specific requirements of the well are dependent upon the nature of the project. However, each interviewee, in one-variation or another, provided insight that lead the Team to believe that no two wells are drilled the same. For each well, variations such as the location, mud type, pressure, etc., will affect what is necessary to drill a proper well for that project. Interviewee #4 expressed that the process of drilling a well is "not a one size fits all engineering solution".

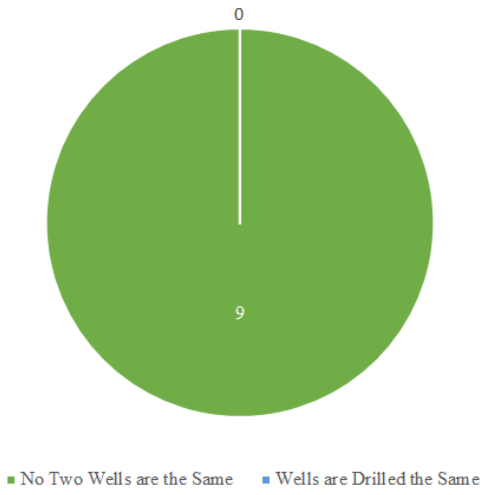

Figure 4: No Two Wells are the Same

Three of the interviewees expressed that pressure plays a large part in the equation when trying to decide the necessary measures and precautions to take during well drilling. The more pressure there is in that environment, the stronger the equipment is required to be. More specifically, Interviewee #3 shared that a change in metallurgy, from standard alloy to 13chrome, is necessary "due to the increase in pressure and wellbore properties such as CO2/H2S discovered when drilling".

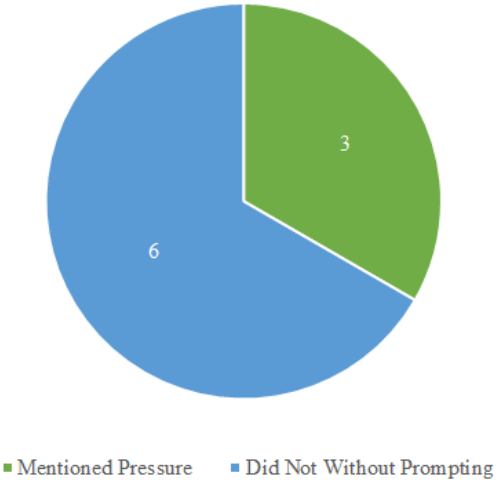

Figure 5: The Importance of Pressure

Throughout the course of conducting interviews, respondents spoke candidly outside of the Team's initial line of questions. The following were points repetitively mentioned by respondents when speaking openly about their industry.

- Three of the respondents reported that the most effective way to ensure the drilling will be a success is to do the proper up-front research and doing initial engineering correctly.
- Two of the respondents specifically spoke to the engineering process and its importance on well drilling success.
- Two of the respondents described logging tools as tools typically used to avoid breaches in well integrity. The usage of loggers provides information on the type of issue that may be occurring and about the location of the issues in the well.

B. Respondent Recognized Trends and Future Use

- Interviewee #1 further provided support of companies looking to be as efficient as possible by stating that the industry is "always looking to be more time efficient so that they can reduce costs."
- Interviewee #2 described that his success comes from having "never felt pressure to complete a well on a timeframe". He described that it is more beneficial to the entire process. He stated that "the risk isn't worth it."
- Three of the interviewees made it known that the trends in the market originate from companies trying to "[reduce] the amount of time to deploy or creating alternate flow paths for each zone" (Interviewee #3).

C. Additional Insights

In addition to the questions asked, some respondents offered the Team additional insights:

1. Time Efficiency and Safety

Reducing the amount of time it takes to drill a well allows for more time for the well to be in operation and yielding revenue for the company. On the downside, it is still just as imperative to ensure that a good-quality well is drilled because if there is a malfunction, the company could suffer a significant loss to the individuals, the environment and the company.

As an example, in 2010 BP experienced this firsthand when one of its oil drilling rigs, the *Deepwater Horizon,* operating in the Macondo Prospect in the Gulf, exploded and sank. This event caused the death of 11 workers and resulted in 4 million barrels of oil spilled into the waters over an 87-day period. The extreme severity of the event made it the largest oil spill in the history of marine oil drilling operations. Consequentially, the U.S. filed a complaint in the District Court against BP Exploration and Production. The company suffered a loss of $5.5 billion in Clean Water Act penalties and $8.8 billion in natural resource damages.

2. Pre-Construction and Testing Protocols

The benefit of allowing sufficient time during production allows the Team to have heightened focus throughout the entire process.

Four of the respondents noted that there are extensive testing protocols to follow prior to the initiation of drilling. Interviewee #1 indicated that out of all the rules and regulations, about "85% [of the] rules are written around construction [of the well]".

THE MARKET

At A Glance:

- The oil market is extremely volatile and can experience both rapid increases and decreases in prices, which can affect overall oil and gas industry drilling.
- There are predictions concerning the future of energy production that current companies in this industry will need to be aware of and make changes to accordingly if they want to continue to exist in the oil and gas industry. The increased focus on reducing carbon footprint is putting pressure on the industry to innovate. (i.e., 2016 Paris Agreement)
- The long-term future of energy is in renewable energy sources.

A. Characteristics of the Market

The oil market is a very sensitive entity that is often affected by external factors including political negotiations, changes within economies, as well as the shifting of needs by companies within the industry. Brent crude oil is the leading global price benchmark which is utilized on a worldwide scale. The price of oil is dependent upon supply and demand activity within the market. This section analyzes oil price trends and investigates why the market is so unpredictable.

1. Understanding Oil Price

Brent crude oil is a major trading classification of sweet light crude oil that serves as a benchmark price for purchases of oil worldwide. It is extracted from several regions within the North Sea. Roughly two-thirds of all crude contracts around the world use Brent as a pricing benchmark, which makes it the most widely used indicator of oil on the planet.

West Texas Intermediate (WTI) is the benchmark for all crude oil that originates in the U.S. and makes its way by pipeline to the hub in Cushing, Oklahoma.

These two sources are typically both standard indications of the price of oil within the market. The prices of both oils are usually within a very close range of one another. However, there are certain circumstances which result in a substantial difference in the prices between the two. In 2011, WTI was trading around $85/barrel while Brent was at $103/barrel. This difference in price was believed to have been caused by the hub in Cushing reaching its capacity due to a surplus of oil in the interior of North America. While the price of WTI was suffering, Brent moved up in reaction to civil unrest in Egypt and across the Middle East. Events such as these across the globe influence the production and price of oil which ultimately has an overall effect on the flow of the market.

2. Industry Vulnerability

PricewaterhouseCoopers (PwC) produces an annual report in which several experienced company members review, analyze, and critique aspects of the oil and gas industry. This report was utilized by our Team to enhance our understanding of the oil and gas industry. PwC is a “multinational professional services network” and is ranked as the second largest professional service firm in the world, with a network of firms in 721 locations across 158 countries. PwC aims to “help organizations and individuals create value”. They work to help intricate systems function, adapt and evolve so they can benefit both communities and society. A primary goal of PwC is to “help clients make informed decisions and operate effectively within them” (PwC website).

According to information published by PwC in its annual report of the oil and gas industry, companies within the oil and gas industry can no longer rely on a “comfortable predictability” within the industry. They note that this year, oil and gas executives are “trying to set a growth course for their companies on shifting sands”. These “shifting sands” are a product of erratic price fluctuations, ambiguity about the future of fossil fuels and increasingly contentious trade negotiations around the world. Such uncertain conditions within the market make investors hesitant to pursue and to support new initiatives and endeavors.

The fluctuation of the market directly affects *The Client*, as it is important to understand whether it is a good time to introduce new products to companies and investors. When the market is doing well and investors are satisfied with their returns, they may be more prone to investigate new technology. If the market is in decline, companies may resort to a more conservative model; they may become apprehensive in investing in new technology. Being aware of how the market is behaving is critical in deciding when to introduce new technology to companies. The vulnerability of the market is reflected in the pricing of oil.

The PWC report explores the “price turmoil” that occurred in the second half of 2018, when, at one point, most companies were experiencing rising prices that reached more than $80/bbl. The sector then experienced a sudden crash where oil prices dropped to the high $60s. In the oil industry, following the definition of the American Petroleum Institute, a standard barrel of oil is often taken to mean the amount of oil that, at a standard pressure (14.696 psi) and temperature (60 F), would occupy a volume of exactly 1 bbl.

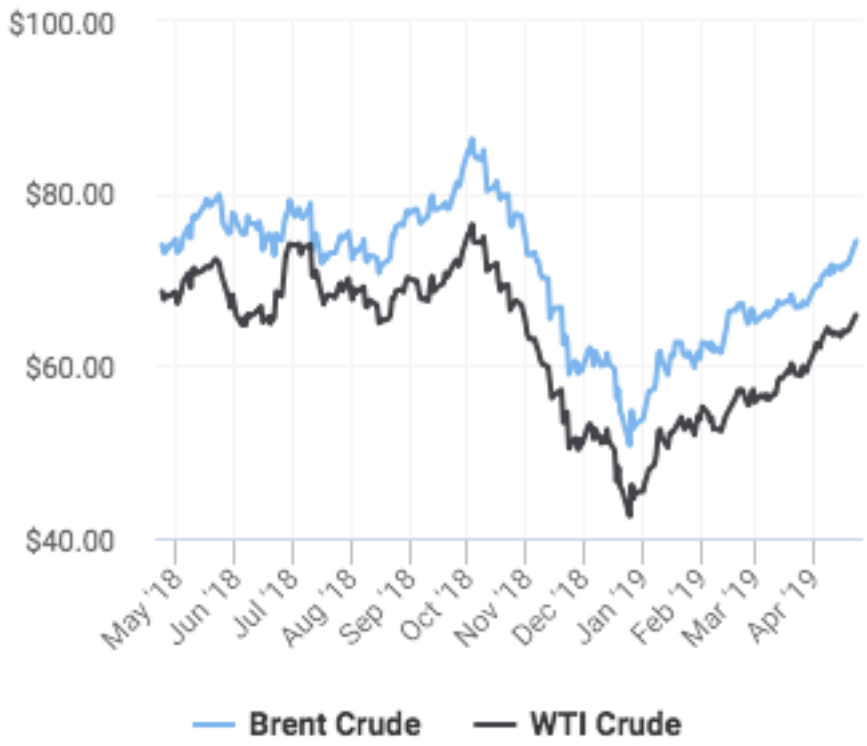

Figure 6: Brent Crude Vs. WTI Crude

As demonstrated by Figure 6, the prices of both oils dropped to a 12-month low in approximately early January of 2019. The prices of Brent and WTI were around $50/bbl and $43/bbl, respectively. It is also apparent that the prices have begun to rebound rather quickly. Within the last four months, the prices of both oils have been on a gradual incline, indicating growth within the market.

David Blackmon, independent energy analyst/consultant for Forbes, predicted in November of 2018 that the timing of the sudden price drops of oil would have a significant effect on production in 2019. He explains that the fall in prices occurred just as the companies drilling most of the wells in the U.S. were in the midst of setting their capital budgets for 2019. The selling/buying price of the oil is important to the companies because they base their capital allocations on the current price environment.

Blackmon brings up a secondary environmental factor that has an effect on the operations of companies within the oil and gas industry. On August 1, 2018, China halted imports of U.S. crude oil. While oil is a global commodity, the overall effects may very-well go unnoticed by the market. This caused short-term disruptions to U.S. suppliers as they had to find new markets for their products. A swift change such as an embargo can disrupt the flow of the market and present the opportunity for substantial disruption to send companies into a panic. These situations are often unplanned and can have a significant effect on multiple components within the market.

Additionally, the increased focus on climate change is also putting pressure on the industry. While such pressures will not have an immediate effect on the market, the preliminary steps are being taken to move the industry in a more ecofriendly direction. Interviewee #5 placed emphasis when describing how the market will follow the trends of the consumers. Meaning, as the population becomes more concerned with improving environmental-friendly standards, the desire for products that align with such standards will be required by the entire energy sector, including oil and gas.

According to the International Energy Agency, in 2040, fossil fuels will account for about 75% of the global primary energy demand. Even though the U.S. chose to not take part in the agreement, many nations globally initiated a movement in which all nations in alliance agreed to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. No matter how the public debate proceeds, this urgency seems unlikely to diminish, and it will have an effect on government policies and on consumer attitudes. Thus, possibly affecting the approach that companies within the energy markets will have to pursue.

B. Market Size

The oil industry contributes to economies across the globe. The number of active oil rigs in each region is constantly changing as companies decide to either continue or cease exploration. Heavy production occurs in key areas such as, several states within the U.S., the Gulf of Mexico, and the North Sea which lies on the European continental shelf. The following section explores the current oil activity within such key regions.

1. North America

a. U.S.

As of March 1st, 2019, there were 1,249 active rotary rigs in North America. Of these rigs, 1,038 were in the U.S., 22 in the Gulf of Mexico, and 211 in Canada. In the U.S., 1,015 were on land, one on inland waters, and 22 offshore, according to the Baker Hughes Rig Count data.

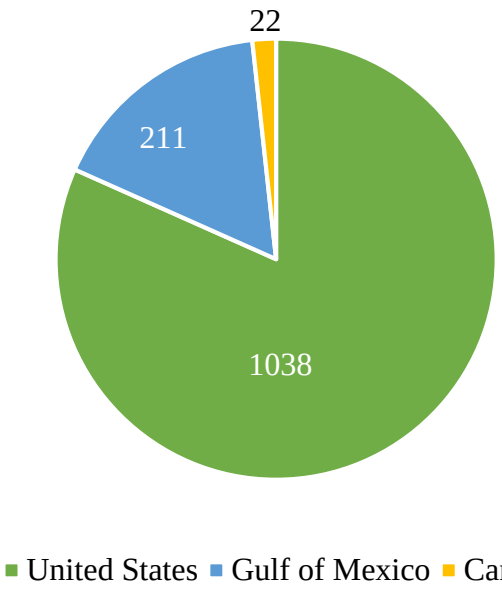

Figure 7: Rigs in North America

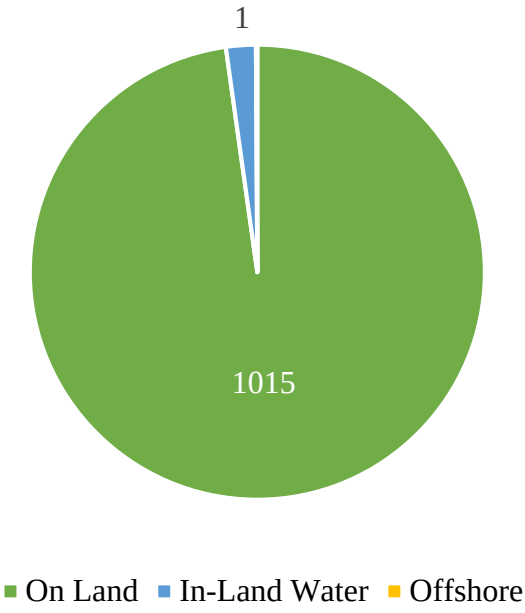

Figure 8: Locations of Rigs

Throughout 2018 the U.S. experienced a steady increase in the number of active rigs, increasing by a total of 57 active rigs. From January 2019 to May 2019, the number of active rigs in the U.S. has been on the decline. The EIA explains this decrease to be a result in a shift in focus from production to efficiency. Even with the decrease in the number of rigs, there is a sufficient enough supply of oil within the market to keep prices steady.

According to the EIA, U.S. oil production is expected to reach a record high of 12.3 million bpd. The agency claims that the U.S. will "drive global oil supply" over the next five years, thanks to the steady production of oil and focus on increase efficiency.

One of the most plentiful oil and natural gas geologic basins in the U.S. is the Permian Basin. The basin holds the largest crude oil field in the U.S., including more than 20 of the nation's top 100 oil fields. It is located in the southwestern part of the U.S., in western Texas and in southeastern New Mexico. It covers more than 86,000 square miles (220,000 km^2) and encompasses several sub-basins, including the Delaware Basin and the Midland Basin.

b. Atlantic Canada

The Atlantic Canada region produces more than 233,000 barrels of oil per day, representing 5% of Canada's crude oil production. The development of oil and gas production in the region has mainly occurred off the shore of Newfoundland and Labrador, as well as offshore Nova Scotia.

Chevron has been exploring for new sources of energy offshore Atlantic Canada for more than 40 years. In 1979, Chevron had a major discovery, the Hibernia field, which was the catalyst that launched Newfoundland and Labrador's offshore energy industry. In 2018, Chevron's net daily production of crude oil was 50,000 barrels.

2. Outside of North America – The North Sea

The North Sea serves as a popular site for oil exploration and drilling. The sea is more than 600 miles (970km) long and 360 miles (580km) wide, with an area of 220,000 square miles (570,000 square km). Although the production costs are relatively high, the quality of the oil and the proximity of important markers in Western Europe are reasons supporting why the North Sea has become an important oil-producing region.

The Ekofisk oil field is in block 2/4 of the Norwegian sector of the North Sea. It is located about 200 miles (320km) southwest of Stavanger. The field was discovered by Phillips Petroleum Company, now ConocoPhillips. The company has several production platforms within the region.

On April 18, 2019, ConocoPhillips announced it had reached an agreement to sell its U.K. oil and gas operations to Chrysaor E&P for nearly $2.7 billion, setting up its exit from the North Sea. This deal is the largest in the exploration and production space outside the U.S. this year, according to investment bank Jefferies, which acted as Chrysaor's financial advisor throughout the process. The transaction is expected to close in the second half of 2019.

C. Understanding Companies within the Market

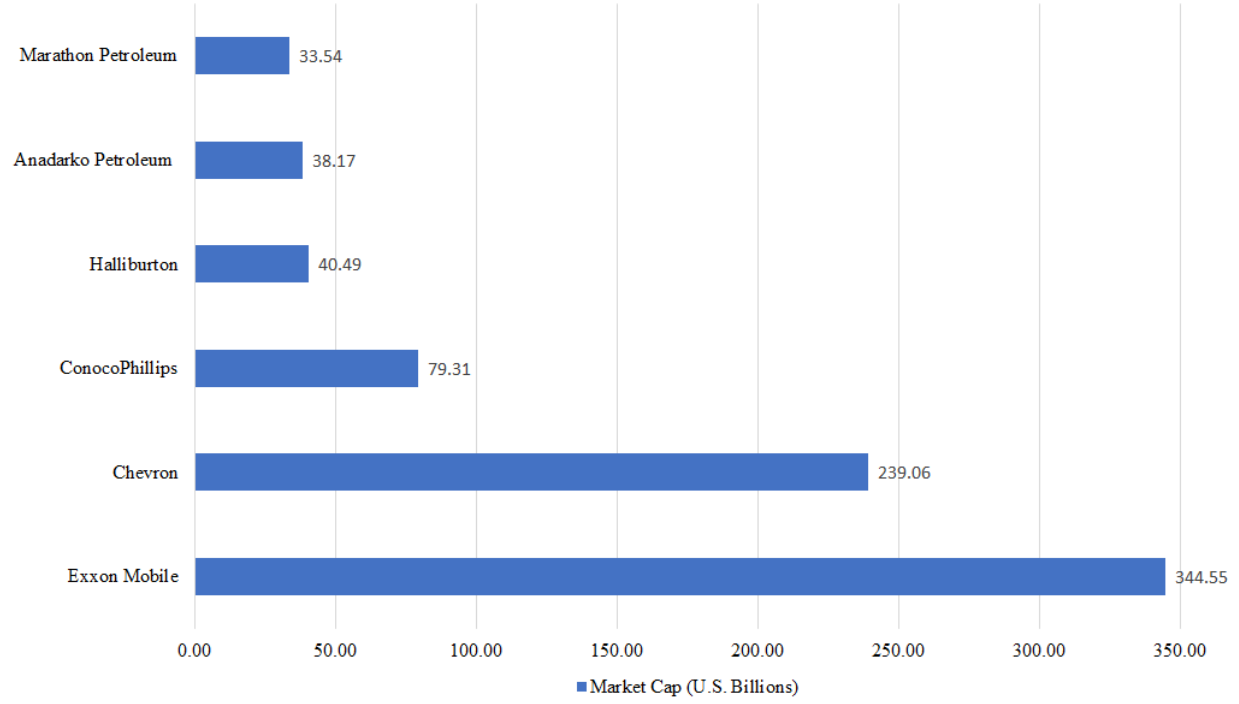

Figure 9: Market Cap (U.S. Billion)

When analyzing oil and gas exploration and production (E&P) companies, market capitalization provides a useful tool. E&P companies have been identified to be the primary target for *The Client's* new technology as these are the companies that would be implementing the devices into their wells.

Figure 9 demonstrates the significant amount of market capital that is possessed by Exxon Mobile and Chevron, simply indicating these are much larger companies than the others. Being a larger company provides an increased amount of resources, including capital, to both investigate in and to make investments in innovative products like *The Client's*.

Larger companies could potentially be less interested in adopting a new product from an unfamiliar company. One of our interviewees stated that companies are "resistant to change" within the oil and gas industry (Interviewee #1). Larger companies trust products that have been on the market for a while and are known to be reliable. On the other hand, a smaller company may be interested in looking into new products in order to become more competitive within the market.

Since oil rigs are the source of drilling for oil, it is important to understand where the largest opportunities for production are located. The location is valuable for the purposes of understanding countries' laws, identifying the practices within the oil and gas industry, and having an awareness of who is operating in that location. Figure 10 provides insight into where the most active areas are for offshore. The North Sea has recently been very popular for offshore drilling as companies continue to increase their drilling activity in that region.

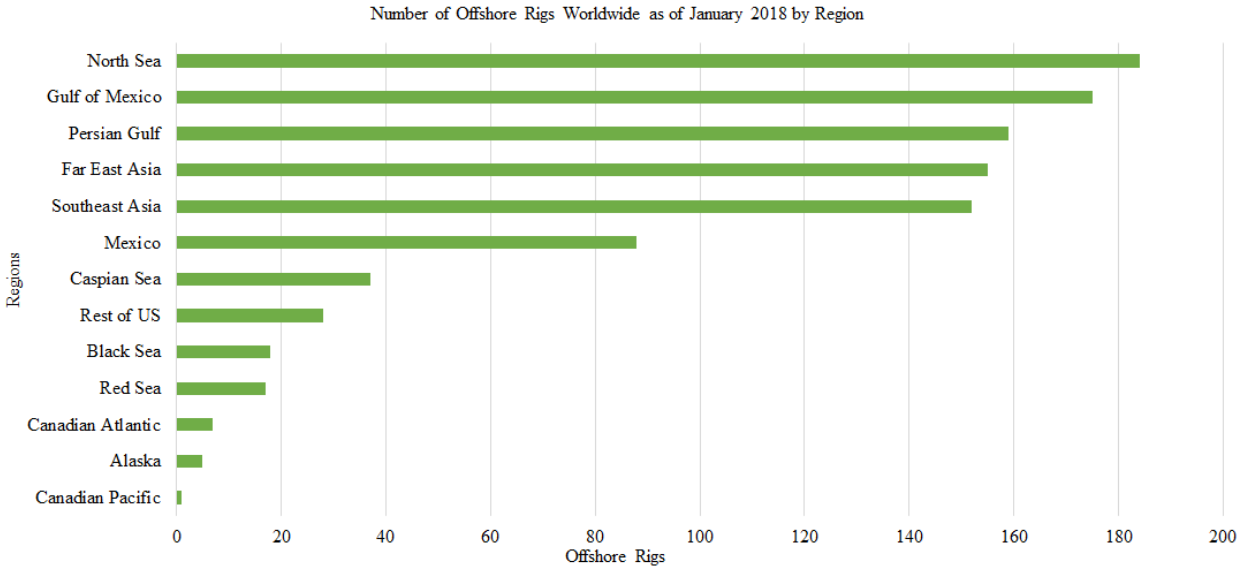

Figure 10: Number of Offshore Rigs Worldwide as of January 2018 by Region

Overall, the oil and gas industry appears to be doing very well. Companies are continuing to invest their time, resources, and capital into the market and as a result, the market is increasing production and companies are seeing returns on their investments. According to a 2018 report by The Business Research Company, a total of $191 billion in revenue was generated worldwide in the oil and gas industry in 2017. Of this total, 28 percent was from companies in North America, Furthermore, 23 percent of that 28 was produced by U.S. the alone. In 2018, the industry in the U.S. totaled $77 billion, according to an analysis conducted by IBISWorld, which also projected an increase in the demand for crude oil through 2023.

D. The Future of Companies in the Industry

In their recent report titled "Oil and Gas Trends 2019," PwC makes three suggestions for oil and gas companies to consider in the near future. Companies will have to 1) push forward with investments in fossil fuels, 2) diversify their portfolio, or 3) put nearly all efforts in renewable energy. The article suggests that companies will have to ultimately pick a route to pursue and stick with it.

Realizing that the first and third options are complete opposites, the experts at PwC are suggesting that it will be most beneficial for companies to choose either fossil fuels or renewables and to differentiate themselves in the chosen industry of the energy sector. They speculate that these changes will affect investor expectations for returns, thus causing oil and gas companies to face a capital-constrained future and need to fund their own endeavors.

In many situations, the investor provides the capital for drilling to occur. If investors, however, perceive indecisiveness as higher risk, they could potentially become less inclined to contribute to companies' drilling efforts. This will pay a toll on individual companies and the industry collectively.

An example of a company choosing to diversify within the fossil fuels sector is Occidental, a midsized company whose product strategy remains focused on expanding oil assets, particularly by increasing investments in the U.S. Permian Basin. In the shale industry, Enron Oil & Gas Company (EOG) Resources doubled its commitment by procuring its own sand, water and chemicals for fracking, rather than sharing the project risk with oil field services companies. That helped to defray costs, and as a result, even in a relatively low-price environment, EOG reported a 92 percent increase in shale sales in the third quarter of 2018 (PWC trend report).

Interviewee #5, who currently serves as a Senior Professional in Global Research and Thought Leadership at PWC, explained that companies in the industry must "work towards trying to develop other revenue streams that are not dependent on core business of oil and gas". This is more difficult for smaller companies and easier for larger companies, like Exxon Mobil.

Some companies are making efforts to broaden their capabilities. European companies such as Shell and BP are seeking investment opportunities in other low carbon operations, such as solar and wind power, carbon capture technology, and electric charging power. While the energy transition is moving towards a lower-carbon world, companies will need to keep up with the changes that consumers are requesting.

Ørsted, formerly known as Dong Energy, models what PWC considers to be the third option, renewables. Ørsted discontinued its upstream oil, gas and coal business in favor of renewable energy sources. Carbon emissions from Ørsted's products have been trimmed by almost 50 percent since 2006, with the goal of reaching 96 percent by 2023.

E. Expected Shift in Energy Source

Although it will not be an immediate change in source of energy, Figure 11 demonstrates one prediction that world energy demand for oil will be reduced by 4 percent and the amount generated by renewables will increase by 7 percent in the next 20 years. While these numbers may not appear to be significant today, the bigger take-away from this prediction is that the shift from fossil fuels to renewables has begun. As time progresses, the opportunity to be the company leading the innovation and production of renewable energy will more significantly present itself. The remainder of this section will provide further insight into why it is a good idea to monitor the progress in using renewables as an energy source.

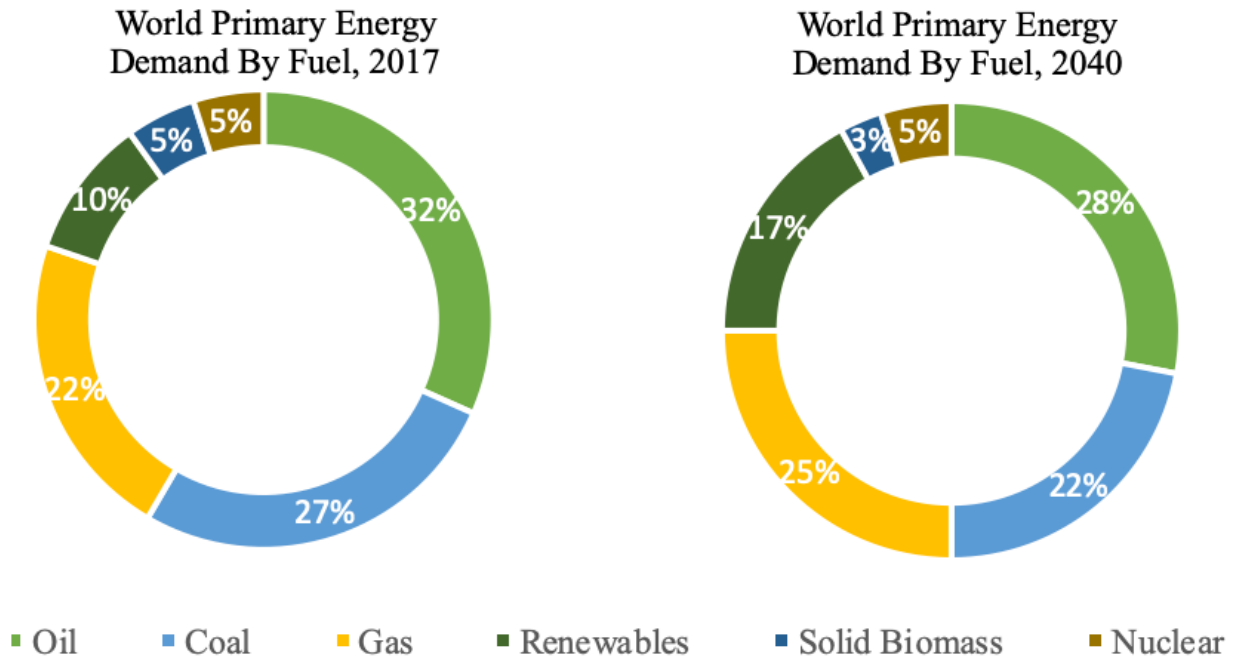

Figure 11: World Primary Energy Demand By Fuel 2017 Vs. 2040

While it is not expected to occur within the next few decades, oil and gas companies are preparing for a shift in energy source from fossil fuels to renewable energy. As a part of the 2016 Paris agreement, countries across the globe came together to agree to work towards the increased use of renewable energy in order to decrease carbon output. Currently, “renewables are the largest source of energy growth, growing in importance in global power markets” (BP energy analysis). The use of renewables is expected to make substantial progress as companies continue to increase their investments in the technology and resources necessary to expand this sector of the energy industry.

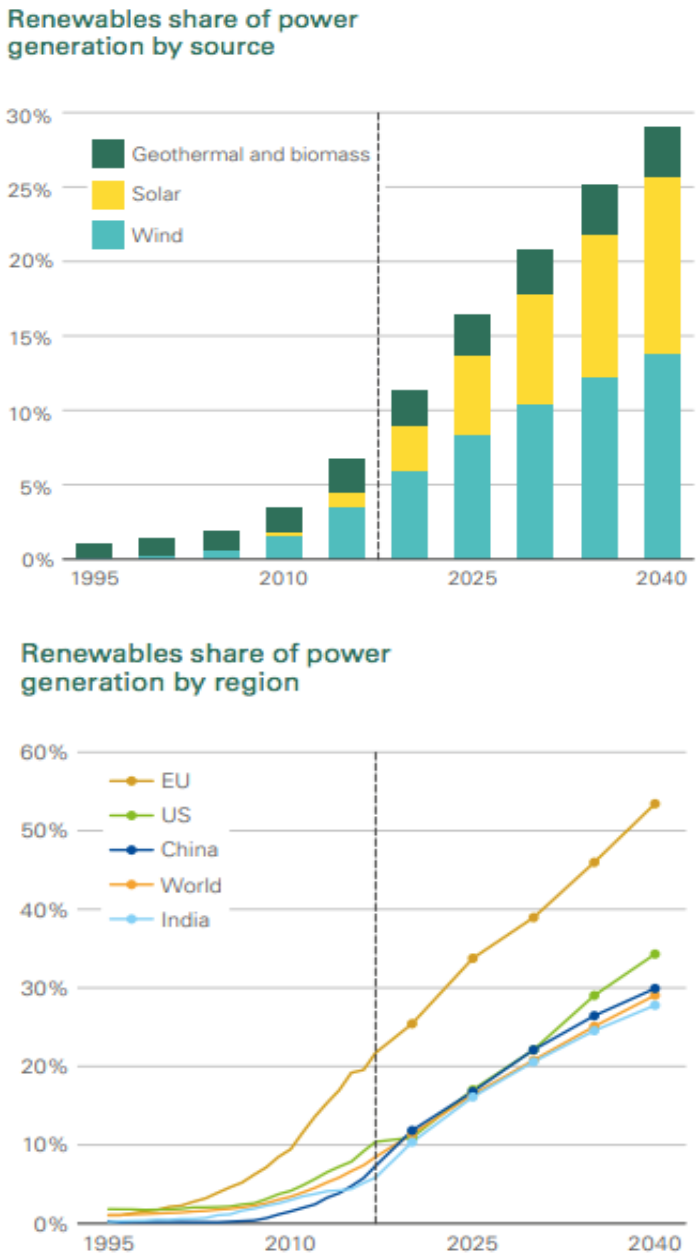

Figure 12: Renewables Share of Power Generation by Source and Region

Figure 12 reflects information derived from an analytical piece of literature produced by BP, which predicted that the European Union will lead the production of renewable power, reaching about 52 percent by 2040. The company places the U.S. as the second highest at approximately 33 percent and China at about 30 percent. The growth of the renewable sector of the energy market could present new opportunities for technology companies like *The Client* to take advantage of and to be a leader in innovation in this market.

The International Framework Paris Treaty of 2016 asserts that there is a need for each country to reduce carbon emissions. Countries responding to this declaration could choose to opt in or out.

Companies in countries that opt in will be required to research and explore how oil industrial sectors can evolve to fit the needs of the environment, as well as examine how to reduce their carbon footprint through insulated homes, development and installation of wind/solar power systems, and automobile fuel alternatives. Interviewee #5 predicts that companies will find a need to invest more in areas of carbon caption storage and producing fuels that are more efficient, biofuels, as well as starting to invest in technology and fuels that are low-carbon. The expert was firm in the belief that there will soon be a change in how power is generated.

Consumer habits are also driving this change in energy production. Collectively, citizens are becoming more focused on climate change and are demanding more sustainable solutions. Companies that want to be successful in the future are trying to adapt their business model. Interviewee #5 insisted that energy models in the future will be different, as consumers and investors are driving change. The expert expressed that if both public companies and investor community are expecting change in the company, there will exist a greater desire to have sustainable investments, to preserve the company's longevity.

BAKER HUGHES WORLDWIDE RIG COUNT ANALYSIS

Baker Hughes Inc., founded in 1987, provides various services and products to the oil and gas industry worldwide. Baker Hughes supplies the industry with oilfield services, products, technology, and systems. Baker Hughes is a General Electric (GE) company. GE is an American multi-national conglomerate that provides products and services in nearly every category of energy. The company's influence ranges from products and services in aviation, healthcare, digital industry, energy, etc. Baker Hughes has been operational in over 120 countries and has come to be one of the world's largest oil field service companies.

One of the services provided is a continuous and public record of the North American and international rig count. According to Baker Hughes, a rig count is a census of the number of "active" drilling rigs in the North America. The North American count is updated every week and the international rig count is updated every month in order to remain as accurate as possible. A drilling rig is considered to be "active" if it is on location and currently drilling or "turning to the right". Drills are active from the moment they are "spudded", meaning they've begun drilling a new well until it has reached its target depth (TD). If a rotary rig is no longer exploring for or developing natural gas or oil, then it is no longer considered active. Baker Hughes offers a breakdown of the data collected into categories including location, basin, well depth, and trajectory.

Baker Hughes is unique in that it only counts active rigs in its rig counts. Other companies will typically include rigs that are available, contracted out, not actively drilling, and actively drilling into their rig count data. This means that these other companies are presenting a census of the number of rigs that are available to work whereas Baker Hughes is providing a census of the rigs that are currently working. Baker Hughes is the most commonly referred to source when looking for rig count data.

Rig counts are impacted by a variety of factors within the oil and gas industry such as technology, seasonal trends, company exploration, and development spending. Therefore, rig counts can be used to reflect the status of the industry in multiple areas. This number can be used as a key indicator of the demand for oil services and for products used in the drilling, producing, and processing of hydrocarbons. For example, if rig count data shows a steady increase in the number of active drilling rigs, then this shows the willingness of oil and gas companies to invest in the market has also increased. When entering a new market, it is important to know what is going on within that industry to avoid going into an industry that is not growing. Overall, rig counts can be used as an indicating factor of the strength and stability of the oil and gas industry.

Although, Baker Hughes is a well-known and reliable source of information concerning rig count, they may not be the top resource for *The Client's* current needs. As a potential supplier

looking to enter this industry, it is not recommended to base decisions solely on the information from Baker Hughes and we believe is insufficient for the needs of *The Client*.

As previously mentioned, Baker Hughes is only showing data for active drilling rigs. This means that any drilling rigs on Baker Hughes GE's radar are already active and are most likely not looking to work with a new supplier at the time. By the time the drilling is active, all plans are in place and providers have been decided for that given project. Therefore, it would be beneficial to look to sources with a broader variety of information like S&P Global Platts.

S&P Global Platts is an independent company based in the United Kingdom. S&P provides information, benchmark prices and analytics for the energy market through a report called Platts RigData, which is published daily, weekly, and monthly on the drilling activity within the U.S., western Canada, and the Gulf of Mexico. These reports include information on the drilling and completion activities, life of the wells, and the production profiles. Unlike Baker Hughes GE, S&P has a subscription-based service that allows subscribers to have continuous access to the extensive data they collect. By having access to the Platts RigData, subscribers can identify new sales leads, identify trends, locate available rigs, identify new production, and monitor competitive activity. The information S&P Platts provides would allow users to be proactive in a way that Baker Hughes GE' Rig Count is unable to support. Subscribing to Platts RigData would allow *The Client* to have the ability to identify and target companies that are preparing to begin the drilling process, indicating a potential need for technology such as the one *The Client* provides.

COMPETITOR ANALYSIS

At a Glance:

The oil and gas industry is comprised of both well-known companies and smaller agencies who engage in contracts with service and product suppliers for technologies to implement during various stages of the drilling process. Amongst some of the suppliers in the industry are Baker Hughes, Schlumberger, and Halliburton. These companies offer a wide array of services and products that include, but are not limited to, reservoir characterization, drilling, production, and processing. These companies would be the direct competitors of *The Client* as they currently provide the most comparable product offerings to the product *The Client* is developing for the cementing phase of drilling. Baker Hughes, Schlumberger, and Halliburton operate across the globe in a vast number of areas.

- Baker Hughes, which is a GE company, operates in over 120 countries
- Schlumberger company operates in more than 85 countries
- Halliburton operates in more than 80 countries.

A. Competitors

1. Baker Hughes/GE

Baker Hughes, a GE company, develops logging-while-drilling (LWD) solutions to deliver "real-time wireline quality petrophysical data to help confidently position wells in the most productive zones" (Our Company). An attractive selling point to customers for Baker Hughes' specific logging system is their proclamation that the system is designed to withstand high temperatures and high vibration while providing comprehensive data to the customer. The system provides a wide range of information about the borehole itself, as well as the surrounding area. Additionally, the company notes that their product provides valuable insight to reduce "Operational risks and costs", which, as presented in the Team's analysis, is an attractive feature to potential customers.

2. Schlumberger

Schlumberger's portfolio of technologies and services "deliver actionable information on reservoir fluid composition, lithology, well placement, reservoir connectivity, and compartmentalization to guide critical decisions for optimal drilling, completions, and ultimate recovery" (Corporate Profile, Schlumberger). Their surface logging services include drilling monitoring and formation monitoring. The drilling monitoring technology is most closely related to the technology in development by *The Client*.

In drilling monitoring, the mechanical, hydraulic, and engineering drilling data is continually measured to balance formation fluid pressures, optimize the drilling process, and maintain a

safe operating environment. The process functions as specialized sensors, located on the rig floor, to measure parameters such as drilling speed, drill-string rotation, and weight in the mud pit room. From these measurements, mud pit volumes, mud flow rate, and mud weight in the shale shaker area can be discerned as well as parameters such as mud gas level, return flow rate, and return mud weight. Additional sensors may be placed on the cement unit and in the flowline, choke, and kill line. The surface acquisition system processes signals from the sensors; data can be displayed versus both time and depth at any location on the rig or sent to remote displays via the Web. The data is also presented through mud logs and drilling logs, which are produced in customized formats and scales daily or on request, providing a record of drilling activity.

3. Halliburton

One of Halliburton's featured drilling services is the managed pressure drilling service. Since understanding bottom hole pressure regimes in the increasingly complex drilling arena is critical for reducing uncertainty and maximizing asset value, the managed pressure drilling (MPD) service allows for proper navigation of the challenging pressure windows between pore and fracture pressure increasingly found in wells.

Additionally, the company offers a service in which they are able to log while drilling, thus named the "logging-while-drilling" service, where they utilize advanced sensor technologies to deliver reliable formation evaluation data in real time. Halliburton Sperry Drilling offers a "wide array of LWD sensors that can be engineered to provide specific reservoir data for multiple applications, including petrophysical and geomechanical analysis, and reservoir fluid characterization" (Corporate Profile, Halliburton).

In their drilling monitoring, the company advertises the ability to adjust to changing parameters while drilling in order to allow their customers to improve performance and efficiency. The DrillFact™ real-time monitoring service from Halliburton Sperry Drilling "combines sensors and real-time software packages, mud logging experts, and technical expertise" (Corporate Profile, Haliburton).

B. Large Customers

While understanding the direct competitors is important, so too is understanding the "consumers" of drilling products and services: oil companies. As the companies that are implementing and applying -- and more important, purchasing -- products and services similar to *The Client's* through contractors (competitors), a "pull-marketing" strategy can be created to help develop market demand from the top of the consumer chain.

1. ExxonMobil: As an American multi-national company, ExxonMobil is one of the world's largest publicly traded energy providers and chemical manufacturers, Exxon develops and applies technologies to help safely and responsibly meet the world's growing needs for energy. One specialization of Exxon is in drilling and production. They strive to "[deploy] technologies and methods to safely develop a wide range of resources both onshore and offshore in diverse locations around the world" (ExxonMobil's website).

ExxonMobil has more recently expressed interest in greener energy solutions though their company's recent research and innovation. According to their website, within the last decade, Exxon has invested approximately $250M in biofuels research. They advertise that the global demand for energy is projected to grow by about 25 percent through 2040. In order for the company to expand its supplies, while also increasing efficiency and alleviating emissions, a uniquely integrated set of solutions will be required. Thus, Exxon is funding a "broad portfolio of biofuels research programs for new energy sources" (ExxonMobil's website).

2. Chevron: An American multi-national company, Chevron has several drilling sites in the Gulf of Mexico with boreholes reaching through 7.000 feet (2,133.6 m) and 20,000 feet (6.096 km) of earth. The company shared that "technology and innovation have long been a competitive advantage for Chevron" (Chevron). Both technology and innovation play an important role in their business as they attempt to "safely and cost-effectively unlock new opportunities" (Chevron). One of their key off-shore drilling sites is Alder Field which is located 100 miles (160 km) east of Scotland. The Alder reservoir lies approximately 14,500 feet (2.75 miles/4.4 km) below the sea bed where pressures are 12,500 pounds per square inch – this is about 400 times that of a typical car tire – and temperatures maintain around 300°F (150°C). This combination of extreme pressure was considered impossible to develop until recently.

Chevron looks forward to innovation which leads to a better global environment. In 2017, Chevron published a more in-depth report that addresses their framework for incorporating climate change into their future endeavors. The company strives to distinguish itself in operating responsibly through the application of new technologies and seeking to work "in a socially and environmentally responsible manner" (Chevron).

CONCLUSION

Based on the research, data, and analysis done, the Team has found three areas of opportunity for *The Client* for potential market entry into the U.S. oil and gas industry. The methods recommended draw upon aspects of the market's currents conditions, including any potential competitors, customers, and allies. Three areas of opportunity for *The Client* are the startup companies in the industry, investors of new technology, and target larger, established competitors.

Startup Companies in the Industry

The U.S. is home to many innovative startup companies because of the friendly business and investor environment. Because of its complex operational nature, the oil and gas industry is host to many startup companies seeking to identify the next innovation to improve productivity. Many of these startup companies would benefit from the technology developed by *The Client*. Moreover, these types of companies are more likely to embrace a new technology than existing companies with well-established alternatives.

Investors in New Technology

Currently, the global market has slowly but surely been developing a higher interest in the benefits of investing into digital technologies. Companies are looking to invest in technologies, similar to the product *The Client* is presenting, that will aid in a more efficient way to receive and process data. Investors want to see more detailed reports provided that can support their decision-making processes. This presents a window of opportunity for *The Client* to enter the market in the near future. In a survey conducted by EY in 2018 of 100 senior oil and gas executives, 90 percent said that they expect their investment in digital technologies to increase over the next two years. This reaction is a direct result of the fall in oil prices in 2018 mentioned earlier. As a result, executives are moving forward with the primary goal to focus on operation improvements and to increase their cost-saving ambitions through the expansion of their digital capabilities. As reported in the PwC/CB Insights MoneyTree Report, 2018 witnessed the highest level of venture capital funding since the dot-com era in 2000. Investor money has been sitting on the sidelines since the global market collapse a decade ago and is now starting to flow into the market. Therefore, for a company, like *The Client*, that is trying to break into the U.S. market with a piece of technology that would fill a rising need within the industry during a period in which investment culture is experience an influx, now would be an optimal time to begin this process.

Target Large Technology and Service Suppliers

New companies entering the oil and gas industry have two hurdles to overcome: the habitual nature of existing drilling companies within the industry and gaining market share from larger and established companies with competing technologies or services. These companies' habitual

nature comes from being “resistant to change,” as mentioned by Interviewee #1, often choosing technology and service suppliers based on their familiarity of those suppliers and their products. Therefore, another consideration for market entry is targeting large technology and service suppliers that can benefit from *The Client’s* new technology. Promoting adoption by established oil companies would create a “pull-marketing” demand, requiring the oil company’s drilling partners to adopt the new technology.

RECOMMENDATION

Through planning, interviews and research the Team recommends the following:

Focus Marketing to Startup Companies

- Larger companies are less willing to take a chance on new technology providers. Most established drilling companies have long-standing relationships and agreements with their suppliers. Younger startups and growth companies will act more aggressively in this aspect of the market as they seek avenues that provide them a competitive advantage against established companies in the drilling sector of the oil and gas industry. The competitive advantage for young startups with *The Client's* product is the opportunity to utilize new, cutting-edge technology that larger drillers are not willing to take a chance on.
- By selling *The Client's* technology directly to new startup exploration and production companies, *The Client* can build relationships with startup companies that have not yet chosen a supplier for the technology *The Client* offers.
- Additionally, partnering with startup technology companies that are involved in the drilling industry will allow the laborious task of penetrating the market to reside with the startup company. The startup will be eager to bring their newly acquired technology onto the market for their own advantage, thus, working harder for *The Client*. This avenue creates a faster introduction into the drilling industry.
- Moreover, startups allow *The Client* to maintain more control over their product. Since no exclusive agreement is necessary to work with startups, *The Client* is granted the ability to continue to implement their technology where they see best fit. This includes contracting with other companies.
- The companies below are a few examples of small, growing companies in the oil and gas industry for *The Client* to potentially pursue as candidates to market the logger in development.
    (1) P3 Petroleum, Inc. - U.S. Based Company
    P3 is and exploration and production company that *The Client* could potentially pursue as a customer. Their company website is http://www.p3petro.com/
    (2) Seven Lakes Technologies - U.S. Based Company
    Seven Lakes is a data analytics company that *The Client* could seek partnership with to bring a more competitive offering to exploration and production companies. Their company website is https://www.sevenlakes.com/
    (3) Sensalytx – Q-DOS – United Kingdom Based Company
    Sensalytx is a software development company. Like Seven Lakes Technologies, Sensalytx is a potential partner for dual product offering to potential customers. Their company website is https://sensalytx.com/

MARKET ENTRY ALTERNATIVES

While pursuing partnership with startup companies can expedite the adoption of a new technology, it is also a high-risk proposition. Alternative options for market entry, though as explained below, these options will require more time and result with slower growth and less-optimal return on investment.

1. Introduce product to programs that support companies in the oil and gas market

- The Oil & Gas Technology Centre is a UK-based center with programs that focus on developing future pioneers within the oil and gas industry. One of the center's programs, called TechX, provides product developers in the oil and gas industry the opportunity to share their ideas to mentors and other innovators. TechX also provides funding and guidance to new companies entering the market to help develop their products to be marketable to the industry. Their Market Entry program could provide *The Client* with a launching point into oil and gas, but because it would also require a significant amount of time and potentially some control, it is not an optimal option. The center's website is https://www.theogtc.com/techx/overview/.

2. License technology to larger, well-established competitors

- Licensing *The Client's* new product to existing companies that already offer similar products or services to large oil companies is another way to enter the market. Benefits include quick introduction to the market and potentially large orders. Licensing, however, likely would be exclusive to one company, reducing the margin, turning over control of marketing and application to licensor. For these reasons, it is not the most optimal option.
- The following are companies that have established relationships as key suppliers of equipment and technology for those within the industry.
  (1) Schlumberger – U.S. Based Company
  Company Website: https://www.slb.com/
  (2) Baker Hughes - A GE Company – U.S. Based Company
  Company Website: https://www.bhge.com/
  (3) Drillform Technical Services Ltd. – Canada Based Company
  Company Website: http://www.drillform.com/
  (4) MRC Global – U.S. Based Company
  Company Website: https://www.mrcglobal.com/Global-Region/Default

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Acknowledgements:
Dr. Michael Latta
Gina Cummings
Peter Gasca
Trevor Greene
Megan Colagrande

"MINING PONTIFICAL TWEETS FOR DISCRIMINATORY LINGUISTIC SHEPHERDING"

HARVESTING TWITTER - COMPARISON

VATICAN NEWS

VATICAN NEWS

MULTIPLE MESSAGES OR ONE MESSAGE FITS ALL

Different languages →→Different messages?

MOTIVATION

- **The capabilities for generating and collecting data have been increasing rapidly.**
- **The computerization of many business transactions, and the advances in data collection tools have provided us with huge amount of data.**
- **This explosive growth in data and databases has generated an urgent need for new techniques and tools that can automatically transform the processed data into useful information.**

BACKGROUND

Leaders, politicians, artists : Many tweets – one account

Pope Francis: First Pope with an official Twitter account – February 2012.

Other accounts: Spanish – March 2012….

Main account: English @Pontifex

GIVE US OUR DAILY TWEET

RESEARCH QUESTIONS

The Pope has multiples official Twitter accounts, each in a different language, with millions of followers.

What is the purpose?

-target audience=target language

-conduit= uniform message

Does the language seem consistent in usage, and frequency across the languages that I will analyze and compare or are there difference stemming directly from the language used?

The top languages are English, French, Spanish, Latin, Arabic, and Italian.

DATA COLLECTION

- **Data sample = 200 tweets**
- **Pope Francis @Pontifex**
- **Pape François @Pontifex_fr**
- **Papa Francisco @Pontifex_es**
- **Papa Franciscus @Pontifex_ln**
- **البابا فرنسيس @Pontifex_ar**
- **Papa Francesco @Pontifex_it**
- **Tested languages : English, French, Spanish, Latin, Arabic, and Italian.**

- **Non-Tested: Deutsch, Portuguese and Polish**

METHODOLOGY

- **Data sample (200 tweets) in each target language**
- **Python – Twitter**
- **Data cleaning - preprocessing:**
- **Pronouns, articles, prepositions**
- **Grammatical rules:**
  - Stem changing: Latin and Arabic
  - nominative, accusative, genitive, ablative, vocative - Diacritics in Arabic
  - Gender and count:
    - French, Spanish, Italian, Latin, Arabic.

    - Similarities - Equivalencies

RESULTS

Zipf Curve results – April 2018

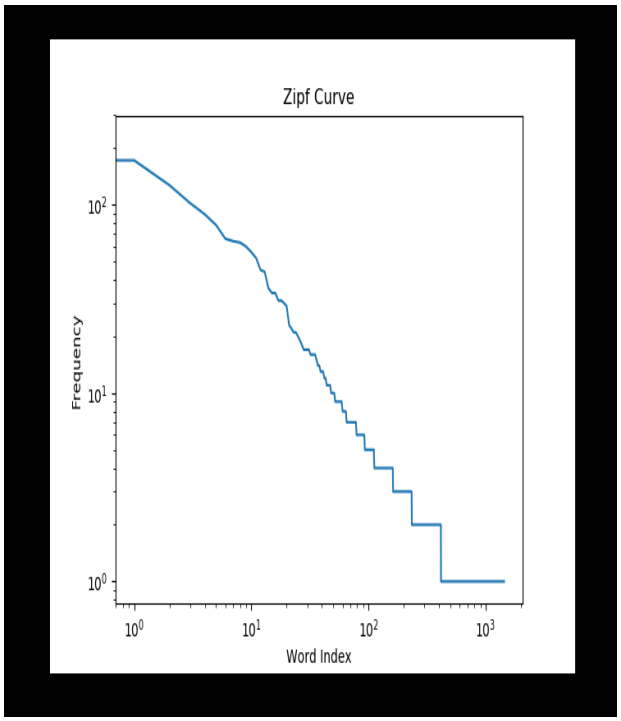
- **Dios 31**
- **Dieu 31**
- 'الرب', 12
- 'الله', 34
- 'الله.', 11
- **Deus**
- **Deum**
- **vita**
- **vitae**

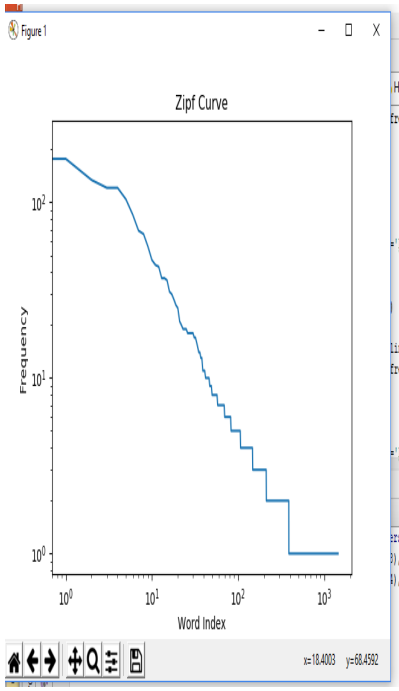
RESULTS

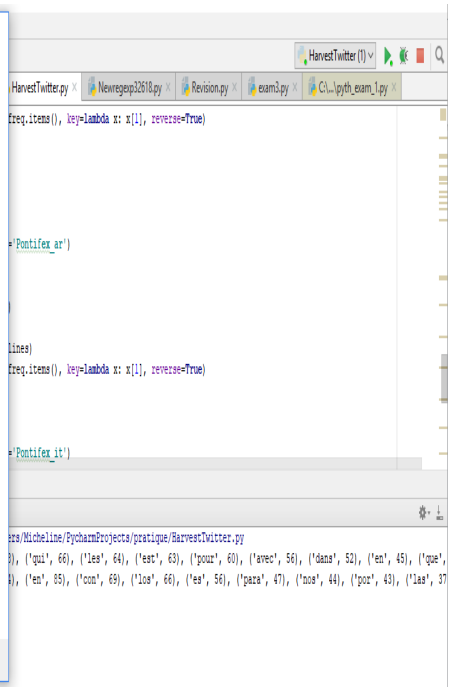
Zipf Curve results – March 2019

- **Dios ,39 -Dios. ,13 - Señor ,25 – corazón,24 –Jesús ,24- vida ,22-amor ,21**
- الرب – 13
  الحياة - 11
  المسيح – 11
- القلب – 6
- الرب. – 3
- المحبة – 4
- محبّة - 5
- **Domino,5 - Deum ,6- Deo, 8- Domini ,8-Dominus ,12-Deus ,10-**
- **Iesus ,10-Iesum ,10- Iesu ,9**
- **vitam ,12 - vitae , 11**

OUR DAILY TWEET FRENCH/ESPANOL

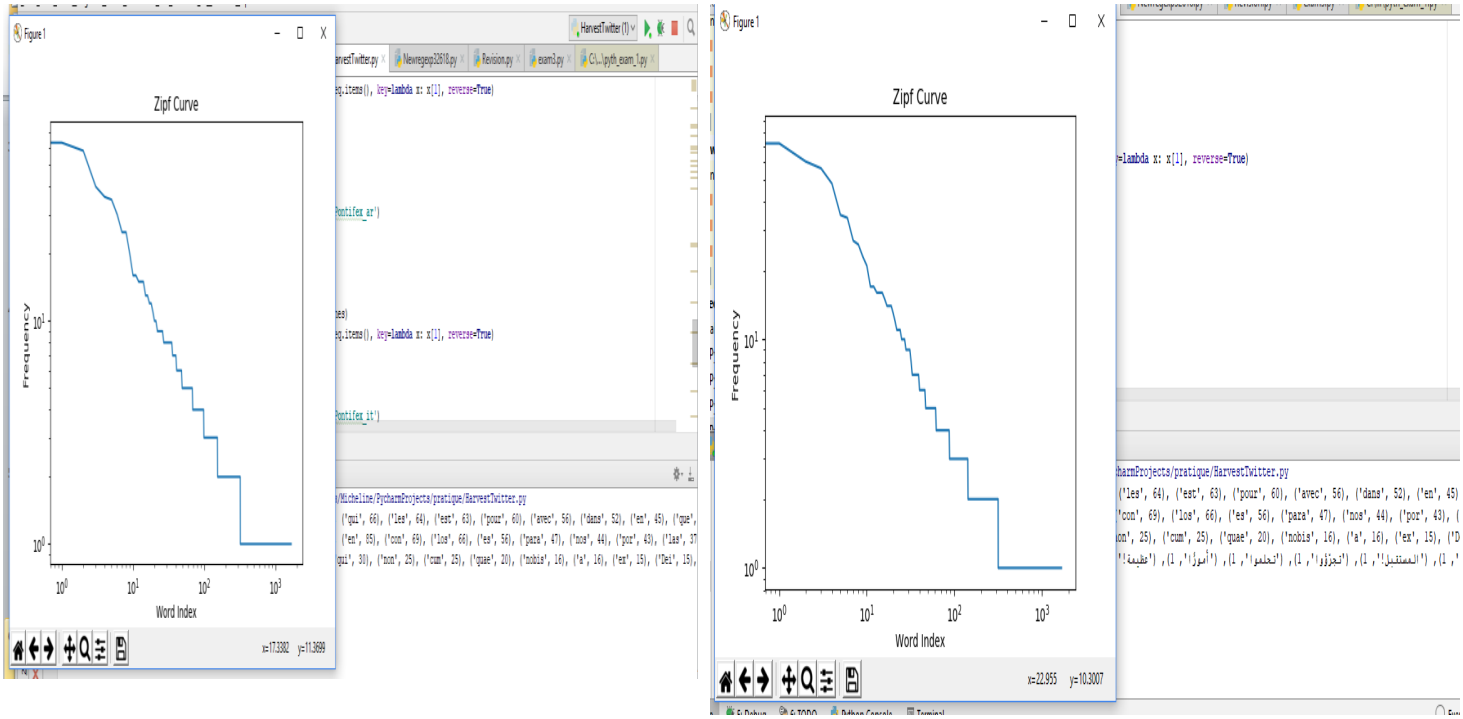






VATICAN NEWS

OUR DAILY TWEET – LATIN/ARABIC



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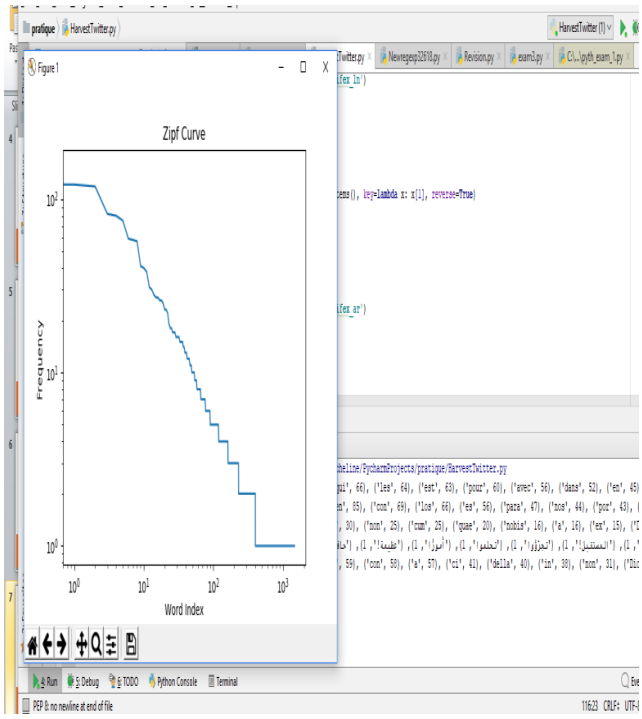
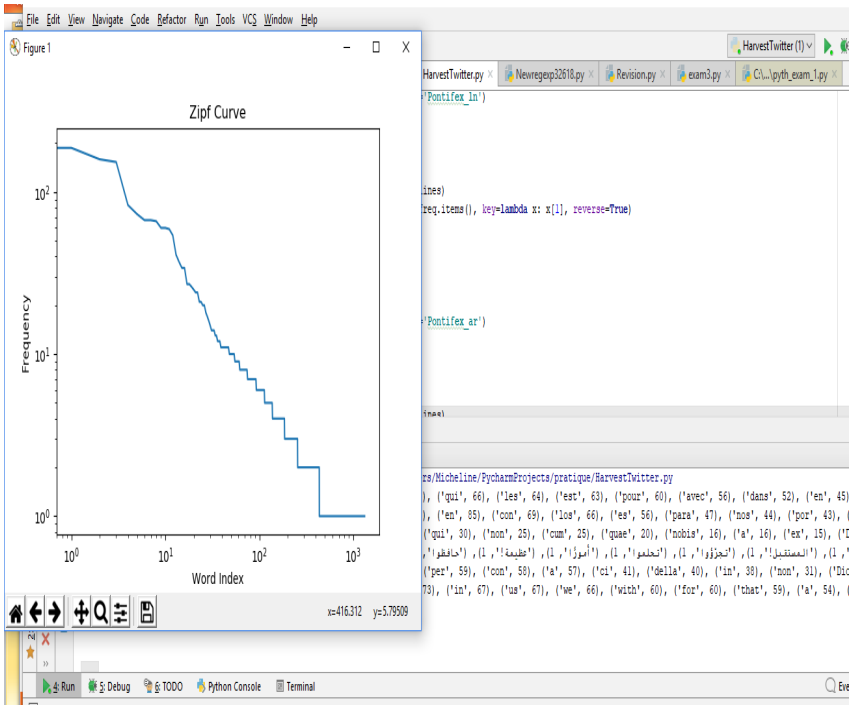
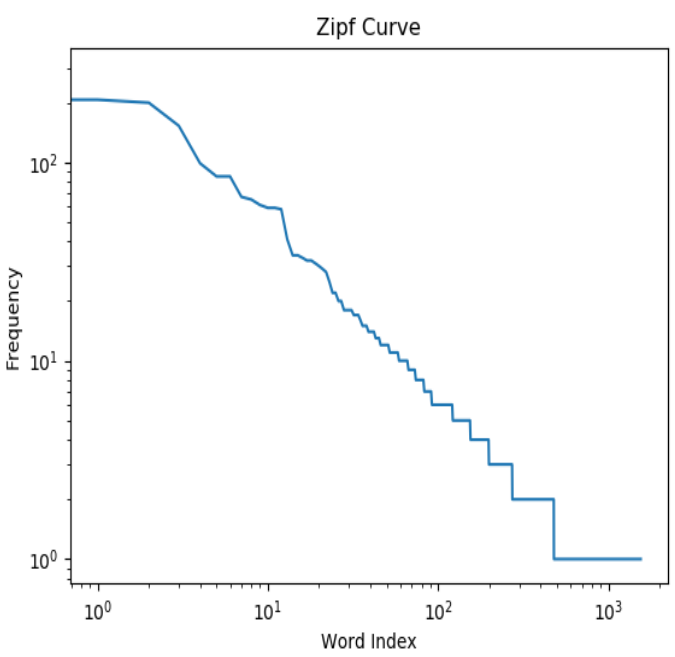
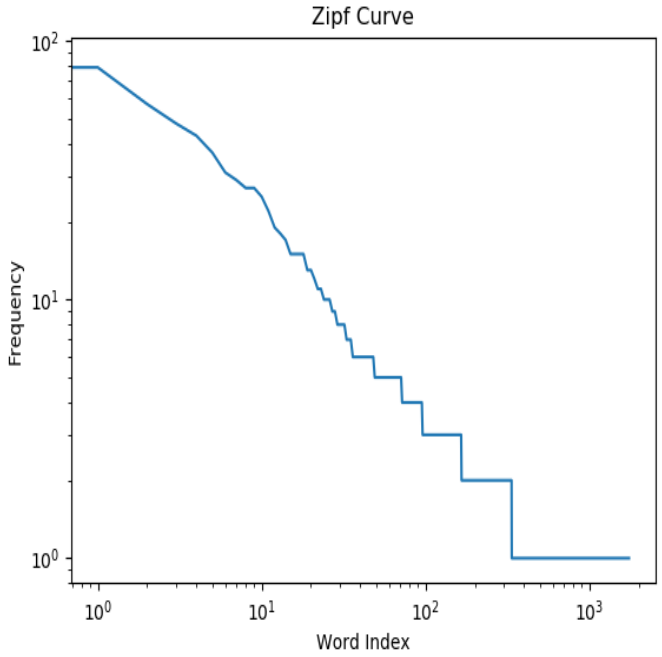




OUR DAILY TWEET: ENGLISH/ARABIC – MARCH 19





OUR DAILY TWEET

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OUR DAILY TWEET

[('في', 77), ('من', 72), ('ل', 60), ('أن', 56), ('لا', 48), ('إلى', 35), ('الله', 34), ('هو', 27), ('الذي', 26), ('إن', 23), ('هي', 17), ('التي', 17), ('اليوم', 16), ('أجل', 16), ('مع', 16), ('المسيح', 15), ('ما', 14), ('يسوع', 14), ('إنَّ', 21), ('أنَّ', 14), ('المدينة', 14), ('عن', 13), ('الرب', 12), ('عندما', 11), ('الله.', 11), ('الإيمان', 11), ('جميع', 10), ('خلال', 10), ('هذا', 10), ('كي', 9), ('السلام', 9), ('نحن', 9), ('يسلك', 7), ('يمكننا', 7), ('القدس', 7), ('العالم', 8), ('يدل', 9), ('يشكل', 7), ('يمكن', 7), ('الإنجيل', 7), ('المحبة', 7), ('أيها', 6), ('مثال', 6), ('هذه', 6), ('الحياة', 7), ('هناك', 7), ('الصلاة', 5), ('الأشخاص', 5), ('تلمسني', 5), ('الكنيسة', 5), ('أولاً', 5), ('بين', 5), ('كي', 6), ('معنى', 5), ('قدس', 6), ('معًا', 6), ('فيما', 5), ('رجاء', 5), ('مريم', 5), ('تكون', 5), ('لمعمل', 5), ('فرح', 5), ('الحديد', 5), ('أكثر', 5), ('الدوام', 5), ('معه', 4), ('جميعًا', 4), ('أيضًا', 4), ('الرجاء', 4), ('يسوع.', 4), ('يومنيًا', 4), ('كلمة', 4), ('نعمة', 4), ('مصدر', 4), ('نجد', 4), ('من', 4), ('عندنا', 4), ('يمنا', 4), ('يمني', 4), ('وإنما', 4), ('الفرح', 4), ('يسوع', 4), ('حتى', 3), ('تساعدنا', 3), ('نور', 3), ('لأن', 3), ('أم', 3), ('كُن', 3), ('هل', 3), ('كيف', 3), ('اليوم_قديسون#', 3), ('أمام', 3), ('أنَّ', 3), ('الرسالة', 3), ('سرّ', 3), ('الأعزاء', 3), ('القلب', 3), ('أشكر', 3), ('المحبة', 3), ('قلب', 3), ('أحد', 3), ('ولكن', 3), ('كل', 3), ('حياة', 3), ('يا', 3), ('علمية', 3), ('لماذا', 3), ('المسيحي', 3), ('يوم', 3), ('نافق', 3), ('ولا', 3), ('سيما', 3), ('العمل', 3), ('الصغاء', 3), ('يجب', 3), ('يسوع،', 3), ('السلام', 3), ('الميلاد', 3), ('جمال', 3), ('الأولى', 3), ('شعلة', 3), ('الحرب', 3), ('وأن', 3), ('محبّة', 3), ('مايامار', 3), ('البشريّة', 3), ('تكن', 3), ('الدوام', 3)

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CONCLUSION

Multiple accounts:

- **Language convenience**
- **Diverse audience**
- **Tweets faithfully translated**
- **Uniform message**

ONE TWEET FITS ALL

OUR DAILY TWEET

VATICAN NEWS

Misunderstandings and Misinterpretations of Researchers about Hypothesis Testing

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Abstract

Statistical analysis is one of the main tools for many empirical studies. 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 and misunderstood topic, maybe now more so than ever, 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. Since early twentieth century, there has been heated debates between Fisher and Neyman–Pearson and some statisticians simply dislike p-values altogether. Even philosophers have published many articles on what Hypothesis Testing is really doing (for example see Deborah Mayo). 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. Refer to Gerd Gigerenzer, 2018, for an excellent survey of research in this area, see Ioannidis, 2005, for the potential problem with research findings based on a single study assessed by formal statistical significance, and look at Ziliak and McCloskey, 2004, for a research on mixing up economic and statistical significance in a leading economic journal.

In this paper, we want to investigate to what extent these survey results are replicable. We also want to see whether 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 we believe it can shed light on the recent concerns with the lack of scientific transparency and replication crisis.

We present the results of our pilot study on Hypothesis Testing literacy among academics and practitioners who were participants in four different business and economics conferences, and compare them to the previous results in the literature. Using a survey of twenty True and False questions (we have also added "Don't Know" and "Ambiguous/Undecidable" to the possible responses), we have asked participants to test their understanding of the Hypothesis Testing, with absolutely no deception (full transparency about the intent of the study) and voluntary participation in answering the survey which biases the results positively: Only those who are more comfortable with the topic and confident about their knowledge of the subject matter will participate. We also look at the differences between economists and other business professionals. The results of the pilot study are alarming, to say the least and show a deep misunderstanding about this statistical tool both among economist and other business professionals even in our positively biased sample which suggest an even more pronounced problem in an unbiased sample. For future research, we plan to collect more data from different conferences and analyze it. In the next phase of this research, we also plan to point out ways to improve the statistical practices in social sciences and business schools and provide suggestions for a smooth introduction of elements into the curricula and textbooks that rectify the presented shortcomings.

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Participation Function Index: College Students and the Drivers of the Professional Student Organizations They Join

This paper proposal abstract presents the use of an adaptation of the Volunteer Function Index (VFI) (Clary et al., 1998) to look at the motives of college students joining collegiate professional organizations such as a collegiate chapter of the American Marketing Association. 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. The rewording of the VFI to reflect participating in a professional organization was minimal. The revised instrument is called the PFI – Participation Function Index.

There is a body of research that explores participation in professional organizations. A common theme among these studies is underlying motivation appears to be functional in nature. For instance, Bennett (1999), examined why people join and stay in business associations and found that the services offered were a key reason to both join and stay a member. Gruen, Summers, & Acito (2000) examined the relationship marketing activities that enhanced commitment to the professional associations. Markova, Ford, Dickson, & Bohn, T. (2013) explicitly looked at the benefits members receive from participation in a large accounting association and found that the quality of the benefits directly assisting members was related to members' perceived value and continued membership. This finding was supported by Ki & Wang (2016) in a survey of over 13,000 members in 18 professional associations. These researchers found that personal and professional benefits were the reason to renew or recommend membership. The idea that personal and professional gain or enhancement is a consistent finding in the literature (Dekker, P. & Van den Broek, A. 2013; Gazley, 2013; Gazley, & Brudney, 2014; Hager, 2014, Wang & Ki, 2018). Finally, Tschirhart & Gazley (2014) called

for research into the phenomenon of professional organization membership, and this paper addresses that call.

The survey was designed to maintain the original six constructs of VFI with each construct representing different motives. These motives are: *values* 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).

The PFI is intended to be modeled as a second order, higher construct. This higher order model is consistent with literature that has addressed some of the instability of the VFI factor structures upon which the PFI is based (Nicholls, 2012; Nicholls & Schimmel 2016; Cornelis, Van Hiel, & De Cremer, 2013; Güntert, Neufeind, & Wehner, 2015).

The questionnaire was designed using commercially available survey software (Qualtrics). The survey includes features to improve visual clarity and attractiveness, simplify the layout, and ease of navigation. In addition, a progress bar indicated progress toward completion. All these features reduced the potential for measurement error and increased

likelihood of completion (Hair et al., 2010). The survey was technically pretested to ensure it worked as expected on a variety of platforms and there were not any other technical deficiencies. The survey itself was estimated to take 15 to 20 minutes (an upper limit for completing the survey), and on average, took 15 minutes. The survey was broken into sections (screens) and an indicator showed visually how much of the survey was completed. The data were collected in the Qualtrics software and subsequently exported into SPSS.

Sampling Procedures and Web Response

The population under investigation is college students in the College of Business (business, safety, sport, hospitality, communication majors and/or minors) at a northeastern university already participating in or planning to participate in student chapters of professional clubs/organizations. Although this population is not difficult to reach, at the beginning of a semester there was no way to predetermine who was participating in professional clubs. Therefore, a link to the pre-experience survey was e-mailed to the college's entire student body. The survey included a question to ensure students were qualified (Hair et al., 2009; Hair et al., 2010), and that the student intended to participate in a professional club during the semester. Of the 910 surveys sent, 210 responses were received. The data was saved as an Excel file and Smart PLS was used for the analysis. The results follow.

Figure 1 represents the inner and outer models for this study. Evaluating these two models are the two main steps in PLS-SEM analysis. The first step assesses the measurement model, or outer model in PLS-SEM language, and shows the relationships between indicators and the latent variables. The second step assesses the structural model, or PLS-SEM inner model, and shows the relationship between latent variables (Hair et al., 2011; Henseler & Fassott, 2010). The structural model is assessed if the analysis in the first step meets measurement and

significance requirements (Hair et al., 2011). All constructs in this study (shown in Figure 1) are reflective and follow the Hair et al. (2011) RoT for reflective measurement models.

Because PLS-SEM provides the ability to develop theory (Hair et al., 2011) and the six VFI first-order constructs likely cause (are not caused by, as Okun et al., 1998 posit and Nicholls et al 2012b demonstrate), a reflective-formative Type 2 (Chin, 2010) second-order construct was created. The creation of the second-order construct also enables a statistical anomaly or potential existence of a suppression effect to be addressed. In the current study, the use of a second-order factor changes the direct path from the six VFI endogenous variables, thereby changing the relationships between the betas and the endogenous variables and eliminates any potential suppression effect. Furthermore, using the reflective–formative higher-order construct allows the six dimensions of the PFI weights to be used in further evaluations. These weights contribute to the formative construct (in this case, a second-order construct) and pass through it to the (downstream) neighboring constructs (Chin, 2010). Per Albers (2010), a significant difference between reflective and formative measures in PLS is that formative measure indicators can be used to identify which drivers are most responsible for explaining an endogenous variable. In addition, weights of formative indicators are not used to predict its construct, but to maximize the betas in the structural model and predict endogenous variables (Chin, 2010) allowing the hypotheses to be examined. The higher-order construct is composed of all integral dimensions of the PFI (values, understanding, enhancement, social, career, and protection). The higher-order construct is similar to a hierarchical (multidimensional) job satisfaction construct that includes multiple facets (e.g., pay, supervisor, opportunity for advancement, etc.; Jarvis et al., 2003) or a service-level agreement construct that includes multiple constructs (e.g., foundation, change, governance; Goo, Kishore, Rao, & Nam, 2009). The hierarchical component development of the

construct follows the recommended processes described in Ringle, Sarstedt, and Straub (2012) and Wetzels, Odekerken-Schröder, and Van Oppen (2009), specifically using PLS-SEM.

The results indicate a valid model with all indicators loading between .824 and .945. All reliability and validity indicators were within acceptable ranges, and the R square from the PFI higher order construct to satisfaction was .498. The Q square statistics were positive and within the acceptable range to indicate a valid predictive model. All six of the sub dimensions of the higher order construct were shown to be significant predictors of Satisfaction with the organization.

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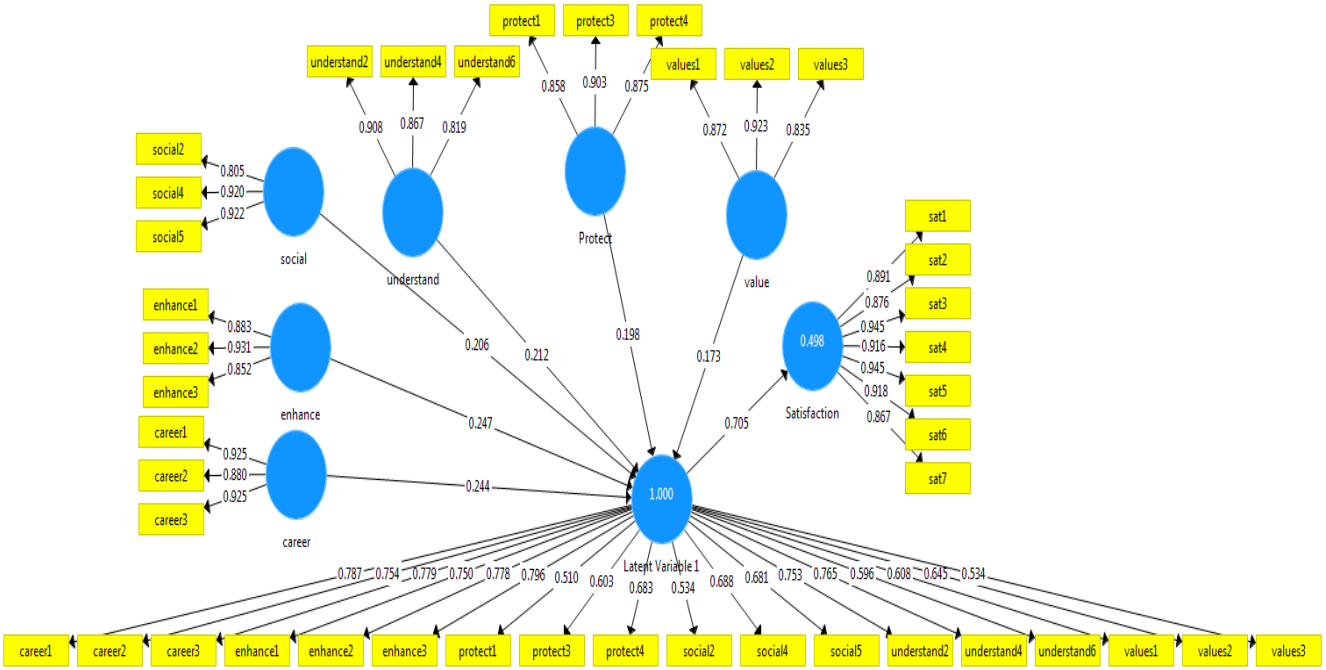
Figure 1


protect1
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Satisfaction
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career1
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career3
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0.925
career
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Latent Variable 1
0.787
0.754
0.779
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0.681
0.753
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0.534
career1
career2
career3
enhance1
enhance2
enhance3
protect1
protect3
protect4
social2
social4
social5
understand2
understand4
understand6
values1
values2
values3

These are not for the abstract but for you to double check my work.

Outer Loadings	Latent Variable 1	Protect	Satisfaction	career	enhance	social	understand	value
career1				0.925				
career1	0.787							
career2				0.880				
career2	0.754							
career3				0.925				
career3	0.779							
enhance1					0.883			
enhance1	0.750							
enhance2					0.931			
enhance2	0.778							
enhance3					0.852			
enhance3	0.796							
protect1		0.858						
protect1	0.510							
protect3		0.903						
protect3	0.603							
protect4		0.875						
protect4	0.683							
sat1			0.891					
sat2			0.876					
sat3			0.945					
sat4			0.916					
sat5			0.945					
sat6			0.918					
sat7			0.867					
social2						0.805		
social2	0.534							
social4						0.920		
social4	0.688							
social5						0.922		
social5	0.681							
understand2							0.908	
understand2	0.753							
understand4							0.867	
understand4	0.765							
understand6							0.819	
understand6	0.596							
values1								0.872

values1	0.608							
values2								0.923
values2	0.645							
values3								0.835
values3	0.534							

Total Effects	Original Sample (O)	Sample	Stdev	T Stat	P Values
Latent Variable 1 -> Satisfaction	0.705	0.709	0.051	13.755	0.000
Protect -> Latent Variable 1	0.198	0.197	0.022	8.968	0.000
Protect -> Satisfaction	0.140	0.140	0.020	6.989	0.000
career -> Latent Variable 1	0.244	0.245	0.019	12.984	0.000
career -> Satisfaction	0.172	0.173	0.017	9.873	0.000
enhance -> Latent Variable 1	0.247	0.246	0.015	16.376	0.000
enhance -> Satisfaction	0.174	0.175	0.016	10.653	0.000
social -> Latent Variable 1	0.206	0.204	0.019	11.024	0.000
social -> Satisfaction	0.145	0.145	0.017	8.640	0.000
understand -> Latent Variable 1	0.212	0.211	0.021	10.133	0.000
understand -> Satisfaction	0.149	0.150	0.016	9.304	0.000
value -> Latent Variable 1	0.173	0.171	0.022	7.879	0.000
value -> Satisfaction	0.122	0.121	0.015	7.950	0.000

R Square	R Square	R Sq Adj
Latent Variable 1	1.000	1.000
Satisfaction	0.498	0.495

Construct Reliability and Validity	Alpha	rho_A	Comp Rel	AVE
Latent Variable 1	0.932	0.937	0.940	0.472
Protect	0.854	0.868	0.911	0.773
Satisfaction	0.965	0.969	0.971	0.826
career	0.897	0.897	0.936	0.829
enhance	0.867	0.867	0.919	0.791
social	0.859	0.878	0.914	0.782
understand	0.833	0.847	0.899	0.749
value	0.850	0.859	0.909	0.770

Fornell-Larcker Criterion	Latent Variable 1	Protect	Satisfaction	career	enhance	social	understand	value
Latent Variable 1	0.687							
Protect	0.690	0.879						
Satisfaction	0.705	0.564	0.909					
career	0.850	0.394	0.565	0.910				
enhance	0.873	0.487	0.630	0.756	0.889			
social	0.723	0.746	0.556	0.414	0.508	0.884		
understand	0.821	0.360	0.549	0.705	0.696	0.469	0.865	
value	0.682	0.266	0.396	0.615	0.539	0.256	0.568	0.877

Heterotrait-Monotrait Ratio (HTMT)	Latent Variable 1	Protect	Satisfaction	career	enhance	social	understand	value
Latent Variable 1								
Protect	**0.777**							
Satisfaction	**0.738**	**0.617**						
career	**0.916**	**0.436**	**0.606**					
enhance	**0.955**	**0.562**	**0.683**	0.855				
social	**0.812**	0.865	**0.602**	**0.469**	**0.578**			
understand	**0.919**	**0.412**	**0.603**	**0.808**	**0.811**	**0.541**		
value	**0.779**	**0.296**	**0.436**	**0.701**	**0.623**	**0.294**	**0.657**	

Construct Crossvalidated Redundancy	SSO	SSE	Q^2 (=1-SSE/SSO)
Latent Variable 1	3,798.000	2,130.436	0.439
Protect	633.000	633.000	
Satisfaction	1,477.000	915.196	0.380
career	633.000	633.000	
enhance	633.000	633.000	
social	633.000	633.000	
understand	633.000	633.000	
value	633.000	633.000	

Programmatic Automation of Excel Using VBA To Clean Dirty Data

In the age of big data, professionals and academics who work with large data sets, database systems, data warehouses, etc., are frequently plagued with the dirty data issue. There are many definitions of dirty data, and anyone one of them is most likely applied relative to the tasks and data at hand. We will define dirty data simply as “data not readily suited to the tasks at hand.” Tasks may range from simple statistical summaries, aggregating catalog data, to performing advanced database queries, or applying a myriad of analytical techniques to data. Regardless of the nature of dirty data, few software tools are available to clean dirty data, that is, to make it suitable to the tasks at hand. This presentation will first describe an actual dirty data case related to preparing products for display in an online catalog, then present several common tools available in Excel to aid in cleaning dirty data. Lastly, it will show how Excel macros and VBA can be used to automate the data cleaning process. An example dirty data set containing thousands of rows and scores of columns will be presented, as well as manual and automated applications of data cleaning tools in Excel 2016.

TEACHING STANDARD COSTS: ALERTING STUDENTS TO THE LOGISTICS OF WORKING PROBLEMS BACKWARDS

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ABSTRACT

Most cost accounting textbooks have two chapters on standard costs. The first chapter usually discusses the overall concepts of establishing predetermined standards for costing a product and then details how to use the standards as guideposts as time passes to isolate variances from the standards. Next, the chapter usually discusses and isolates the direct materials and direct labor variances, leaving the variable and fixed overhead variances to be covered in the second chapter on standard costs. Before leaving the direct materials and direct labor variance calculations, however, students should be alerted to the logistics of working standard costing problems backwards – where the variance is given and one of the other pieces of data in the variance calculation is missing and expected to be found. The logistics of working such calculations is not difficult, but it is tricky enough that exposure to the procedure should be done well before a student sees such a question on an exam. In addition, working a question using the backwards approach does help highlight the importance of the Favorable versus Unfavorable determinant for the variance.

THE RIGHT TO BE FORGOTTEN: AN ETHICS CASE STUDY

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ABSTRACT

A timely ethical and legal issue with potential personal and long-term professional consequences in our digital environment is whether there should be a 'right to be forgotten'. Almost everyone has done something as a teenager or young adult that they later regret. Historically, juvenile records were 'sealed' because it was deemed to be unfair to hobble a person's educational and employment prospects based on a transgression committed early in life. Indeed, until the last 20 years, those early indiscretions were easily forgotten. Personal knowledge or an arduous search at a library would have been necessary to uncover an incident reported in a newspaper. Likewise, a background check entailed a trip to the local courthouse and a considerable amount of time combing through court records, and juvenile records would not be accessible. With the advent of the Internet, social media, and the ubiquitous cell phone, a *de facto* permanent digital record of almost everything that is said or done has been created. These digital records are easily accessible and shared. They have had devastating personal, educational and professional consequences. This case study summarizes the status of the 'right to be forgotten' and provides specific incidents to inspire discussion. The European Union's 'right to be forgotten' law and California's Minor Erase Law are both outlined. Two cases involving youthful indiscretions, one by a minor and the other by a young adult, are presented. Suggestions are made for discussion questions with additional teaching notes italicized.

Introduction

The advent of the Internet and the omnipresent smart phone has created a permanent digital record of our daily life. Almost everyone at some time has done or said something that they later regret. For example, Virginia Governor Ralph Northam was forced to publicly address the presence of a racist photo on his page of the 1984 Eastern Virginia Medical School yearbook. (Wong, 2019) Although memories fade over time, the Internet preserves digital records forever. Clearly, Governor Northam was not the first person and won't be the last to have to explain or face the consequences for an insensitive comment or offensive photo.

The question is whether there should be a 'right to be forgotten' or perhaps a digital statute of limitations. The EU has formally adopted a 'right to forget' directive and California recently passed a Minor Eraser Law. There is a movement in the US to adopt some sort of 'right to be forgotten', creating an ethical dilemma and fodder for a timely discussion.

This case study includes two scenarios from the news to encourage students to consider whether there should be a 'right to be forgotten' – a student whose admission to Harvard was rescinded, and a junior financial analyst who lost his job for leaking information about the Facebook IPO. Under what circumstances should a digital record be erased? Are there some events that should never be forgotten? Does erasure of an event create a false narrative? How does erasure affect freedom of speech?

The 'right to be forgotten'

The 'right to be forgotten' is based on an idea that was first recognized in the EU and has been defined as "the right to silence on past events in life that are no longer occurring." (Pino, 2000) The right to be forgotten initially came from the landmark case of Mario Costeja González, who after being forced to sell some property to satisfy a debt, had the incident printed in a Spanish newspaper in 1998. About a decade

later, Costeja González attempted to have the sale of his assets removed from the Internet by Google and the newspaper, alleging that the incident was no longer relevant. The EU's Court of Justice heard the case and held that search engines had an obligation to consider the good faith requests of EU citizens, and where appropriate, to remediate search engine results. With this precedent, "the digital right to be forgotten became a privilege enjoyed by all citizens within the E.U., and Google has removed 1.1 million links from its search results since." (Swearingen, 2019) Now formally adopted by EU directive and recognized in EU courts, a person may file an application to have harmful personal information, videos, and photos removed from Internet records. In other words, the deleted information would not be revealed in search engine results performed in the EU.

On January 1, 2015, the California 'Minor Eraser Law' went into effect. The California Eraser Law (Cal. Bus. & Prof. Code §§ 22580-81) was passed in the wake of the EU 'right to be forgotten' and permits someone to request that an online server remove postings made by a person during their minority (before the age of 18). Additionally, the existence of this right must be included in a service provider's privacy policy. (Ross, 2015) It should be noted that the right to have data permanently deleted only applies to an item posted by the person requesting deletion.

Two Cases to Consider

1. Harvard rescinds admission offer.

Kyle was excited about being accepted for admission to Harvard – his first choice school. He had survived the Marjory Stoneman Douglas shooting in Parkland and while many of his fellow classmates were advocating gun control, Kyle presented a conservative response to the school shooting and met with President Trump in the Oval Office. After being accepted to Harvard, screenshots of Kyle's private Facebook conversations made two years earlier were resurrected. These postings were made while Kyle was sixteen and included racial slurs. According to Kyle, "After the story broke, former peers & political opponents began contacting Harvard urging them to rescind me. Harvard then sent this letter stating that Harvard "reserves the right to withdraw an offer of admission" and requested a written explanation within 72 hours." (@KyleKashuv, June 17, 2019)

Harvard's Admissions Committee reserves the right to rescind offers of admission "if an admitted student engages or has engaged in behavior that brings into question their honesty, maturity or moral character." (Avi-Yonah, 2019) Kyle immediately responded to the rescission letter, took responsibility for his comments, provided an explanation, and apologized. He also emailed the Office of Diversity and Inclusion and expressed that he wanted "…to seek guidance on how to right this wrong and work with them once I was on campus." (@KyleKashuv, June 17, 2019) The Admissions Committee reaffirmed its decision.

This is not the first time that Harvard has rescinded an offer of admission based on offensive online postings. In 2017, ten members of the Class of 2021 had their offer of admission rescinded for participating in a Facebook messaging group formed with other newly admitted freshmen. This explicit group chat included obscene memes, mocked sexual assault, and the death of children. (Natanson, 2017)

If Kyle had been a resident of California, he would have been able to erase the offensive, private conversation he had when he was sixteen years old…before he applied to college and presumably before it resurfaced. It would have been gone without a trace.

1. Should a minor be allowed to erase postings? *A minor is someone who has not yet reached the age of 18. Under our civil law, a minor is allowed to avoid almost all contracts made during his/her minority. These contracts may be avoided during minority and for a reasonable time*

after majority (turning 18). The primary reason that we allow minors to avoid contracts is to protect them from making foolish decisions and/or from being taken advantage of by an adult. Although a minor may commit a criminal act, when a minor is prosecuted, his/her "record" is generally sealed. In other words, the offense must not be revealed to the prying eyes of the public. Again, our criminal laws acknowledge that a minor may commit an offense; however, that offense should not irreparably damage a person's life.

2. What if Kyle had posted the racist comment when he was 13 years old – would that change your opinion of whether the comment should be forgotten?
3. Is there a difference between Harvard's rescission of Kyle's admission offer and the revocation of the offer of admission to the ten members of the class of 2021?
4. Do you believe that a person can change…even after a relatively short period of time? "*The Green Book", is a recent movie based on the true story of an African-American concert pianist and his Italian-American driver, Tony "the Lip". In part, the movie shows the growth of a relationship between these characters. This could be an interesting part of a discussion of whether a person can change attitudes and paradigms as Tony did.*
5. Under what circumstances, if any, would you allow a posting to be erased? *Even a minor may be held responsible for some contracts made during his/her minority. Under the common law, a minor may not avoid contracts for "necessaries" – food, clothing, or shelter. This exception is logical. After all, many minors are employed and have disposable income – it would be unfair for a minor to go into a restaurant and order food and after eating a meal, refuse to pay for it. By statute in a majority of jurisdictions, a minor is not allowed to avoid a contract made while running a business. The rationale for this rule is that if a minor is savvy enough to run a business, then he/she should be bound by business-related contracts. Criminal laws in many states provide that a minor who is 14 years old or older when he/she commits a violent felony may be prosecuted as if he/she were an adult.*

2. Junior Research Analyst (JRA). In an effort to have full and fair disclosures, the Securities Exchange Act strictly regulates the primary securities markets and initial public offerings (IPO). The disclosure of inside and confidential information is strictly forbidden and analysts, underwriters and others working on an IPO are well aware of the importance of confidentiality. JRA is a 2008 Stanford graduate in his mid-twenties on a successful career path – that is, until May 2012. While working for Citigroup's Internet analyst group, JRA disclosed non-public, confidential information about the Facebook IPO to his college pal and TechCrunch writer. When this indiscretion came to light, four things happened: Disclosure of this confidential information was publicized and JRA was identified online, Citigroup fired its Internet analyst group, the Internet analyst group was assessed a $2 million fine by the state of Massachusetts for these unlawful disclosures, and JRA lost his job. (Carlson, 2012)

1. If JRA applied for an analyst position at your firm, would you want to know about the unauthorized disclosures and the $2 million fine his previous employer had to pay? *A prospective employer would most likely want to know of the disclosure incident and the resulting fine. A relevant question is whether this was an isolated event or a character flaw? Additional questions a prospective employer may want to ask include the following: How did this impact your worldview, your professional view or personal life? What would you do differently moving forward?*
2. Would you allow JRA to exercise the 'right to forget' and to have all of the associated coverage removed from search engine results? *By removing this coverage from all search engines, this would essentially change JRA's history. Of course, one who has committed an unauthorized disclosure of confidential information may be the person least likely to do this again…or JRA could be a serial leaker. Is there a way to uncover whether JRA has a true sense of remorse? Does he take responsibility for his mistake or does he simply blame someone else? Where JRA places the blame could provide a clue as to whether he would do this again.*

3. Are there any circumstances under which you would allow JRA to 'erase' his past unauthorized disclosures? After 10 years? After 20 years? *A relevant point to highlight is that this offense had a direct relationship to unauthorized disclosure of information on the Internet*.

Additional Questions for Discussion

1. What is the difference between Kyle's offensive comment(s) and JRA's disclosure of confidential information?
2. Is a 'Minor Eraser Law' a good idea?
3. Should the US have a 'right to be forgotten'?
4. Given the First Amendment (freedom of speech/expression), should the right to delete personal information be limited to items that the individual posted? *Although photos may be "untagged", Facebook has facial recognition technology – a face can be readily identified even if it is not "tagged". Please note that students may have seen a Black Mirror episode (Netflix) highlighting such technology and social ranking, which could be part of this discussion.*
5. Could the 'right to forget' compromise the integrity of an Internet search? *Perhaps the 'right to forget' would re-write history and in effect, hamper due diligence of employers, investors, or even voters.*
6. If a 'right to forget' is adopted, what form should it take?
    - *Should the 'right to forget' be limited to information posted during a person's minority?*
    - *What if that posting was a 'hit list'?*
    - *Should the 'right to forget' be applied only to false and/or defamatory information?*
    - *Should the 'right to forget' be applicable to any/all information after a certain number of years?*
7. In 2015, the Commission nationale de l'informatique et des libertes (CNIL) asked Google to remove data from all versions worldwide. Should the EU be able to determine what search engines reveal on an international basis?
8. Are there some things that should never be forgotten?
    - *What about a sex offense or conviction as a sex offender?*
    - *Did the fact or act only affect you **or** did the act affect (or change the history) of another?*
    - *What if the item that was posted was about a minor? Example: A photo of a minor dressed inappropriately or a minor consuming alcohol.*

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TRUST'S ROLE IN THE EXPECTANCY THEORY OF MOTIVATION

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ABSTRACT

This study investigates the role Trust plays in the Expectancy Theory of Motivation (Vroom, 1962.) Elements of Expectancy Theory are 1) belief (probability) that Effort will lead Performance level, 2) belief that Performance will lead to an Outcome, and 3) the value placed on that Outcome. Motivational force is determined as the product of the three elements.

For the purpose of this study, Effort to Performance expectancy is operationalized as self-efficacy, or "trust in self" and Performance to Outcome expectancy is operationalized as organizational trust. For the purposes of this study, organizational commitment is used as a proxy for the value of the outcome.

Two theses are explored in this review: 1) Generalized Organizational Trust (trust of systems and people) as it relates to Performance to Outcome expectancy, and 2) Self-Efficacy (trust in self) at it relates to Effort to Performance expectancy.

BACKGROUND

Motivation: Expectancy Theory

This study 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 [34] 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.

Two areas of the theory are quantified in terms of trust in this study: 1) Generalized Organizational Trust (trust of systems and people) as it relates to Performance to Outcome expectancy, and 2) Self-Efficacy (trust in self) at it relates to Effort to Performance expectancy.

For any set of individual effort(E), performance(P), and outcome(O), the Expectancy Theory of Motivation [34] 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:

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

Although the Expectancy Theory of motivation is over a half century old, it continues to be used as a basis for research in areas such as business education. [26] Future research proposed by the author 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 [28] 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" [28, p. 1], and Zand's [37] 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" [37, 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 this 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.

Li and Tan [18] investigated specific mediators between supervisor trust and job performance. They found positive effects between trust and performance as mediated by psychological meaningfulness, availability, and safety.

The addition of controls and limits on risk may have an interaction with trust, potentially reducing the intrinsic motivation of the trusted individual. Motivation Crowd Out theory predicts that the addition of material incentives may reduce intrinsic motivation, however Bengtssom and Engstrom [4] found that not to hold in a non-profit grant-based study.

Research in the area of leadership also shows an important relationship to trust. Braun et al. [5] found in an academic setting through a multilevel assessment of transformational leadership that trust was an important mediating factor and influence both the perception and effectiveness of transformational leadership in that setting. A broad review published in 2016 of more recent research in education on transformational leadership, job satisfaction and commitment indicate that trust in the leader is overall positively correlated with each of those variables. [13] On the student side of the education environment, Ennen et al. [14] found significant correlations in student groups between trust, group similarity, and collaborative learning both at the middle and end of semester long projects. Walumba et al. [35]present a review of studies which indicate that among knowledge workers, trust and motivation are best served with an "authentic" leadership style characterized as having a strong internalized moral perspective, high self-awareness, and relational transparency.

Trust research can be extended to public and private industry policies, systems and services. Chaouali et al. [9] investigated adoption of internet banking services in Tunisia

and found that trust of the banking system influenced adoption intentions. Chen et al. [10] investigated public service motivation and trust in citizens, colleagues and found that trust did positively influence motivation.

Bulloch [7] presents a three stage "grammar" of trust based on Uslaner [32] as follows

- Grammar 1: A trust(s).
- Grammar 2: A trust(s) B.
- Grammar 3: A trust(s) B to do X.

In as presented by Bulloch, the "giver" of trust individual A, may have a general "moralistic" trust in grammar, or a more "strategic" trust in grammar 2 where individual B is the subject of trust, and in grammar 3 the trust is limited to the B's performance of a specific task X the "object" of the trust. [7]

Moving beyond more traditional business organizational research, Zak [36] recently published neuroscience research that shows a specific relationship between oxytocin and trust, as well as a strong relationship between oxytocin and "joy" or engagement in the workplace as well as reduced stress and higher productivity.

A well-done review of measurement in trust research literature was presented by McEvily and Tortoriello [22]. Their review indicated that there was great inconsistency in the instruments used in the research stream which limits the ability to compare studies as there are multiple conceptualizations of trust. Their review recommends five specific instruments that are appropriate in various contexts which researchers would be well served to consider using. Included in their list are the Managerial Interpersonal Trust Instrument [20], and the Organizational Trust Instrument [21]both of which are used in the current study.

A third trust scale is used, the J.B. Rotter Interpersonal Trust Scale [27], although it's focus is on broader interpersonal trust rather than organizational trust.

Self-Efficacy:

Self-Efficacy is a construct related to an individual's belief that they can complete a task or achieving a level of performance. Typically, self-efficacy is described as either generalized or task specific. For the purposes of this study, the focus is on generalized self-efficacy as measured by the General Self-Efficacy (GSE) scale [29]. The GSE is used in this case as proxy measure for self-trust which has theoretical similarities to Effort to Performance expectancy (E →P). Task specific self-efficacy may be a more accurate measure for task specific motivation but requires a task specific scale. [3]

Organizational Commitment

The concept of Organizational Commitment is included in this research as a proxy for motivational force.

Mowday, Steers, and Porter [25]conceptualized “commitment as an attitude” potentially important to organizational outcomes. They investigated “attitudinal commitment.” defined as an individual's identification with an organization and its goals. Because organizational commitment is an attachment to the organization and its goals, they predicted that organizational commitment should be more stable over time than job satisfaction. Mowday et al. [25] also predicted a relationship between organizational commitment and turnover.

Mowday et al. [25]designed an instrument to measure organizational commitment called the Organizational Commitment Questionnaire (OCQ) (see Appendix C). Since its creation, the OCQ has become the most widely used and accepted instrument to measure affective organizational commitment [6]. Examples of empirical research using the OCQ include: Ashford, Lee, and Bobko [1]; Meyer, Paunonen, Gellatly, Goffen, and Jackson [24]; Van Dyne et al. [33]; Dunham, Grube, & Castaneda [12]; Brett, Cron & Slocum [6]and; Shore, Barksdale, and Shore [30].

Mowday et al. warned researchers using the instrument to be aware that employees may distort responses “if they feel, for example, threatened by completing the questionnaire or are unsure how their responses will be used.” [25, p. 244] This requires an assurance of confidentiality and, if possible, anonymity from the researcher.

Meyer, Allen & Smith [25] conceptualized three types of organizational commitment, affective (based on attachment), continuance (based on cost of leaving), and normative (based on perceived obligation). “Employees with a strong affective commitment remain with the organization because they want to, those with a strong continuance commitment remain because they need to, and those with a strong normative commitment remain because they feel they ought to do so.” [23, p. 539]

Results from Meyer, Paunonen, Gellatly, Goffen, & Jackson [24] indicated that the nature of the commitment may be more important than the level of commitment to relevant performance outcomes, and that affective commitment had the most direct relationship. The current study considers only affective organizational commitment as it is definitionally the most consistent with issues of Trust.

In 1990, Mathieu & Zajac [19] published the most comprehensive review of organizational commitment to date. They found that the most commonly used measure of organizational commitment was the OCQ. Ninety of the samples reviewed used the 15 item OCQ with 80 (n=24258) reporting an average internal consistency reliability of .88 (SD = .04).

Early research by Cook & Wall [11] on the relationship between commitment and trust found a positive correlation in its British all-male sample. Baek & Jung [2] extended the Cook & Wall findings using Structural Equation Modeling (SEM) in their research. Baek and Jung compared two models of the interrelationship between institutional trust and organizational commitment. Noting that earlier research had focused on the main effects between personal trust (trust in co-workers and supervisors) and impersonal trust (trust in the organization) and organizational commitment, they applied SEM to determine if the model would be improved as a mediating model rather than as a main effect model. Their findings indicate that the moderating model provides slightly better fit that the main effect

model. Similar findings of a clear trust/commitment relationship were found in Turkey by Tekingunduz et al. [31]

Eslami and Gharakhani [16] extended commitment and job satisfaction to workers in Iran and found significant positive correlations between job satisfaction and all three forms of commitment: affective, normative, and continuance.

MODEL DEVELOPMENT AND HYPOTHESES

There is substantial support over time for the expectancy theory as well as a rapidly growing literature on trust in multiple contexts. Organizational trust specifically may play a key role in determining performance to outcome expectancy (Instrumentality or P>O Expectancy.) Self-trust or self-efficacy may play a similar role in effort to performance expectancy.

In an organizational setting, an individual may not automatically receive an outcome as a level of performance. If performance and outcome are clearly linked, then P>O expectancy should be extremely high, that is we trust the system. If on the other hand there is some element of risk or reliance on a person, group, or system that may not automatically provide the expected outcome, then trust enters the equation. Trust may also play a role when the measurement of performance is more subjective than objective.

The hypotheses related to trust are presented below:

H1: Trust will be positively correlated with motivational force.

- H1a: Generalized Interpersonal Trust will be positively correlated with motivational force.
- H1b: Managerial Interpersonal Trust will be positively correlated with motivational force.
- H1c: Organizational Trust will be positively correlated with motivational force.

Self-Efficacy's key role is in the Effort to Performance (expectancy or E>P expectancy) portion of the motivation equation. This would theoretically function as an intrinsic belief that a certain level of performance is possible given effort. The higher one's self-efficacy, the stronger the relationship would be between effort and performance.

The hypotheses related to self-efficacy are presented below:

H2: Self-Efficacy will be positively correlated with motivational force.

- H2a: General Self-Efficacy will be positively correlated with motivational force.
- H2b: Task Specific Self-Efficacy related to Economics will be positively correlated with motivational force.
- H2c: Task Specific Self-Efficacy related to Accounting will be positively correlated with motivational force.

The final set of hypotheses relate to the full model incorporating both Trust and Self Efficacy.

H3: Self-Efficacy and Trust will significantly relate to motivational force.

Hypothesis 3 will be tested using regression analysis with Motivational Force as the independent variable (as measured by the OCQ proxy) and each combination of trust (Generalized, Managerial, and Organization) and self-efficacy (General, Accounting, and Economics) as the independent variables (nine total regressions). In addition, the interaction effect will be tested using a logarithm transformation.

METHOD

Survey Instrument

An online survey was used to collect the response data. The survey began with a consent form and agreement to provide a student ID so the responses could be matched to minimal demographic data. The online survey was composed of six instruments as follows:

- Managerial Interpersonal Trust Instrument (MIT) [20]
- Organizational Trust Instrument (OTI) [21]
- J.B. Rotter Interpersonal Trust Scale (ITS) [27]
- Organizational Commitment Questionnaire (OCQ) [25]
- General Self-Efficacy (GSE) scale [29]
- A set of questions related to task specific self-efficacy for students [3] From these are drawn a question about Economics (SEEconomics), and one about Accounting (SEAccounting)

Sample

The sample was comprised of majors and minors in Accounting, Business, and Economics in a small liberal arts college. E-mail invitations to participate were send to 233 students. There were 150 student responses of which 117 completed all the sections for a response rate of just over 50%. The exceptionally high response rate was likely due to the size and nature of the college involved as the respondents were likely to know the researcher and to respond even though no response was required, and confidentiality was guaranteed.

RESULTS AND ANALYSIS

All analysis was done using IBM SPSS. Each of the scales was subjected to a reliability test and passed (Cronbach's $\propto$ greater than .80.) A correlation matrix was run on the scales, see table 1.

Table 1

Correlations

		ITS	MIT	OTI	GSE	SEAccounting	SEEconomics	OCQ
ITS	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	129						
MIT	Pearson Correlation	0.166	1					
	Sig. (2-tailed)	0.068						
	N	121	121					
OTI	Pearson Correlation	.315**	.671**	1				
	Sig. (2-tailed)	0.001	0.000					
	N	117	117	117				
GSE	Pearson Correlation	-0.037	0.135	0.079	1			
	Sig. (2-tailed)	0.681	0.139	0.395				
	N	126	121	117	126			
SEAccounting	Pearson Correlation	0.019	.233**	0.128	.274**	1		
	Sig. (2-tailed)	0.833	0.010	0.170	0.002			
	N	125	121	117	125	125		
SEEconomics	Pearson Correlation	-0.030	.179*	0.093	.230**	.393**	1	
	Sig. (2-tailed)	0.737	0.050	0.317	0.010	0.000		
	N	125	121	117	125	125	125	
OCQ	Pearson Correlation	.212*	.513**	.665**	.297**	0.157	.276**	1
	Sig. (2-tailed)	0.019	0.000	0.000	0.001	0.083	0.002	
	N	122	121	117	122	122	122	122

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Motivational force, as measured by the OCQ, was positively correlated with Generalized Interpersonal Trust, Managerial Interpersonal Trust, and Organizational Trust. This result provides support for hypothesis 1: a, b, and c. It is interesting to note that generalized interpersonal trust did not have as strong a relationship as managerial interpersonal trust organizational trust, indicating that the type of trust may be very important to its relationship with motivation.

Generalized Self-efficacy was positively correlated with motivational force as measured by the OCQ. This gives support to hypothesis 2 a. Hypothesis 2b was also supported, however hypothesis 2c failed the test of significance. While this indicates a difference between accounting and economics in terms of self-efficacy as related to organizational commitment measuring motivational force, the author suspects that this has more to do with a smaller number of accounting majors as opposed to business majors in the sample.

Results of the tests for hypothesis three are presented in the three sections of table 2. Each of the self–efficacy measures and each of the trust measures were regressed against the

OCQ as a motivation proxy. To test for interaction effects, the natural logarithm of each of the self-efficacy measures and each of the trust measures were also regressed against the OCQ. The first section of table 2 indicates that the test of significance for each model met the .05 significant standard. In fact, only the two accounting measures against the ITS measurement failed to meet the test of significance at the .01 level. In the second section of table 2 we see the R square calculations for each of the models is interesting to note that the more specific measurements the MIT and OTI provide a higher R square than the more generalized ITS measurement. This result meets with the expectations that the MIT and OTI are more appropriate measures than generalized trust as measured by the ITS. The highest r squares were generated with the OTI measurement was looked at indicating that trust in the broader organization seems to be more important than generalized trust or trust in the immediate supervisor. The significance of the individual variables in each model is presented in the third section of table 2, and for each of the GSE measurements in the self-efficacy economics measurements all the variables met the test of significance at the .01 level. The self-efficacy in accounting measurements however failed to meet the test of significance at the .05 level when regressed against the ITS and failed to meet any test of significance regressed against the MIT or the OTI.

The results from the first section of table 2 indicate strong support for hypothesis three, however the results from the third section of table 2 clearly indicate that there is a difference in effect between self-efficacy and accounting and self-efficacy generally or self-efficacy in economics. At the very least this shows discriminant validity between self-efficacy and accounting and self-efficacy and economics. The reason accounting and economics function different differently in this model is not as clear from the data currently analyzed.

CONCLUSION

Given the data and the results presented, we see a strong level of support for the idea that trust in self or self-efficacy and organizational trust each play a role in motivation. The lack of correlation between the self-efficacy measures and two of the trust measures (the ITS and OTI measure), indicate that we are dealing with two different constructs: both self-efficacy and organizational trust. This lends credence to the theory that self-efficacy and organizational trust are related to expectancy theory as presented. There is more work to be done, an explanation of why accounting and economics function so differently in the self-efficacy measures would be an interesting next step, as would a model that looked at some other outcome measure such as GPA or some sort of performance measure in an industry sample.

Table 2

Sig (F)	GSE	LogGSE	SE Accounting	Log SEAccounting	SE Economics	LogSE Economics
ITS	0.000		0.016		0.000	
LOG ITS		0.000		0.014		0.000
MIT	0.000		0.000		0.000	
LogMIT		0.000		0.000		0.000
OTI	0.000		0.000		0.000	
LogOTI		0.000		0.000		0.000

R Square	GSE	LogGSE	SE Accounting	Log SEAccounting	SE Economics	LogSE Economics
ITS	0.138		0.067		0.124	
LOG ITS		0.130		0.070		0.129
MIT	0.315		0.265		0.295	
LogMIT		0.320		0.258		0.295
OTI	0.499		0.448		0.417	
LogOTI		0.487		0.419		0.452

Variable Significance	GSE	LogGSE	SE Accounting	Log SEAccounting	SE Economics	LogSE Economics
ITS	0.000		b (.092)		0.000	
LOG ITS		0.000		b (0.080)		0.000
MIT	0.000		b (.616)		0.000	
LogMIT		0.000		b(.616)		0.000
OTI	0.000		b (.287)		0.000	
LogOTI		0.000		b (.274)		0.000

b = Self Efficacy variable non-significant as a model variable (t sig.)

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Using Cluster Analysis to Group Together Similar Markets for A/B Experiments

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Abstract

Testing various marketing campaigns or strategies to identify the ones that are most effective has become a common task for today's marketing teams. Many campaigns and strategies can only be applied within large geographic areas (e.g., cities). When comparing say two marketing strategies (A vs. B) in these scenarios, it will only be possible to apply Strategy A in one city and Strategy B in a different city for any given period of time.

To effectively compare the impact of those two different marketing strategies, it is extremely important that that impact is isolated from the potential differences those two cities may have on the outcomes.

Using a statistical technique known as Cluster Analysis, the presenter will illustrate how characteristics of candidate cities can be used to group the cities into "similar pairs" where one city will receive marketing Strategy A and there other Strategy B. In doing so, the resulting differences in outcomes will be able to be better attributed to the marketing strategies instead of the differences between the cities.

Clustering Observations

EXAMPLE | Test & Control Market Selection

The Marketing Analytics team within a national investment brokerage firm has been asked to assist the Client Services Organization in selecting markets to test a new service offering being developed targeted at their High-Net-Worth (HNW) client segments.

The CS Org wishes to run a pilot of the new program in 7-10 test markets. Good experimental practice suggests that the results of the pilot in each test market should be compared to the results in a control market where the two markets are similar to each other with regard to important market attributes.

20 Candidate markets were selected and data retrieved on the size of 3 High-Net-Worth segments (High-Net-Worth Retirees, High-Net-Worth Midlife, and High-Net-Worth Young).

Find 7-10 pairs of markets that are similar to each other with regard to the profile of the three High-Net-Worth segments for one to serve as the test market and one to serve as the control market.

Test & Control Market Selection

Test & Control Market Selection

High-Net-Worth Retirees

High-Net-Worth Midlife

High-Net-Worth Young

Test & Control Market Selection

3 variables obtained for each of the 20 Markets

HNW Ret : The % market share of High-Net-Worth Retiree segment the company has in that market

HNW Mid : The % market share of High-Net-Worth Mid-Life segment the company has in that market

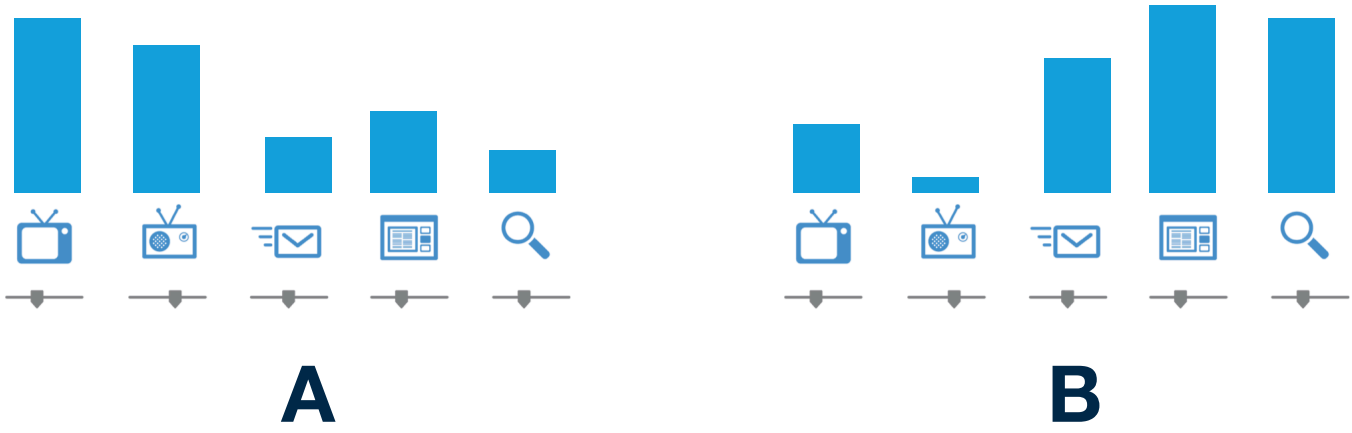
HNW Young : The % market share of High-Net-Worth Young segment the company has in that market

Clustering Observations

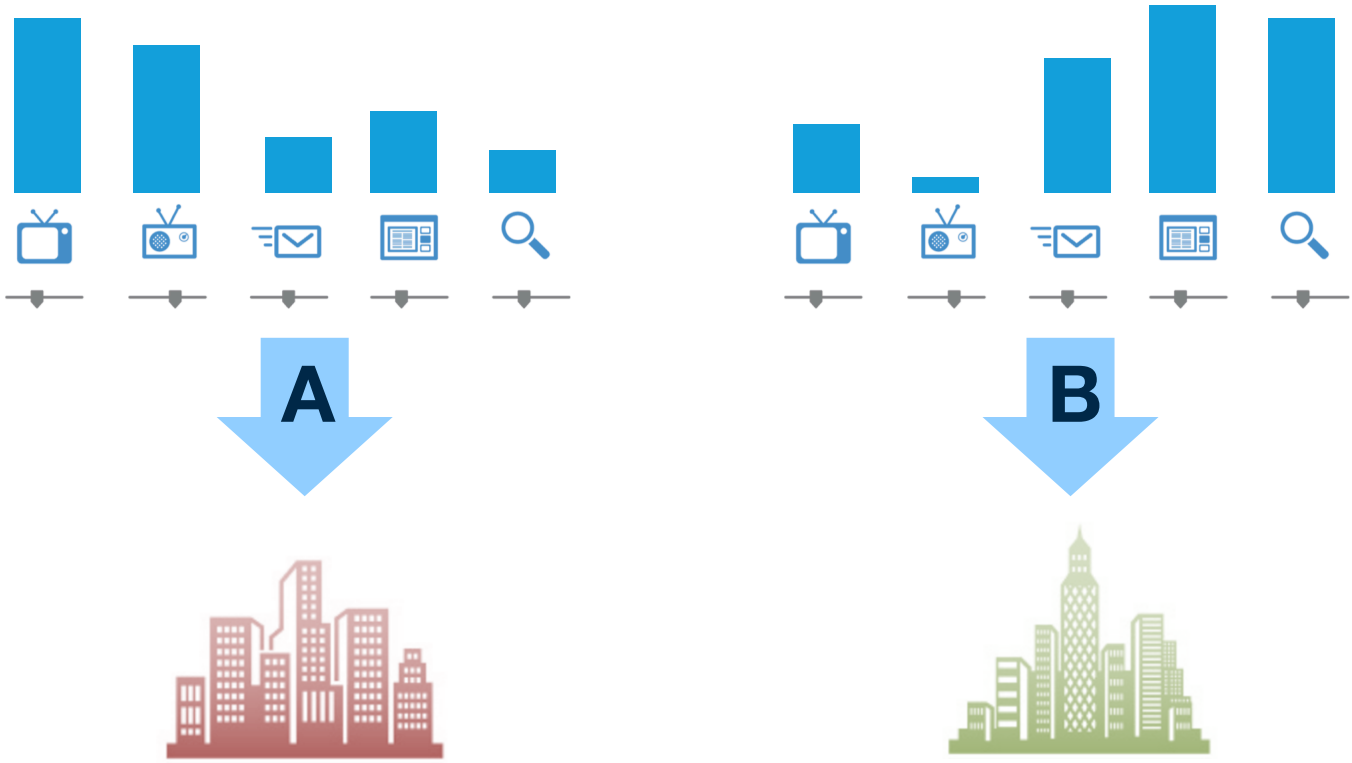
EXAMPLE | Test & Control Market Selection

	A	B	C	D
1	**Market**	**HNW Ret**	**HNW Mid**	**HNW Young**
2	Atlanta	18%	32%	7%
3	Boston	20%	25%	8%
4	Charlotte	13%	30%	11%
5	Chicago	15%	24%	16%
6	Dallas	18%	46%	12%
7	Denver	17%	40%	18%
8	Houston	11%	32%	10%
9	Los Angeles	9%	41%	14%
10	Miami	22%	37%	5%
11	Nashville	14%	33%	11%
12	New York	15%	28%	9%
13	Orlando	10%	37%	16%
14	Philadelphia	7%	28%	10%
15	Phoenix	12%	35%	9%
16	Portland	17%	52%	11%
17	Raleigh	20%	34%	6%
18	Sacramento	16%	33%	15%
19	San Francisco	19%	25%	10%
20	Seattle	13%	39%	11%
21	Washington DC	16%	26%	8%

Marketing Experiments



Marketing Experiments



Marketing Experiments

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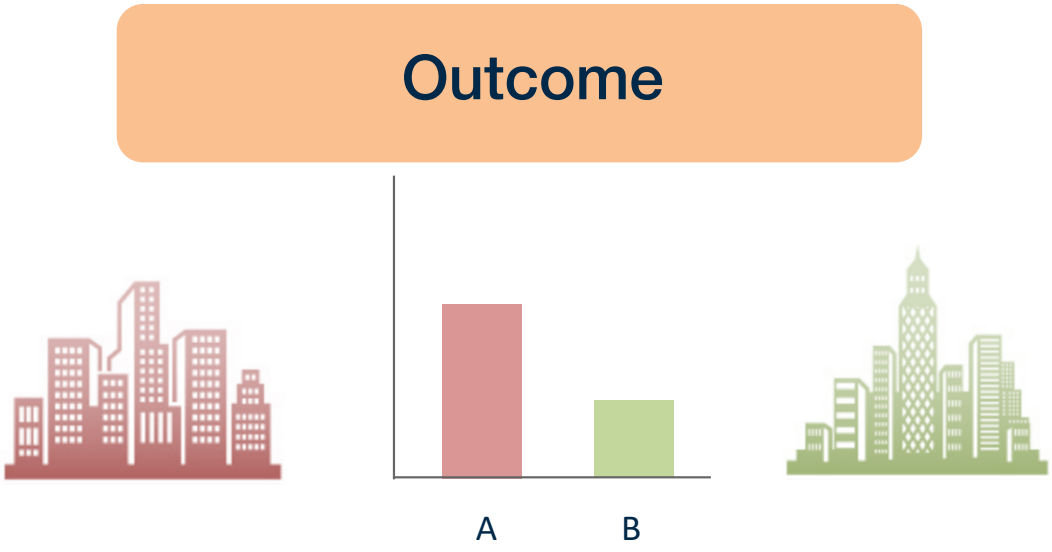
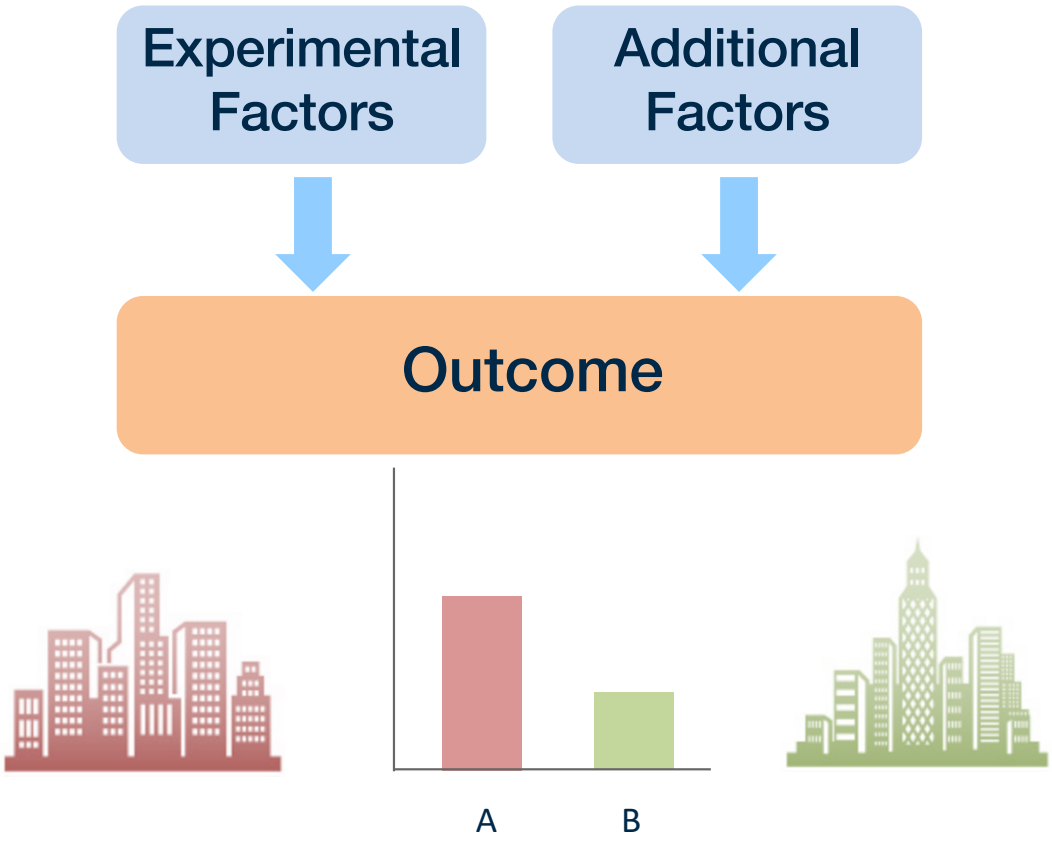


Marketing Experiments



Statistical Analysis + Models

Statistical Analysis + Models

Statistical Analysis + Models

Statistical Analysis + Models

Statistical Analysis + Models

Statistical Analysis + Models

Outcome Variables = Experimental Factors + Additional Factors + Error

The Challenge

How can differences in geographical regions be controlled for in marketing experiments so that those differences don’t adversely affect the attempts to quantify the impact of a particular marketing effort?

Solution

Solution

Cluster Observations Analysis

Grouping “things” together
that are “similar” to each other

Solution

Cluster Observations Analysis

- Intuitive and accessible
- Handles high dimensional problems
- Strengthens the experiment
- Simplifies analysis of results
- Supports myriad applications
- Exploratory and Data Mining technique

Clustering Observations | Intro

Clustering Observations

Clustering Observations

Grouping observations that are “similar” or “close” to each other

Clustering Observations

Grouping observations that are “similar” or “close” to each other

- “Similarity” or “closeness” is typically evaluated across multiple dimensions simultaneously (i.e., many different variables or characteristics on the observations)

Clustering Observations

Grouping observations that are “similar” or “close” to each other

- “Similarity” or “closeness” is typically evaluated across multiple dimensions simultaneously (i.e., many different variables or characteristics on the observations)
- Resulting clusters may be the final solution sought or a means to guide further analyses

Clustering Observations

Applications

Clustering Observations

Applications

- Group customers into meaningful “customer segments” based upon various demographics and shopping behaviors to help develop targeted marketing strategies.

Clustering Observations

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- Create “groups of products or items” (e.g., books, movies, songs) that are similar to each other to guide in the development of product recommendations.

Clustering Observations

Applications

- Group customers into meaningful “customer segments” based upon various demographics and shopping behaviors to help develop targeted marketing strategies.
- Create “groups of products or items” (e.g., books, movies, songs) that are similar to each other to guide in the development of product recommendations.
- Categorize students into “student types” based upon their performance and various social/behavior characteristics to support the development of more effective teaching strategies.

Clustering Observations

Components of a Cluster Observations Analysis

Clustering Observations

Components of a Cluster Observations Analysis

- Set of measured characteristics on each observation

Clustering Observations

Components of a Cluster Observations Analysis

- Set of measured characteristics on each observation
- Method to measure distance between observations and sets of observations

Clustering Observations

Components of a Cluster Observations Analysis

- Set of measured characteristics on each observation
- Method to measure distance between observations and sets of observations
- Implementation of an algorithm that determines how observations form into clusters

Clustering Observations

Unsupervised learning technique

Clustering Observations

Unsupervised learning technique

- No outcome variable to guide the classification of the observations.

Clustering Observations

Unsupervised learning technique

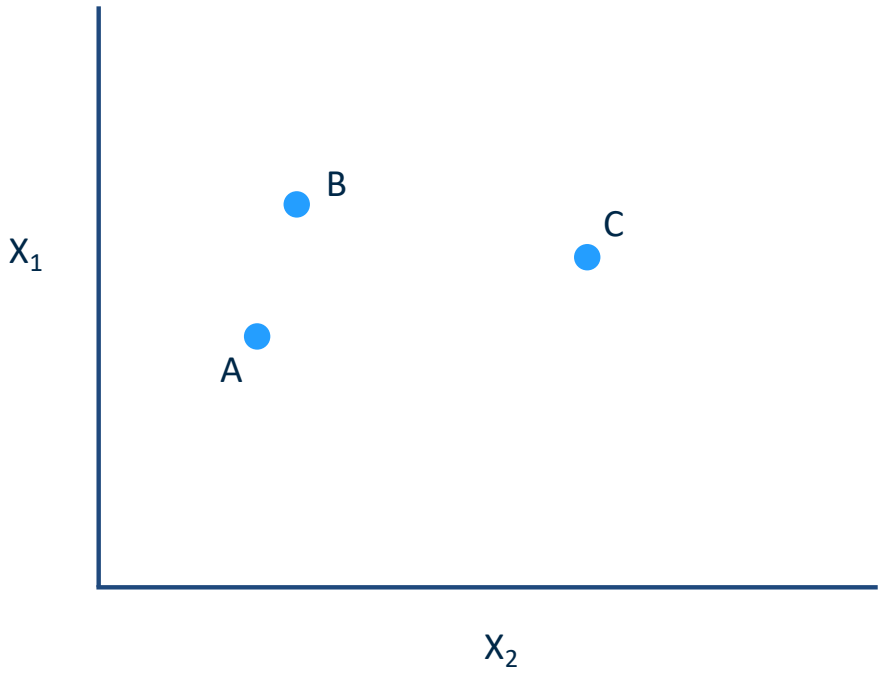
- No outcome variable to guide the classification of the observations.
- No means for which to evaluate how correct the analysis performed at clustering the observations.

Clustering Observations

Distance

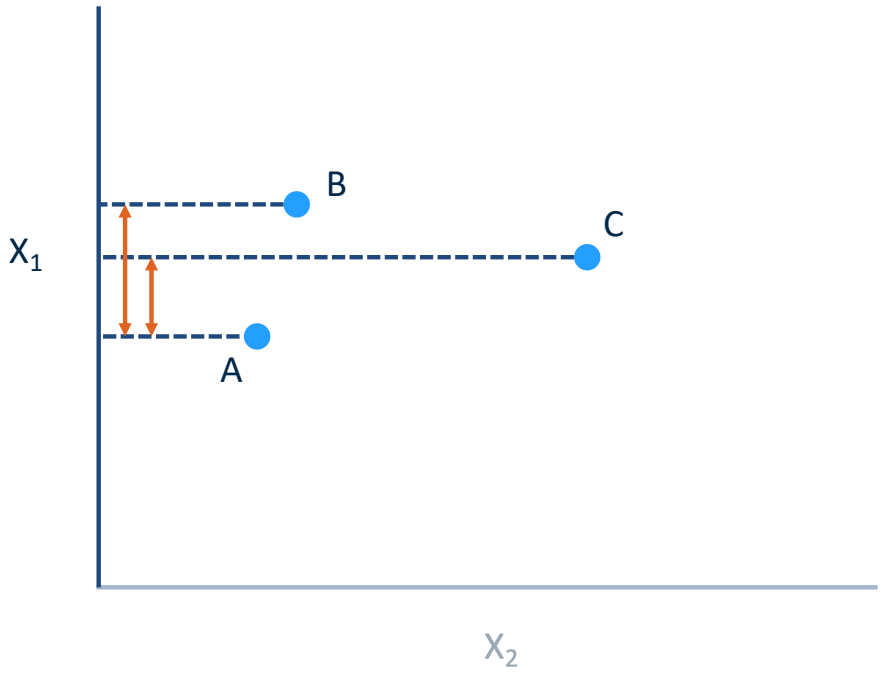
Clustering Observations

Distance



Clustering Observations

Distance



Clustering Observations

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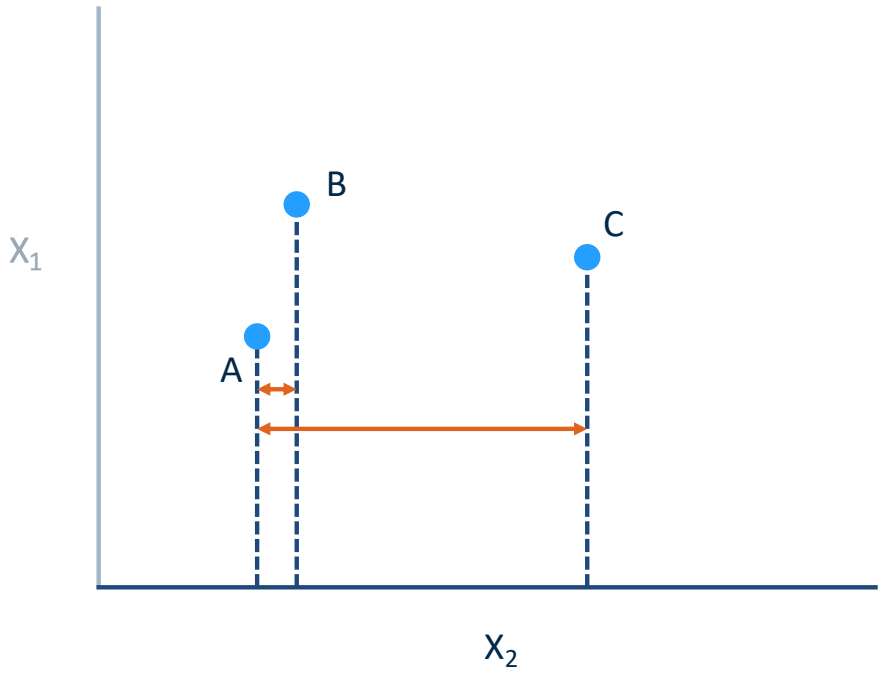
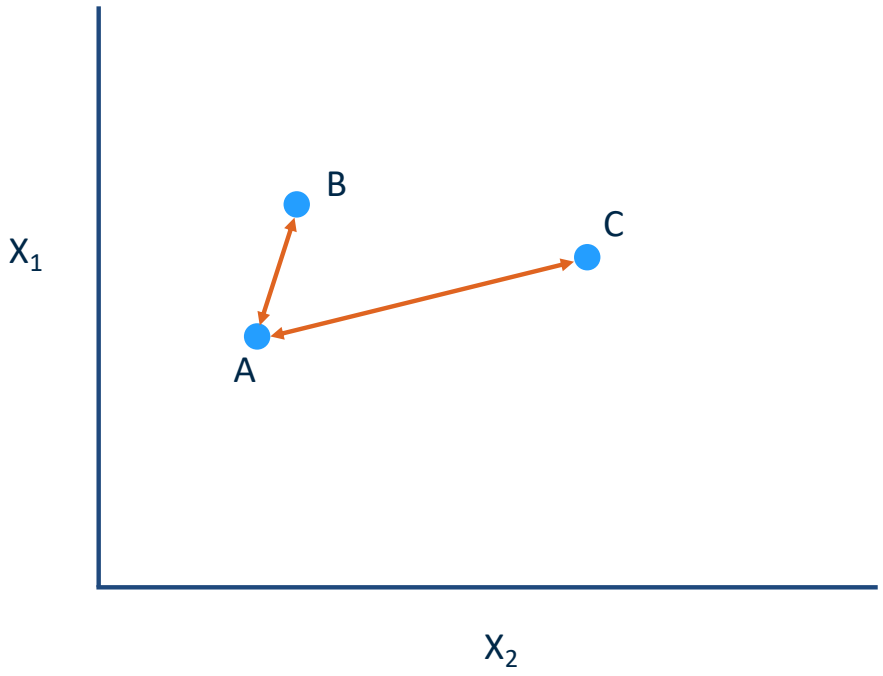


Clustering Observations

Distance – Euclidean Distance



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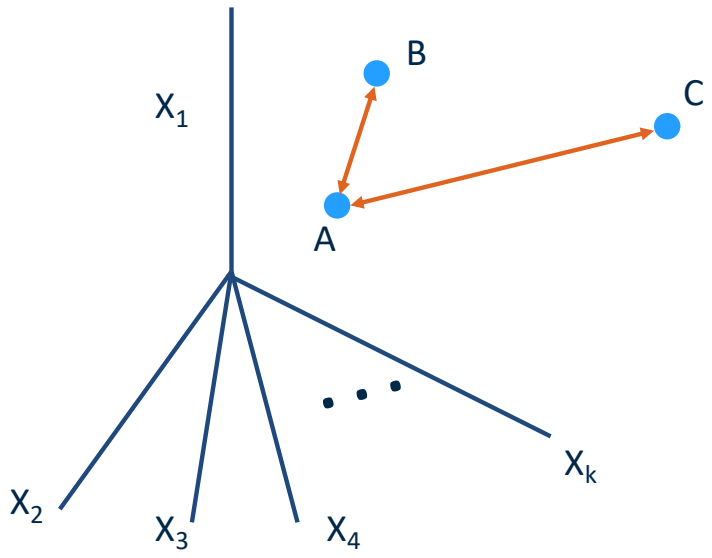

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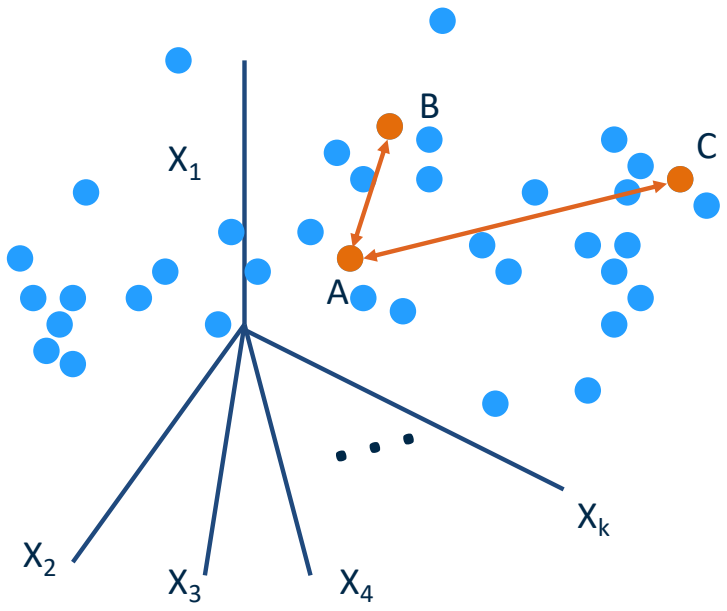

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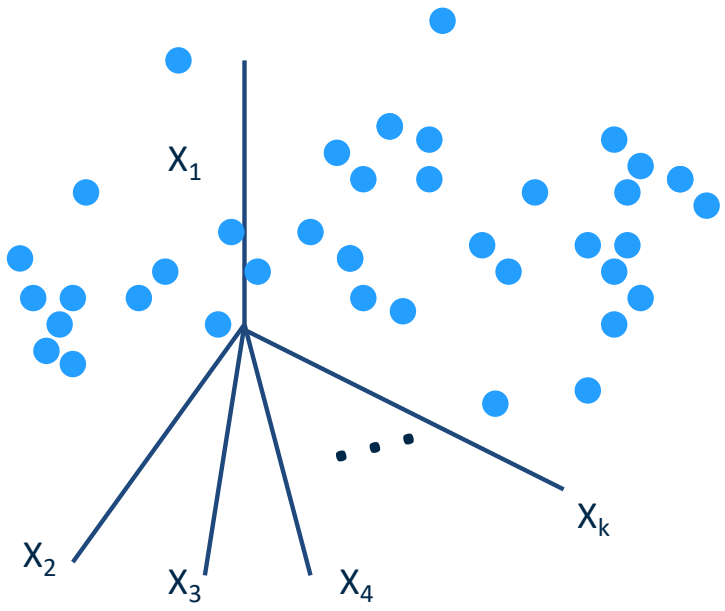

Clustering Observations

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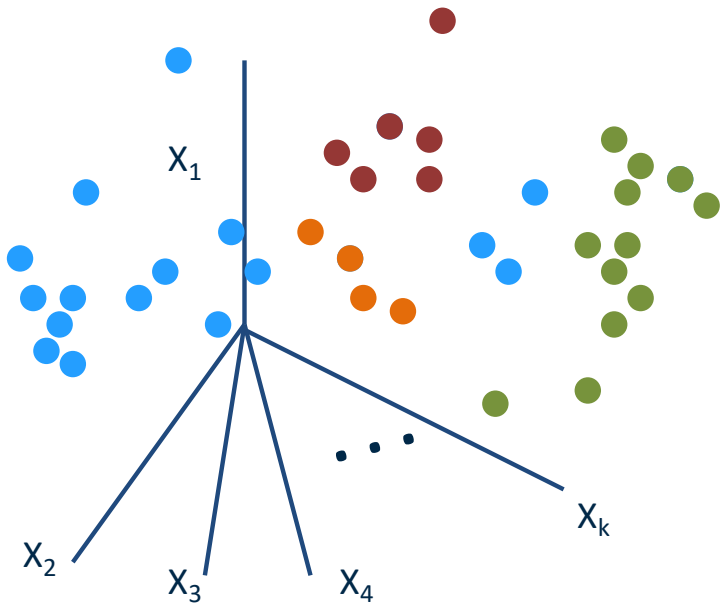
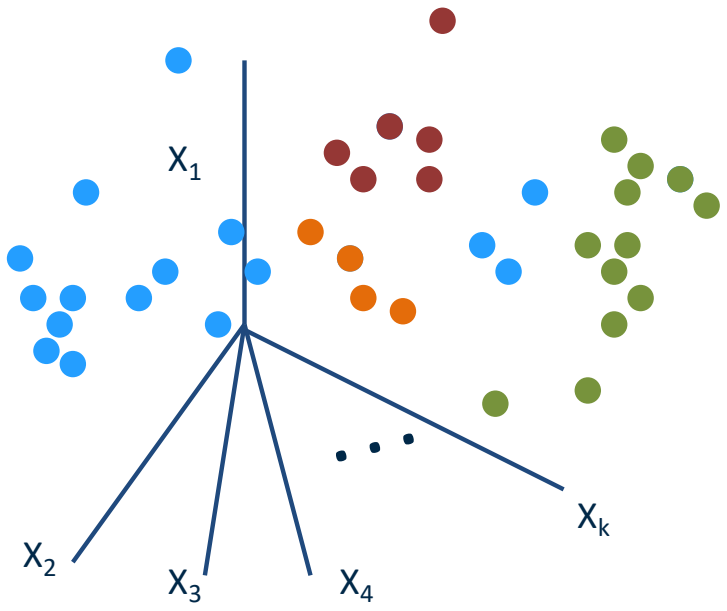


Clustering Observations

Distance, Linkage, and the formations of clusters



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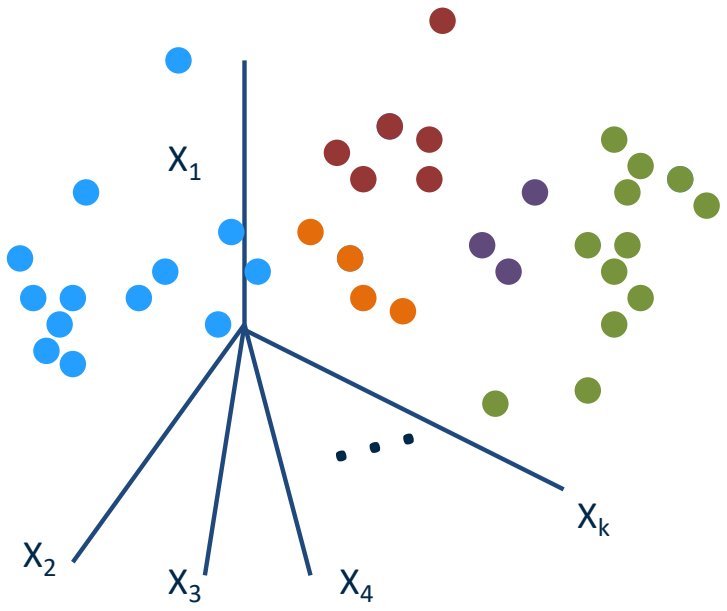

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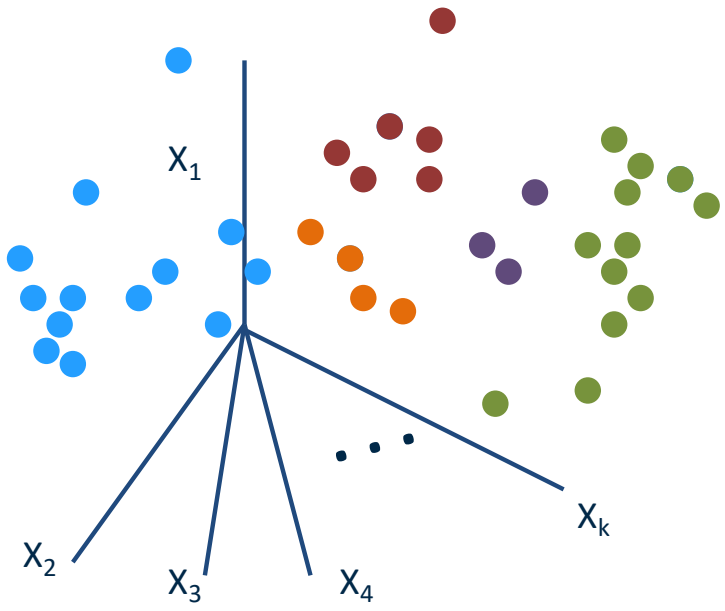
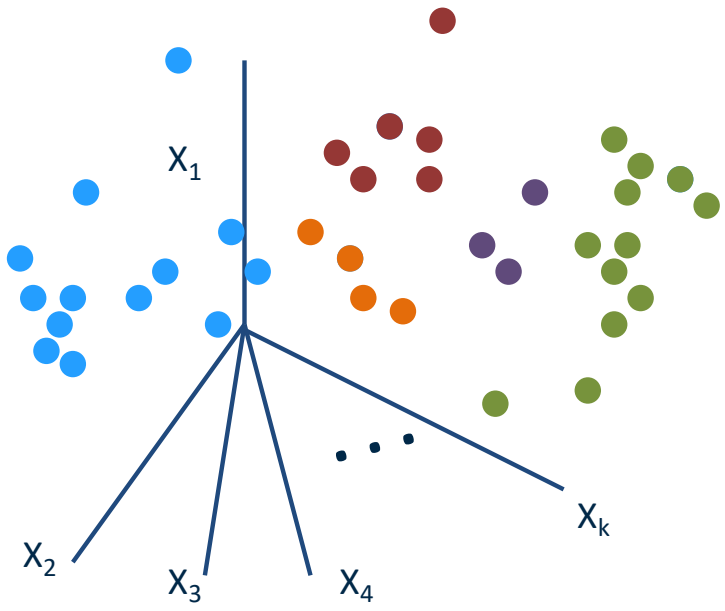


Clustering Observations

Different cluster solution based upon the choice of Distance, Linkage, and Method/Algorithm of forming the clusters



Clustering Observations

Methods / Algorithms

Clustering Observations

Methods / Algorithms

- Hierarchical clustering
- Partitioning methods

Hierarchical Clustering

Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Perform a Cluster Observations Analysis…

Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Perform a Cluster Observations Analysis…

- Hierarchical Clustering Algorithm

Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Perform a Cluster Observations Analysis…

- Hierarchical Clustering Algorithm
  1. Begins with all *n* observations in their own individual cluster

Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Perform a Cluster Observations Analysis…

- Hierarchical Clustering Algorithm
  1. Begins with all *n* observations in their own individual cluster
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Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Perform a Cluster Observations Analysis…

- Hierarchical Clustering Algorithm
  1. Begins with all *n* observations in their own individual cluster
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  3. At each subsequent steps in the algorithm, individual observations, or clusters of multiple observations are joined with other individuals or clusters based upon their closeness to each other

Hierarchical Clustering

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  3. At each subsequent steps in the algorithm, individual observations, or clusters of multiple observations are joined with other individuals or clusters based upon their closeness to each other
  4. Continues until all *n* observations are in one cluster

Test & Control Market Selection

Test & Control Market Selection

High-Net-Worth Retirees

High-Net-Worth Midlife

High-Net-Worth Young

Clustering Observations

EXAMPLE | Test & Control Market Selection

	A	B	C	D
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7	Denver	17%	40%	18%
8	Houston	11%	32%	10%
9	Los Angeles	9%	41%	14%
10	Miami	22%	37%	5%
11	Nashville	14%	33%	11%
12	New York	15%	28%	9%
13	Orlando	10%	37%	16%
14	Philadelphia	7%	28%	10%
15	Phoenix	12%	35%	9%
16	Portland	17%	52%	11%
17	Raleigh	20%	34%	6%
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Clustering Observations

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Clustering Observations

EXAMPLE | Test & Control Market Selection

Open the JMP File: Test and Control Market Selection

Clustering Observations

EXAMPLE | Test & Control Market Selection

Start by…

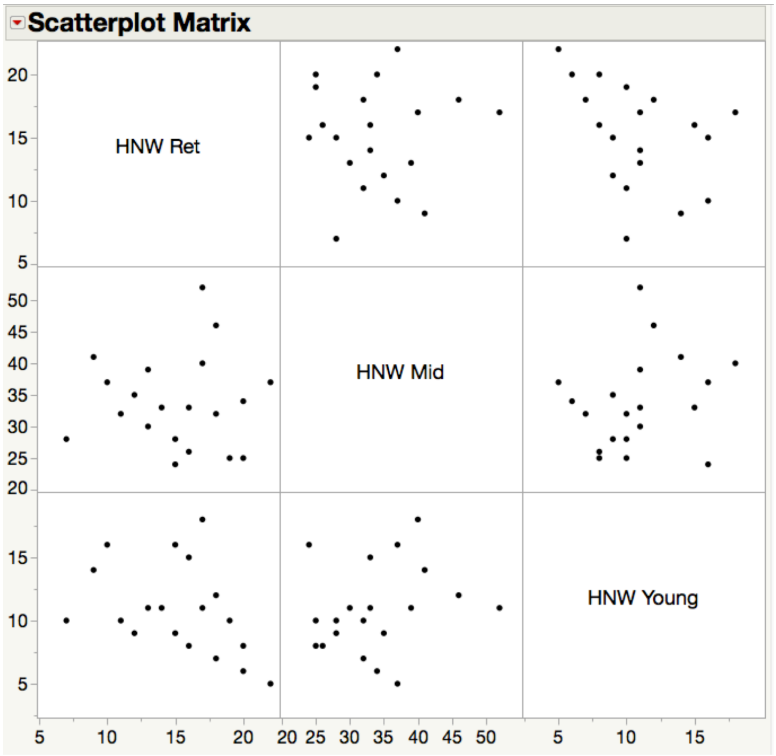
- Exploring the data graphically and numerically to examine the similarity and differences between the observations

Initial Analysis in JMP

Clustering Observations

Correlations

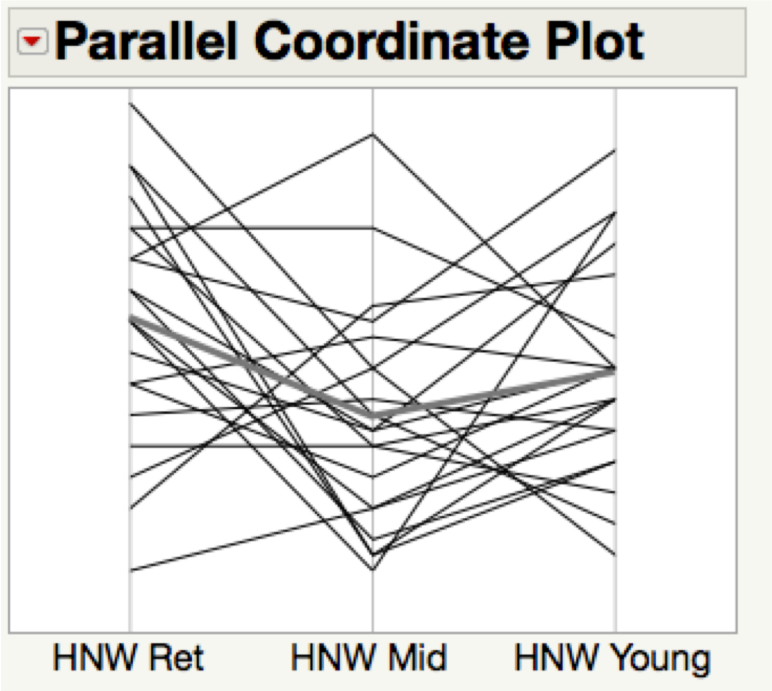
	HNW Ret	HNW Mid	HNW Young
HNW Ret	1.0000	0.0077	-0.3969
HNW Mid	0.0077	1.0000	0.2135
HNW Young	-0.3969	0.2135	1.0000



Clustering Observations

Univariate Simple Statistics

Column	N	DF	Mean	Std Dev	Sum	Minimum	Maximum
HNW Ret	20	19.00	15.1000	3.9855	302.000	7.0000	22.0000
HNW Mid	20	19.00	33.8500	7.3289	677.000	24.0000	52.0000
HNW Young	20	19.00	10.8500	3.4834	217.000	5.0000	18.0000



Clustering Observations

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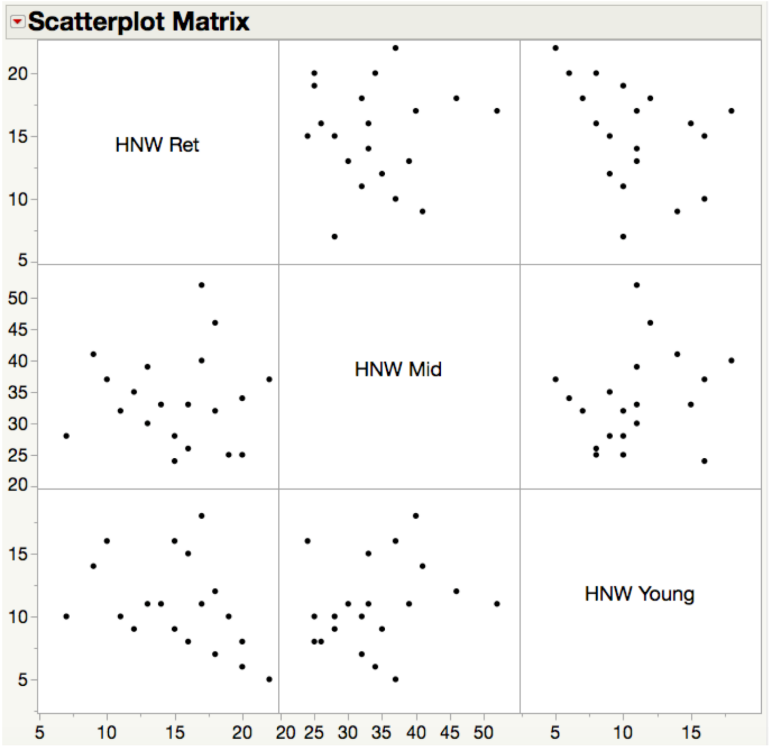

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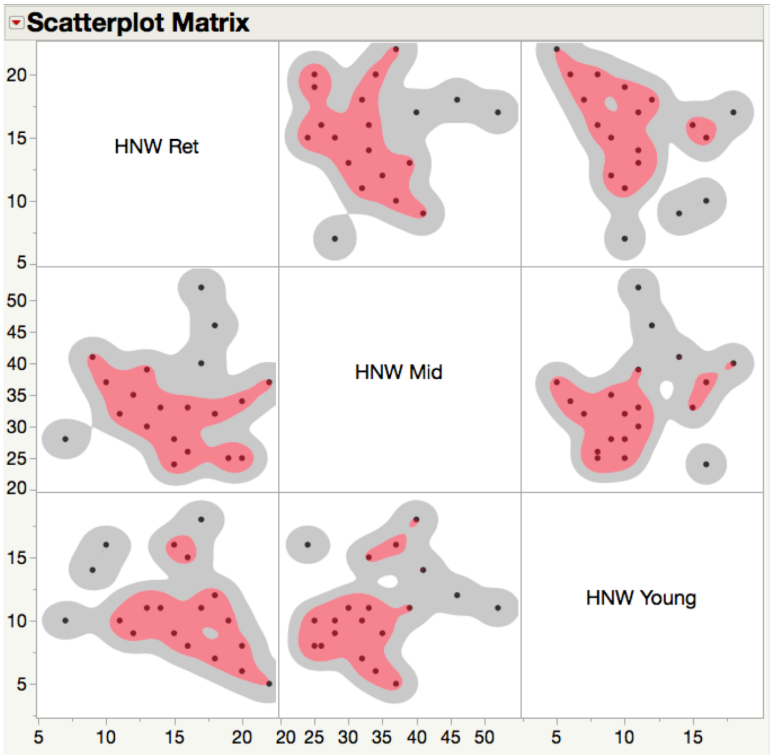

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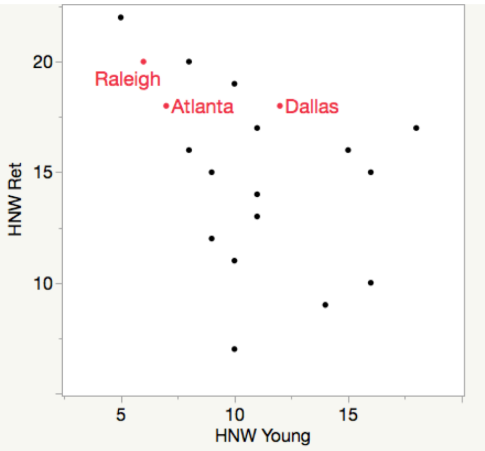

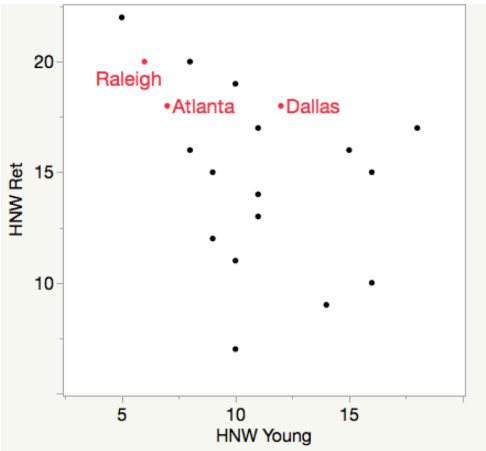

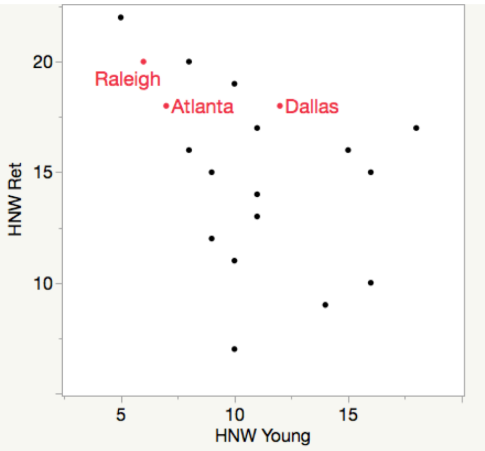

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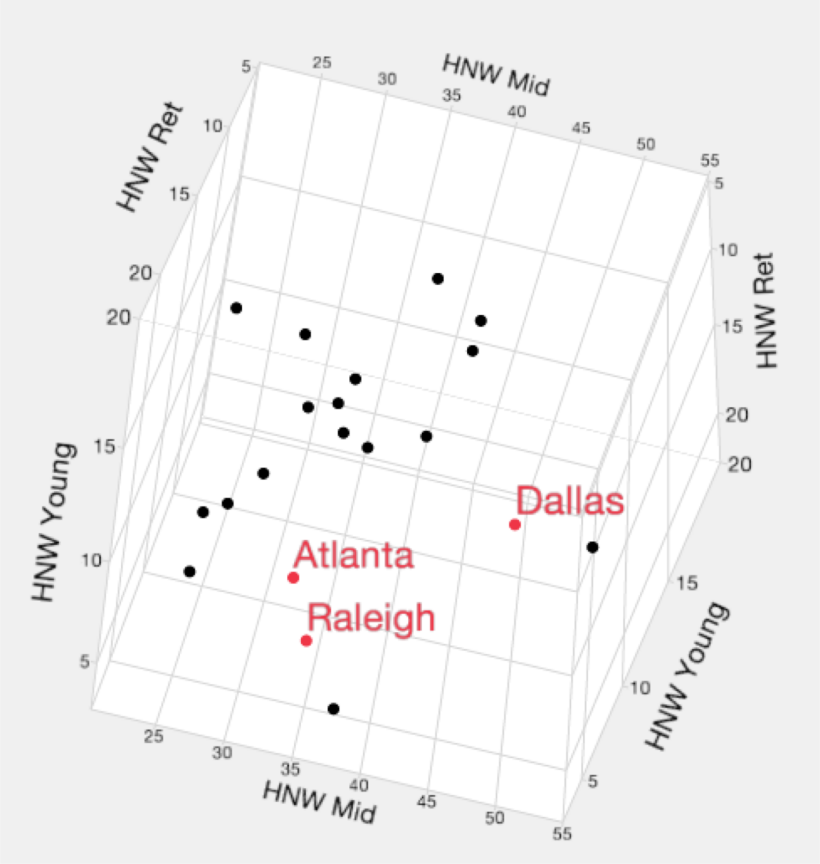

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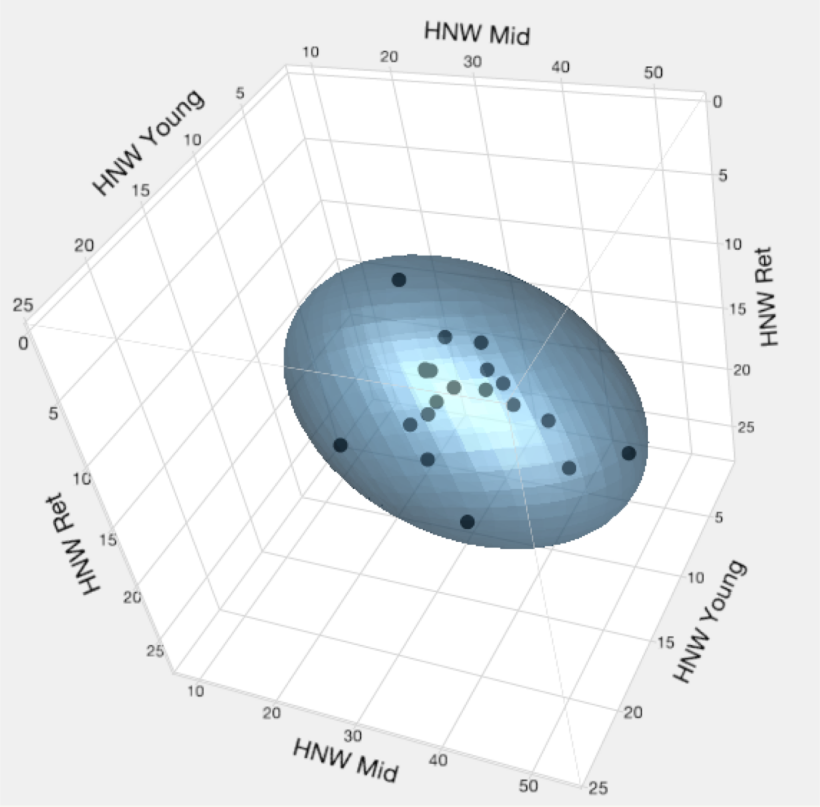

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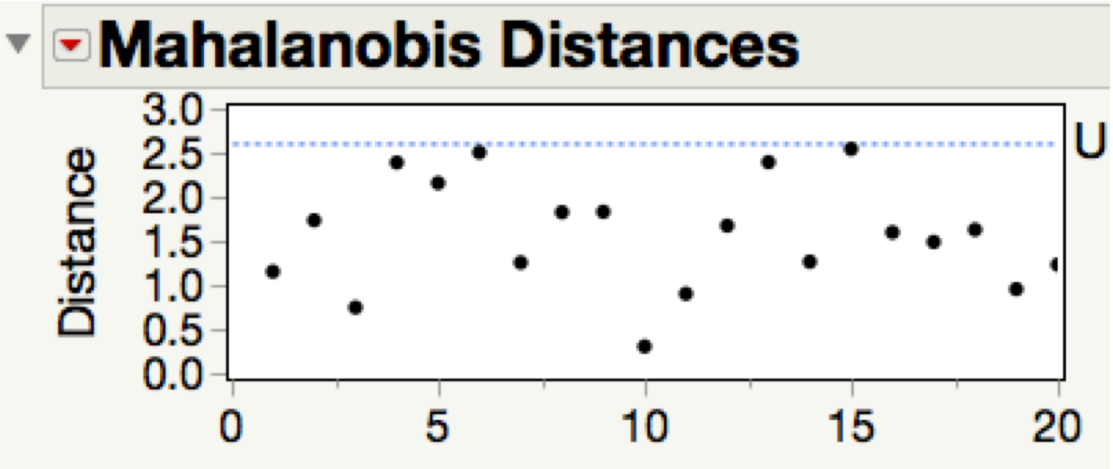
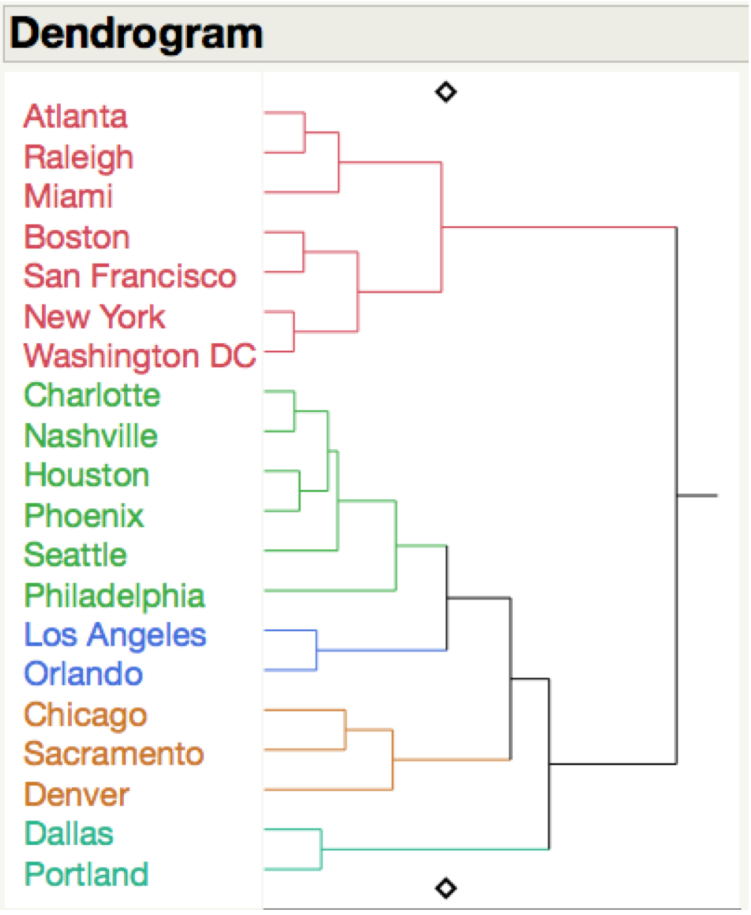
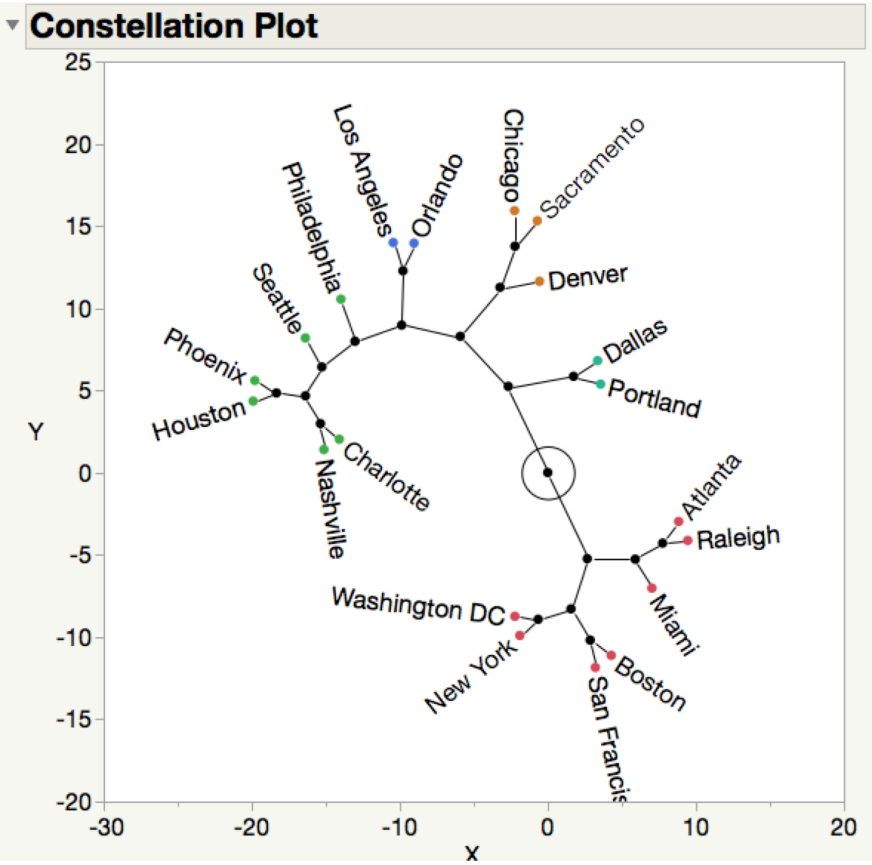


Hierarchical Cluster Observations Analysis in JMP

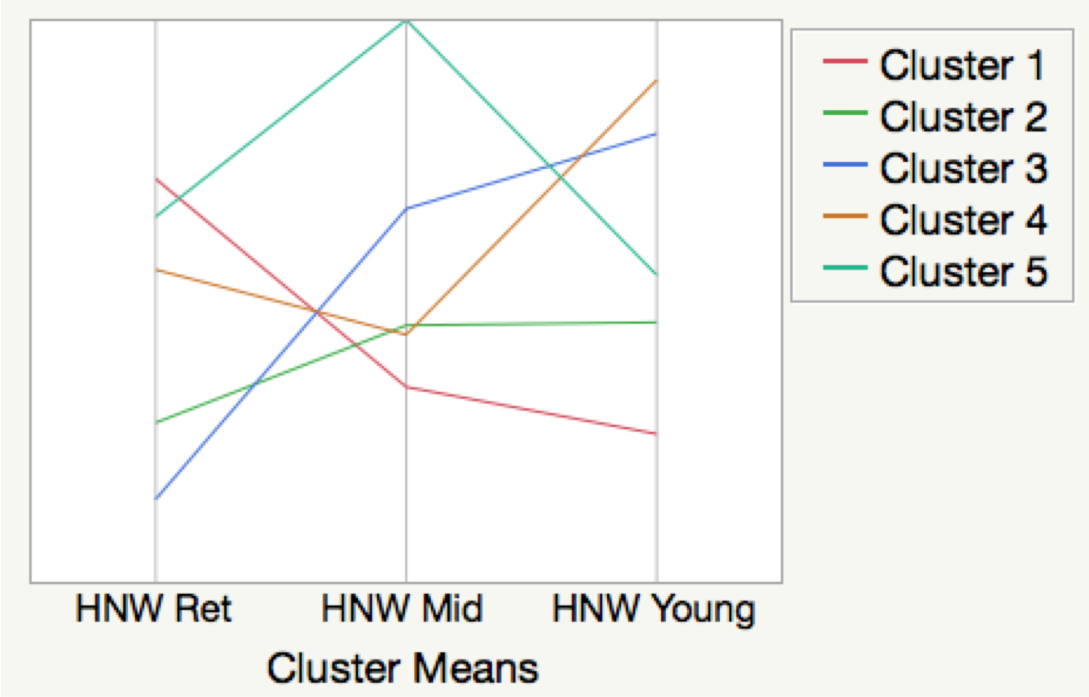
Hierarchical Clustering



Hierarchical Clustering



Hierarchical Clustering



Hierarchical Clustering

Hierarchical Clustering

Cluster Means

Cluster	Count	HNW Ret	HNW Mid	HNW Young
1	7	18.5714	29.5714	7.5714
2	6	11.6667	32.8333	10.3333
3	2	9.5000	39.0000	15.0000
4	3	16.0000	32.3333	16.3333
5	2	17.5000	49.0000	11.5000

Cluster Standard Deviations

Cluster	Count	HNW Ret	HNW Mid	HNW Young
1	7	2.43975	4.79086	1.71825
2	6	2.50333	3.86868	0.81650
3	2	0.70711	2.82843	1.41421
4	3	1.00000	8.02081	1.52753
5	2	0.70711	4.24264	0.70711

Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Based upon the Cluster Observations Analysis, what would you recommend as the cities to pair together for a Test and Control Market experiment?

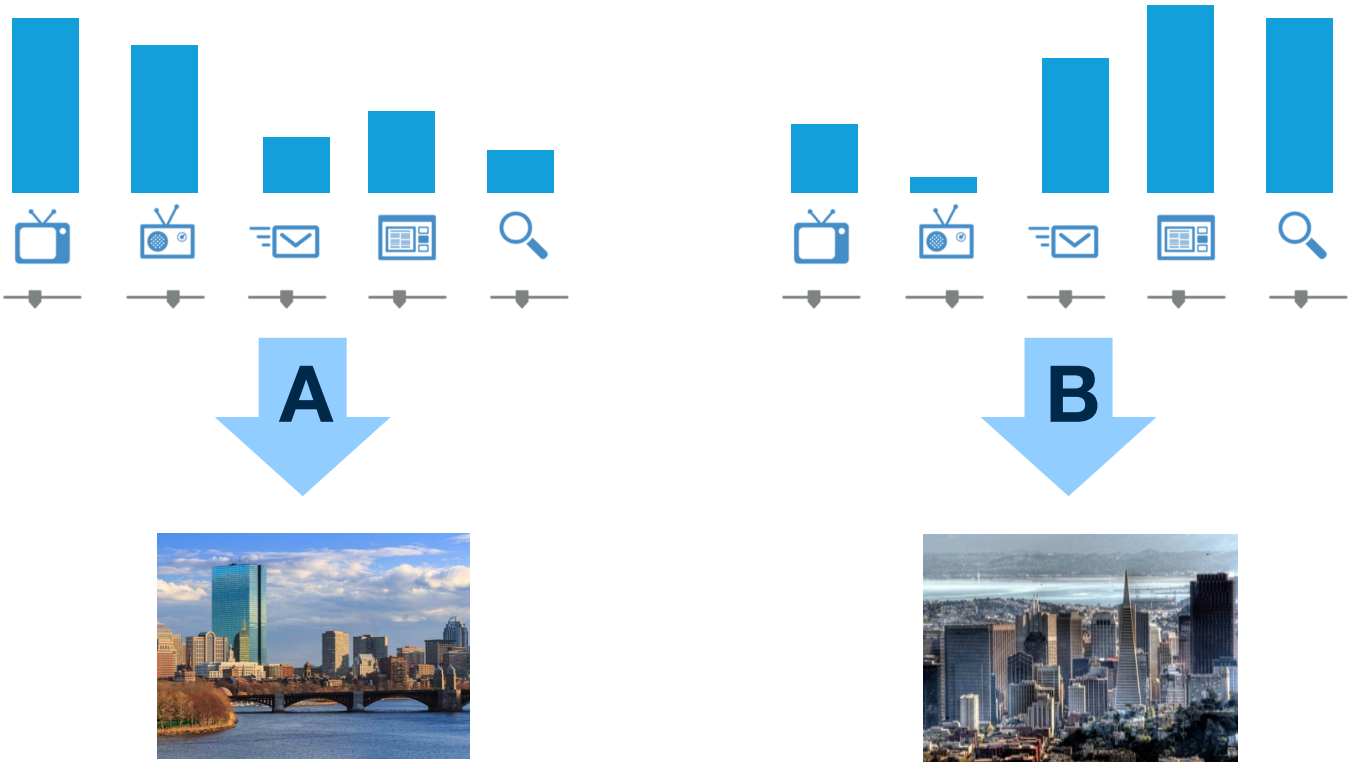
Hierarchical Clustering

EXAMPLE | Test & Control Market Selection

Candidate Market Pairs

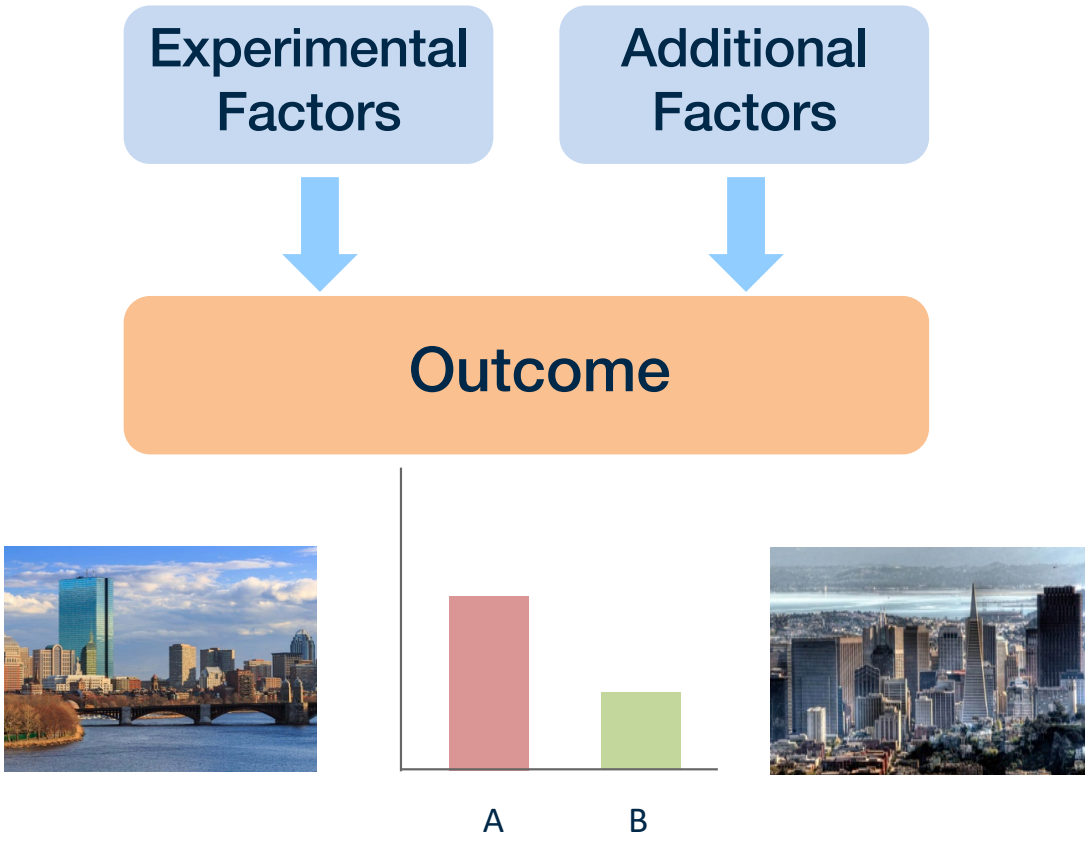
Atlanta and **Raleigh** (alternative **Miami**)
Boston and **San Francisco**
New York and **Washington DC**
Charlotte and **Nashville**
Houston and **Phoenix**
Los Angeles and **Orlando**
Chicago and **Sacramento**
Dallas and **Portland**

Marketing Experiments

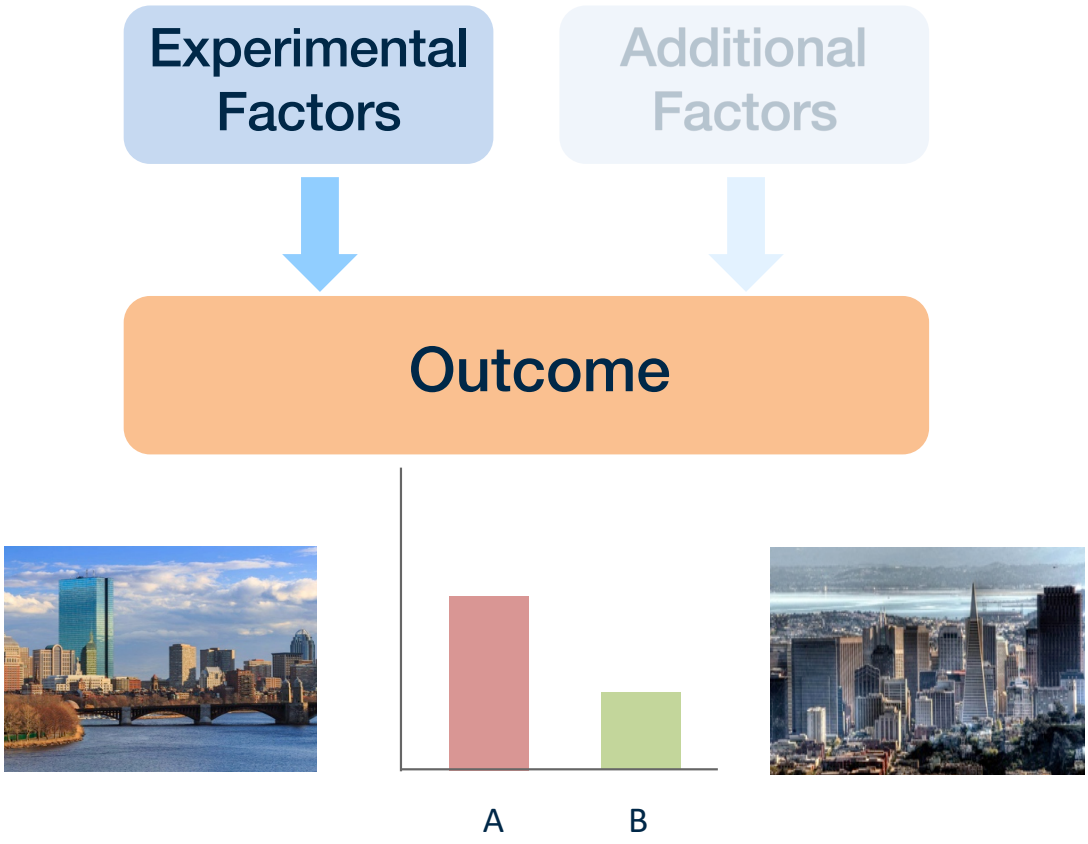


Marketing Experiments

Marketing Experiments



Marketing Experiments



Statistical Analysis + Models

Test & Control Market Selection Exercise

Clustering Observations

EXERCISE | Test & Control Market Selection

6 Additional variables were retrieved pertaining to the 20 Markets

FS Sent : The Sentiment that market has towards the Financial Services Industry

Brand Sent : The Sentiment that market has towards that particular companies brand

Growth Rate : The rate of growth that company is experiencing in that market

Branches : The Number of primary branches the company has in that market

Aff Branches : The number of affiliate branches the company has in that market

Mark Eff : Score of the effectiveness of the company's marketing efforts in that market

Perform a similar analysis as was done on just the 3 variables (HNW Ret, NHW Mid, and HNW Young) now including all 9 variables.

USING PRINCIPAL COMPONENT ANALYSIS IN THE VALIDATION OF A STUDENT ACADEMIC AND COMMUNITY RELATIONS INTENTIONS SCALE: RESPONSES OF THE HSTA PARTICIPANTS

Sherron McKendall, Health Sciences & Technology Academy, West Virginia University
Alan McKendall, Industrial & Management Systems Engineering, West Virginia University
Ann Chester, Health Sciences & Technology Academy, West Virginia University

ABSTRACT

The purpose of this paper is to perform Principal Component Analysis (PCA) on a subset of questions that are part of a logic model pertaining to the academic, career, and community relation goals of participants in an out-of-school-time (OST) program. The importance of accurately measuring such factors could allow OST programs to understand which programmatic components could improve student outcomes. A better understanding of best practices may be translatable to other OST programs as participants progress through and exit such programs. As such, longitudinal analyses of participants' intentions may provide greater insight into programmatic impact and effectiveness.

INTRODUCTION

The purpose of this paper is to perform Principal Component Analysis (PCA) to measure student intentions on pursuit of academic, career, and community relations goals as related to their participation in a health sciences/STEM academic enrichment program. For over 25 years, the Health Sciences and Technology Academy (HSTA) has provided academic and social support for African-American and other underrepresented students (i.e., financially disadvantaged, first generation to college, and rural students) in West Virginia **McKendall, et al [1]**. Since the program's inception, a primary goal was to "home grow" future health care providers who would remain, live and work in the rural areas of the state. In the past several years, HSTA's mission has expanded to include pursuance of science, technology, engineering, and mathematics (STEM) majors. Over the course of two decades, HSTA has graduated over 2,700 students with 99% attending college and 87% earning a four-year degree or higher.

HSTA leadership believes that providing academic and social support are key elements in helping students to persist through the educational pipeline. Between 2013 and 2014, HSTA formed a partnership with faculty in the School of Public Health to conduct a series of focus groups and interviews of HSTA community leaders and staff members. From this partnership, HSTA created a program logic model as well as designed several psychometric scales to collect longitudinal data and perform analyses on HSTA participants as they progress through the program. From this study, several key concepts were shown to impact participants' success with Intentions as a primary area.

METHODOLOGY

Study Context

As previously mentioned, this study is part of a larger quasi-experimental, non-randomized design conducted by HSTA and the West Virginia School of Public Health. During the fall of 2016, 2017 and 2018, HSTA disseminated surveys to all HSTA participants (N=1755) in WV HSTA counties. The self-developed scale presented below was part of a larger survey examining mediating variables as predictors of student success.

PROCEDURES

Data Screening

First, we screened the data for outliers in which respondents did not respond to all items within the scale and deleted those from the data set. The final sample size of 1,652 provided a ratio of 127 cases per variable **Neill [2]**.

Factor Analysis

We utilized SPSS 25 to perform the Principal Component Analysis (PCA) utilizing promax and direct oblimin rotations. Promax and direct oblimin are oblique rotations, which assumes that the factors are correlated **Brown [3].** The factorability of the 13 Intention items was examined using several conditions, which included correlations above .3 for the items, the Kaiser-Meyer-Olkin measure of sampling adequacy, the Bartlett's test of sphericity, and the communalities of .5 or above. During analyses, we suppressed small coefficients and indicated that absolute values should not fall below .3.

The results produced the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy**.** KMO determines how well the data is suited for factor analysis measuring sampling adequacy for each variable in the model as well as the complete model and returns a value between 0 and 1 **Costello and Osborne [4]; Spicer [5]; Matsunaga [6]; Beavers et al. [7]**. In other words, this test measures the proportion of variance among the variables that might be common. If the test returns a value between 0.8 and 1, and a p-value that is less than .05, we can reject the null hypothesis and continue to perform EFA on the data. Another important consideration was to examine the commonalities among the items. **Fabrigar and Wegener [8]** suggest that under optimal conditions, communalities of .70 or greater and having 3 to 5 measured variables is acceptable**.** Furthermore, communalities of .40 to .70 are considered moderately good along with sample a sample size of at least 200 **Fabrigar et al [9]**.

Descriptive Statistics: Measures and Variables

Traditional background and demographic data were collected in all surveys. Table 1 shows the frequency distributions for gender, race, school grade, parents' college attendance, and whether the students are eligible for free or reduced lunch in school (measure of socio-economic status).

Variables		Percent
Gender		
	Male	29.0
	Female	71.0
Race		
	Black	23.5
	Caucasian	60.6
	Other	13.8
Parents' College		35.3
Free or Reduced Lunch		69.7

Table 1. Demographic and background variables.

ANALYSIS AND RESULTS

The results of our study indicates that our data is more than adequate for performing EFA with all 13 item. The items were measured on a 5-point Likert-type scale (i.e., Not committed at all; A little committed; Committed a medium; Committed a lot; Completely committed). Table 2 provides the Intentions scale in which we will examine this latent variable through EFA.

Label	Item	Mean	SD
Intent-1	Successfully completing the HSTA program.	4.67	.641
Intent-2	Earning all A's and B's in my classes next school year.	4.61	.679
Intent-3	Earning high enough grades to be accepted into college.	4.68	.631
Intent-4	Preparing for my college entrance exams (SAT or ACT).	4.59	.706
Intent-5	Graduating from high school.	4.72	.625
Intent-6	Enrolling in college.	4.70	.654
Intent-7	Majoring in health sciences or a health science-related subject.	4.30	1.063
Intent-8	Attending medical, nursing, pharmacy, dental, or public health graduate or professional programs.	4.15	1.171
Intent-9	Having a career providing health services or as a health scientist.	4.09	1.206
Intent-10	Living in West Virginia after completing college.	3.48	1.389
Intent-11	Helping to improve my community as a high school student.	4.07	1.016
Intent-12	Helping to improve my community as a college student.	4.08	1.020
Intent-13	Helping to improve my community as a working adult.	4.17	.993

Table 2. Intentions scale and descriptive statistics.

Our sample size of 1,652 as well as the KMO measure of sampling adequacy indicated a ‘marvelous’ common variance for factor analysis (KMO=.906) which is higher than the .6 recommended value **Spicer [5].** Bartlett’s test of sphericity was also significant ($\chi 2$ (78) = 21621.800; p = 0.00) suggesting the correlation matrix was significantly different from the identity matrix and therefore factorable. The overall data screen points to a highly factorable correlation matrix. We are able to reject the null hypothesis that this is an identity matrix, which provides us with more indication that we can perform EFA on our data. As indicated below in Table 3, we have communalities of .540 or greater. In fact, the range level of communalities for the promax and direct oblimin rotations were identical, ranging from .540 to .902, which once again indicates that our data satisfies the condition of performing PCA.

	Initial	Direct Oblimin Extraction	Promax Extraction
Intent-1	1.000	.812	.812
Intent-2	1.000	.784	.784
Intent-3	1.000	.881	.881
Intent-4	1.000	.738	.738
Intent-5	1.000	.853	.853
Intent-6	1.000	.846	.846
Intent-7	1.000	.857	.857
Intent-8	1.000	.897	.897
Intent-9	1.000	.894	.894
Intent-10	1.000	.540	.540
Intent-11	1.000	.870	.870
Intent-12	1.000	.902	.902
Intent-13	1.000	.830	.830

Table 3. Communalities for Principal Component Analysis (PCA) extraction

The component matrix (Table 4) reveals that the items have relatively high loadings on (component 1), with the lowest at .374 (Living in West Virginia after completing college). In addition, many of the items cross-load on two or more components in either direction on both the direct oblimin and promax rotations. Intents 7, 8, and 9 all load in the positive direction above .30 on all three components. The most salient component comes from Intents 1 through 6 and 11 through 13, as they load with .821 to .700, indicating strong positive or upward sloping linear relationships between the items and component 1. Although Intents 7, 8, and 9 load at .696, .649 and .635, respectively, these items are still considered to have a strong positive relationship to component 1.

Intent-10 has the lowest factor loading on component 1. In addition, it is the only item that has a moderate positive linear relationship, with a loading of .560 on component 2. Along with Intent-10, Intents 7, 8, 9, 11, 12, and 13 have a positive correlation with component 2, but they are not as strong as with component 1 (i.e., .491 to .314). It also appears that as Intents 1 through 6 have good correlations on component 1 (i.e., 791 or above), and these same items show a weak to moderate negative linear relationship on the 2nd components (i.e., -.476 to -.328).

A final and important indicator that factor analysis is suitable for all 13 items is that the MSA for all items is greater than .5 (see Table 5, highlighted variances). The diagonals of the anti-image correlation matrix ranged from .807 to .966, further confirming that each item shared some common variance with other items **Neill [2]**. Given these overall indicators, factor analysis was deemed to be suitable with all 13 items.

The Scree Plot (Figure 1) shows that three components were extracted with an eigenvalue of 1.0 or higher. Component 1 with an eigenvalue of 6.90 contributes (53.10%) and is definitely important, but component 2 contributes 18.44% with an eigenvalue of 2.40. In totality, these components represent 71.5% of the cumulative variance. However, component 3 with an eigenvalue of 1.41 contributes 10.83%. Thus, the data shows that there are 3 components extracted at 82.347% cumulative variance.

	Direct Oblimin Rotation Factor			Promax Rotation Factor		
	Component 1	Component 2	Component 3	Component 1	Component 2	Component 3
Intent-1	.816	-.383	-.022	.816	-.383	
Intent-2	.807	-.362	-.049	.807	-.362	
Intent-3	.821	-.453	-.031	.821	-.453	
Intent-4	.792	-.328	-.059	.792	-.328	
Intent-5	.791	-.476	-.020	.791	-.476	
Intent-6	.820	-.414	.033	.820	-.414	
Intent-7	.696	.314	.524	.696	.314	.524
Intent-8	.649	.409	.555	.649	.409	.555
Intent-9	.635	.461	.528	.635	.461	.528
Intent-10	.374	.560	-.294	.374	.560	
Intent-11	.700	.491	-.373	.700	.491	-.373
Intent-12	.724	.467	-.400	.724	.467	-.400
Intent-13	.721	.396	-.391	.721	.396	-.391

Table 4. Component matrix for Principal Component Analysis (PCA) extraction

Anti-correlation matrix	Intent-1	Intent-2	Intent-3	Intent-4	Intent-5	Intent-6	Intent-7	Intent-8	Intent-9	Intent-10	Intent-11	Intent-12	Intent-13
Intent-1	.964[a]	-0.12	-0.222	-0.074	-0.239	-0.132	-0.041	0.013	-0.016	0.022	-0.05	-0.008	0.004
Intent-2	-0.12	.942[a]	-0.348	-0.283	-0.004	-0.034	-0.085	0.025	0.024	0.038	-0.077	0.046	-0.056
Intent-3	-0.222	-0.348	.927[a]	-0.141	-0.311	-0.183	-0.001	-0.031	0.049	-0.04	0.014	0.037	-0.041
Intent-4	-0.074	-0.283	-0.141	.966[a]	-0.053	-0.13	0.032	-0.004	-0.039	-0.019	-0.042	-0.021	0.011
Intent-5	-0.239	-0.004	-0.311	-0.053	.917[a]	-0.438	0.022	0.035	-0.009	-0.023	0.032	-0.004	0.005
Intent-6	-0.132	-0.034	-0.183	-0.13	-0.438	.932[a]	-0.088	-0.059	0.031	0.133	0.063	-0.072	-0.024
Intent-7	-0.041	-0.085	-0.001	0.032	0.022	-0.088	.916[a]	-0.363	-0.348	0.011	-0.023	0.04	-0.052
Intent-8	0.013	0.025	-0.031	-0.004	0.035	-0.059	-0.363	.855[a]	-0.571	-0.031	0	-0.032	0.034
Intent-9	-0.016	0.024	0.049	-0.039	-0.009	0.031	-0.348	-0.571	.855[a]	-0.059	-0.048	-0.015	-0.004
Intent-10	0.022	0.038	-0.04	-0.019	-0.023	0.133	0.011	-0.031	-0.059	.940[a]	-0.193	-0.027	-0.077
Intent-11	-0.05	-0.077	0.014	-0.042	0.032	0.063	-0.023	0	-0.048	-0.193	.865[a]	-0.664	0.014
Intent-12	-0.008	0.046	0.037	-0.021	-0.004	-0.072	0.04	-0.032	-0.015	-0.027	-0.664	.807[a]	-0.599
Intent-13	0.004	-0.056	-0.041	0.011	0.005	-0.024	-0.052	0.034	-0.004	-0.077	0.014	-0.599	.896[a]

Table 5. Anti-image correlation matrix and measures of sampling adequacy (MSA).

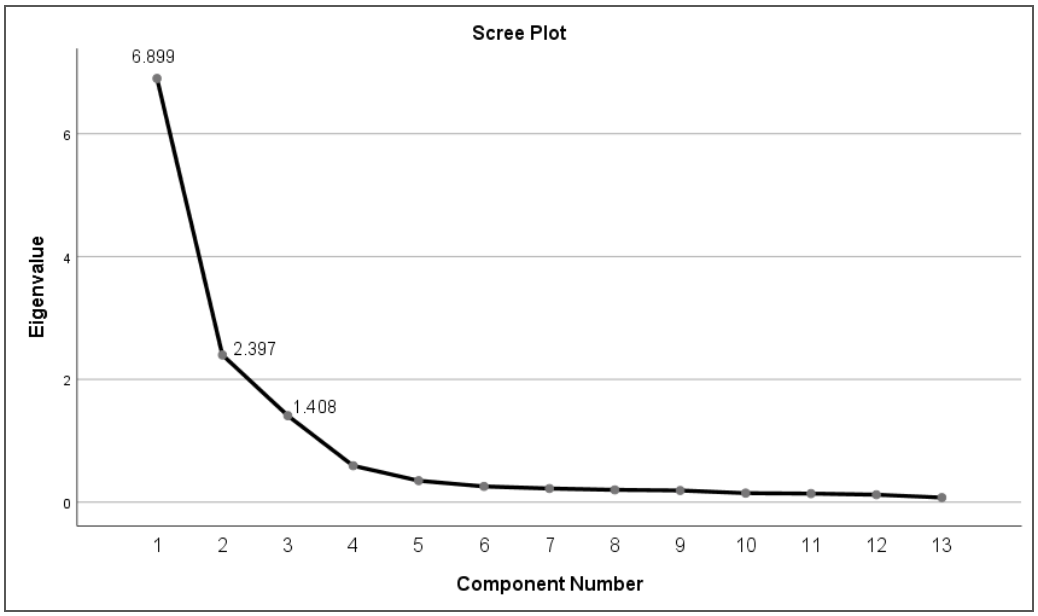


Figure 1. Scree Plot of Eigenvalue for the 3 extracted components.

The data indicates three primary components on which the 13 items load. Based on the grouping of the intents, the following components emerged: Education Intent, Community Intent, and Work/Health Science Intent. As shown in Table 6, both the direct oblimin and promax rotations produced identical item to component groupings, which are as follows: Intent-1 – Intent-6; Intent-7 – Intent-9; and Intent-10 – Intent-13.

	Direct Oblimin Rotation Factor			Promax Rotation Factor		
	Education Intent	Community Intent	Work/Health Sci. Intent	Education Intent	Community Intent	Work/Health Sci. Intent
Intent-1	.879			.890		
Intent-2	.859			.868		
Intent-3	.946			.961		
Intent-4	.821			.828		
Intent-5	.944			.961		
Intent-6	.902			.917		
Intent-7			.891			.888
Intent-8			.954			.952
Intent-9			.945			.943
Intent-10		.756			.781	
Intent-11		.885			.906	
Intent-12		.900			.921	
Intent-13		.844			.862	

Note: Assumes factors are not independent and are correlated. Both rotations were performed with Kaiser Normalization.

Table 6. Pattern matrix for direct oblimin and promax rotations.

CONCLUSIONS

In this paper, we performed principal component analysis (PCA) on a set of items designed to determine the intentions of students who participated in the Health Sciences and Technology Academy (HSTA) program. The pre-analyses process revealed that our data more than adequately satisfied the assumptions for performing PCA. Principal component analysis (PCA) in conjunction with the direct oblimin and promax rotation methods produced 3 primary components, Education Intent, Community Intent and Work/Health Science Intent, from the 13-item scale on student intentions. From this analysis, we believe that we have a viable scale to examine the academic, work and community intentions of participants in an out-of-school- time/STEM enrichment program.

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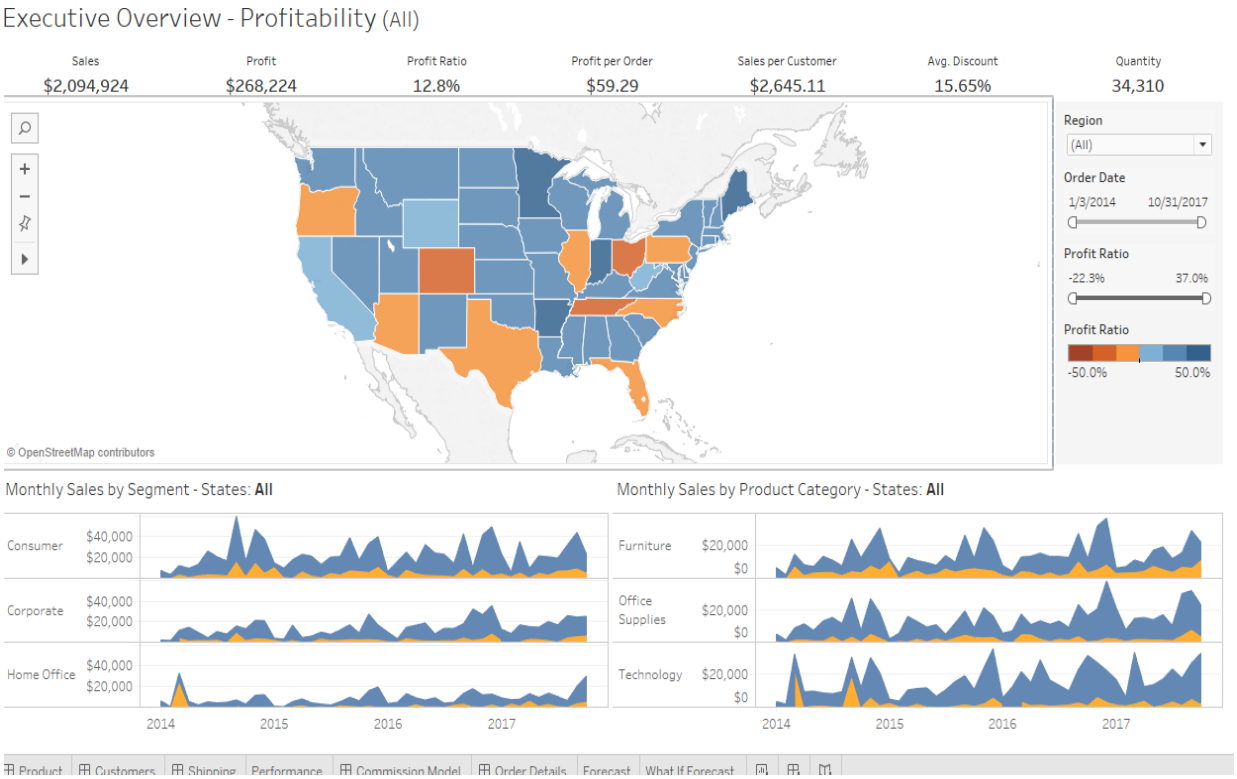
Visual Business Analytics Course: Learning From Experience

Advances in technology making it possible to create visual model with little or no effort. This is good news for managers who can visualize impact of their policies in real time and perform multiple analysis. Visualization is becoming an important tool for exploring data. Though many data analytics techniques exist for data exploration, only recently visualization has become feasible. It combines visuals and analytics for analyzing data. Simple visual tools can, even be used by senior executives to explore sensitive data themselves.

Visualization consists of several parts, however, two parts are dominant: Exploration and Explanation. First part deals with data analysis and second part with story building. Once data is analyzed, it need to be told in simple terms. Visualization is creating tremendous opportunities and challenges for professors. Opportunities because it is an emerging field challenges because it requires multiple functional backgrounds. However not all is lost. Software like SAS, JMP, KNIME and Tableau are making visualization a reality. It is important for business students not only to create visuals but be able to analyze them. We have developed a course which is be data-driven with visualization. This paper presents our experiences with such a course and discusses what worked and what did not work. We will also discuss how this course may evolve in future. Instructors planning to offer such a course can learn from our experiences.

An example of visualization

Source: Tableau.com



The new course is still evolving and a final version will contain actual topics and resources. We will discuss our experiences with developing and conducting the course. In addition, we will discuss student learning as measured from their comments.

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WITH A VIEW TOWARD MAXIMIZING LEARNING OUTCOME BENEFITS, DO THE DIFFERENCES IN LEARNING THEORIES (ANDRAGOGY VS. PEDAGOGY) HAVE SIGNIFICANT IMPLICATIONS FOR THE INSTRUCTIONAL DESIGN OF ADVANCED UNDERGRADUATE BUSINESS COURSES?

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ABSTRACT

The primary purpose of this article is to demonstrate that the differences in learning theories (Andragogy vs. Pedagogy) have meaningful implications for the instructional design of advanced, sequential, undergraduate business courses. Specifically, this article argues that if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy (Knowles 1984) into the instructional design of advanced undergraduate business courses, especially advanced, sequential, undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased. It is in this regard that the instant article has extensive public interest for educators and instructional designers of undergraduate business courses.

Accordingly, the two primary objectives of this article are:

(1) **To identify** the differences between Andragogy and Pedagogy as learning theories, specifically focusing on (A) the assumptions made of adult learners vs. child learners and (B) the principles of Andragogy vs. the principles of Pedagogy, and
(2) **To argue** that the differences in learning theories (Andragogy vs. Pedagogy) have meaningful implications for the instructional design of advanced, sequential, undergraduate business courses. Specifically, if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy (Knowles 1984) into the instructional design of advanced, undergraduate business courses, especially advanced, sequential, undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased.

This article postulates that if these objectives are met, educators of advanced undergraduate business courses will be motivated to experiment with the instructional design of said courses. In this regard, the instant article has significant public interest, not only for business undergraduate educators and instructional designers, but educators and instructional designers in general.

This article accomplishes its primary purpose and objectives in a stepwise fashion as follows.

- In Part I, the differences between Andragogy and Pedagogy, as learning theories, are identified, specifically focusing on (A) the assumptions made of adult learners vs. child learners and (B) the principles of Andragogy vs. the principles of Pedagogy.
- In Part II, this article argues that if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy

(Knowles 1984) into the instructional design of advanced undergraduate business courses, especially advanced sequential undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased.

- In Part III, future empirical research that tests the current hypothesis is discussed.

I.
DIFFERENCES BETWEEN LEARNING THEORIES (ANDRAGOGY VS. PEDAGOGY)

A.
In General

Andragogy regards learning methodologies, strategies and processes that focus on efficient and effective adult-learning. (Knowles 1984). In contrast, Pedagogy regards learning methodologies, strategies and processes that focus on efficient and effective child-learning. Accordingly, differences between Andragogy and Pedagogy presume that adult learners are different from child learners.

B.
Knowles' Five Assumptions of Adult Learners vs. Child Learners (esthermsmth 2017)

"Knowles theory of andragogy [Knowles 1984] identified five assumptions that teachers should make about adult learners.

1. *Self-Concept* – Because adults are at a mature developmental stage, they have a more secure self-concept than children. This allows them to take part in directing their own learning.
2. *Past Learning Experience* – Adults have a vast array of experiences to draw on as they learn, as opposed to children who are in the process of gaining new experiences.
3. *Readiness to Learn* – Many adults have reached a point in which they see the value of education and are ready to be serious about and focused on learning.
4. *Practical Reasons to Learn* – Adults are looking for practical, problem-centered approaches to learning. Many adults return to continuing education for specific practical reasons, such as entering a new field.
5. *Driven by Internal Motivation* – While many children are driven by external motivators – such as punishment if they get bad grades or rewards if they get good grades – adults are more internally motivated."

1. Self-Concept.

The adult learner has a developed mental image of himself/herself – a personal identity – established in terms of a set of understandings, opinions about said understandings, and attitudes formed from said opinions. Furthermore, the adult learner has matured in such a manner as to enable said learner to be a self-sufficient participant in his/her learning experiences, wherein the adult learner is in complete control of (and is responsible for) his/her learning outcomes. As a result, the adult learner is driven to self-direct his/her learning experiences, i.e., the adult learner has an understanding about what learning outcomes need to be achieved and how to evaluate his/her success in achieving those outcomes. Within this context, the "teacher" acts as a

facilitator who supports the adult learner through this flexible type of learning experience by providing the tools and resources needed for the adult learner to achieve the established learning outcomes.

In contrast, the child learner does not have a developed mental image of himself/herself – a personal identity. As a result, the child learner is incapable of being a self-sufficient participant in his/her learning experiences. Instead, the child learner is dependent upon the teacher to establish predetermined learning outcomes and guide the child learner through the learning experience toward achieving those outcomes. It is the teacher who knows what learning outcomes need to be achieved and how to evaluate the child learner's success in achieving those outcomes. It is the teacher who is responsible for the predetermined content and instructional design of this type of fixed learning experience.

2. Past Learning Experience.

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. This developed mental image is shaped from an assortment of prior learning experiences that provide the adult learner with an advanced experience level, comprised of a specific knowledge base and skill set, across a wide range of fields of study. Such an array of advanced experience levels across a wide range of subjects is also the primary resource upon which the adult learner relies in self-directing future learning experiences. Within such a future learning experience, related to a particular specialty, the adult learner acquires new information and builds upon his/her existing knowledge base and skill set to achieve the desired learning outcomes. However, given that a learning experience related to a particular specialty will not achieve the same learning outcomes across all adult learners, any group of adult learners will necessarily have a diverse set of advanced experience levels, resulting in differing knowledge bases and skill sets across members of the adult group. This dynamic must be considered by the educator in formulating an instructional design for a series of learning experiences within which a group of adult learners will participate.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. The child learner lacks an assortment of prior learning experiences that would have provided him/her with an advanced experience level across a wide range of fields of study. Accordingly, across a wide range of subjects, the child learner lacks a developed knowledge base and skill set, which otherwise would have served as a learning resource. Instead, for the child learner, learning outcomes of a learning experience only impart to the child learner a basic knowledge base and skill set with regard to a particular field of study.

3. Readiness to Learn.

As the mental image of the adult learner develops, the adult learner recognizes that there is a substantial personal benefit to each learning outcome of a learning experience. Based on such recognition, the adult learner is driven to become a self-sufficient participant in a variety of learning experiences yielding a multitude of learning outcome benefits across a wide range of fields of study. As a self-sufficient participant in a variety of learning experiences, the adult learner is engaged and resolute, while achieving the learning outcomes with their intended benefits.

In contrast, the child learner does not have a developed mental image of himself/herself – a personal identity - because the child learner lacks an assortment of prior learning experiences. Moreover, the child learner is unaware that a substantial personal benefit accrues to each

learning outcome of a learning experience. Instead, the child learner, as a passive participant in the learning experience, accepts the teacher's predetermined learning outcomes with their intended benefits. Within this context, the intended benefit of a learning outcome imparted to the child learner may be characterized as information content, which is subject-focused, where the learning experience is modular and sequential, fixed by the teacher who is responsible for imparting such information content.

4. Practical Reasons to Learn.

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. As such, before the adult learner actively engages in (and takes ownership of) the learning experience, the adult learner must understand the dynamics of the learning experience that support achieving the learning outcomes, i.e., the when, where and how. More importantly, however, is the why, i.e., why must the adult learner be actively engaged in this learning experience, because adult learners are most often focused on real-world, practical and relevant learning experiences. As such, most learning experiences of the adult learner have learning outcomes that involve solving problems and resolving issues that relate to the contemporaneous personal and professional life of the adult learner. Such learning outcomes characteristically deepen an adult learner's knowledge base (information content) and improve an adult learner's competency in applying certain skills.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. As a result, the child learner is incapable of being a self-sufficient participant in his/her learning experiences. Furthermore, the child learner does not internally recognize that a substantial personal or professional benefit accrues to the learning outcomes of a learning experience. The child learner, instead, as a passive participant in the learning experience, is dependent upon the teacher (a) to establish predetermined learning outcomes with their intended benefits and (b) to guide the child learner toward achieving those learning outcomes by predetermining the content and instructional design of this fixed type of learning experience. Within this context, the child learner passively accepts the teacher's predetermined learning outcomes with their intended benefits.

5. Driven by Internal Motivation.

To become actively engaged in a learning experience, the adult learner must be internally motivated. As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. As such, the adult learner has matured in such a manner as to enable said learner to be a self-sufficient participant in his/her learning experiences, wherein the adult learner has an understanding about what learning outcomes, with their intended benefits, need to be achieved. Accordingly, the adult learner is motivated to self-direct his/her learning experiences toward achieving those learning outcomes whose intended benefits are perceived by the adult learner to be intrinsically needed. Such intrinsic motivators include personal motivators, financial motivators, and professional motivators. Personal motivators include increasing one's self-esteem by increasing one's self-confidence, self-worth, self-image, self-respect or self-assurance. Financial motivators include a yearning for an improved quality of life. Professional motivators include professional development, promotion or recognition.

In contrast, to become engaged in a learning experience, the child learner must be externally motivated, rather than internally motivated. As stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. As such, the child

learner has not matured to enable said learner to be a self-sufficient participant in his/her learning experiences. The child learner does not have sufficient understanding about what learning outcomes, with their intended benefits, need to be achieved. Accordingly, the child learner is not internally motivated to self-direct his/her learning experiences toward achieving such learning outcomes. Instead, based upon the strength of extrinsic motivators, the child learner passively accepts the teacher's predetermined learning outcomes, with their intended benefits. Such extrinsic motivators include reward motivators such as points, good grades or similar rewards.

C.
Knowles' Four Principles of Andragogy (esthermsmth 2017) vs. Pedagogy

"Based on [the above] assumptions about adult learners, Knowles discussed four principles that educators should consider when teaching adults.

1. Since adults are self-directed, they should have a say in the content and process of their learning.
2. Because adults have so much experience to draw from, their learning should focus on adding to what they have already learned in the past.
3. Since adults are looking for practical learning, content should focus on issues related to their work or personal life.
4. Additionally, learning should be centered on solving problems instead of memorizing content.

1. Because adult learners are motivated to self-direct their learning experiences, they should participate in the instructional design of their learning experiences.

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. Furthermore, the adult learner has matured in such a manner as to enable said learner to be a self-sufficient participant in his/her learning experiences. Within each of these learning experiences, the adult learner is in complete control of (and is responsible for) his/her learning outcomes. Moreover, the adult learner has an understanding about what learning outcomes need to be achieved and how to evaluate his/her success in achieving those outcomes, with their intended benefits. Within this context, to maximize the learning outcome benefits to the adult learner, the adult learner must not only become an active participant in the learning experience, the adult learner must also have a sense of ownership in the learning methodologies, strategies and other processes that are applied in the learning experience. With such a sense of ownership, the adult learner actually becomes an integral part of the learning experience.

The adult learner develops a sense of ownership in the learning methodologies, strategies and other processes that are applied in the learning experience if the adult learner participates in the instructional design of his/her learning experiences. In one paradigm, the adult learner participates in the instructional design of his/her learning experiences to the extent that the adult learner participates in the decision-making process that (a) identifies the learning outcomes, with their intended benefits, (b) establishes the information content needed to be imparted, (c) chooses the learning materials to impart such information content, (d) develops the activities within which the adult learner will be actively engaged to achieve the learning outcomes, and (e) formulates the criteria used to evaluate the success of the adult learner in achieving those learning outcomes.

In a second paradigm, the adult learner participates in the instructional design of his/her learning experiences to the extent that the learning experience provides activities within which the adult learner with a high degree of autonomy in applying the learning methodologies, strategies and other processes to achieve the learning outcomes, with their intended benefits. Within the dynamics this paradigm, the process of acquiring an advanced experience level relative to a particular field of study is flexible, rather than fixed. In this case, the adult learner more efficiently and effectively acquires an advanced knowledge base and skill set, relative to a particular field of study, if the adult learner(s) is (are) somewhat isolated, while being actively engaged in the activities of the learning experience. In other words, the adult learner acquires a heightened knowledge base and skill set relative to a particular field of study to the extent that the adult learner independently works through the activities of the learning experience. Within this context, obstacles will be met, mistakes will be made. However, the adult learner more efficiently and effectively advances his/her knowledge base and skill set by overcoming those obstacles and learning from his/her mistakes in this heuristic, trial and error approach to problem-solving. Examples of specific activities provided within such a learning experience may include self-study modules, group study, and group projects involving simulations or actual fact-based scenarios. These activities require only slight oversight by the facilitator. However, the facilitator must be available for support to address complicating impediments to the achievement of the learning outcomes by the adult learners. With respect to group study and group projects, such activities are collaborative in nature and require the adult learner to heighten not only his/her knowledge base and skill set, but also the knowledge base and skill set of other members of the group.

Finally, the adult learner participates in the instructional design of his/her learning experiences to the extent that each of those learning experiences allows assessment by the adult learner of the learning experience, including the learning outcomes with their intended benefits, which is then fed back to the facilitator of the learning experience for appropriate consideration and change.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. As a result, the child learner is incapable of being a self-sufficient participant in his/her learning experiences. Furthermore, the child learner has neither understanding about what learning outcomes need to be achieved nor how to evaluate his/her success in achieving those outcomes, with their intended benefits. Instead, it is the teacher who knows what learning outcomes need to be achieved and how to evaluate the child learner's success in achieving those outcomes. Within this context, the child learner is dependent upon the teacher to establish the predetermined learning outcomes and guide the child learner through the learning experience toward achieving those learning outcomes, with their intended benefits. Accordingly, to maximize the learning outcome benefits to the child learner, it is the teacher who must be responsible for the predetermined content and instructional design of the learning experience. It is the teacher who must guide the child learner through his/her learning experience toward achieving those learning outcomes, established by the teacher, with their intended benefits.

2. *Because adult learners have acquired advanced experience levels across a wide array of subjects, the instructional design of an adult learner's learning experience should take a value-added approach.*

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. This developed mental image is shaped from an assortment of prior learning experiences that provide the adult learner with an advanced experience level, comprised of a specific knowledge base and skill set, across a wide range of fields of study. Such an array of advanced experience levels across a wide range of subjects is also the primary resource upon which the adult learner relies in self-directing future learning experiences. Within such a future learning experience, related to a particular specialty, the adult learner acquires new information and builds upon his/her existing knowledge base and skill set to achieve the desired learning outcomes. Thus, in formulating the instructional designs for such future learning experiences, the facilitator should take a value-added approach.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. Furthermore, the child learner lacks an assortment of prior learning experiences that would have provided him/her with an advanced experience level across a wide range of fields of study. Accordingly, across a wide range of subjects, the child learner lacks a developed knowledge base and skill set, which otherwise would have served as a learning resource. Instead, for the child learner, learning outcomes of a learning experience are designed to impart to the child learner a basic knowledge base and skill set with regard to a particular field of study. Furthermore, as stated above, it is the teacher who knows what learning outcomes need to be achieved relative to a particular learning experience for the child learner. In other words, it is the teacher who knows the basic knowledge base and skill set needed by the child learner relative to a particular field of study. Accordingly, to maximize the learning outcome benefits to the child learner, it is the teacher who must be responsible for the predetermined content and instructional design of this fixed type of learning experience. It is also the teacher who must be responsible for guiding the child learner through such a learning experience toward achieving a predetermined set of learning outcomes. Thus, in formulating the instructional designs for the learning experiences of a child learner, the teacher should focus on imparting a basic knowledge base and skill set with regard to a particular field of study.

3. *Because adult learners are seeking real-world, practical learning experiences, the instructional design of an adult learner's learning experience should emphasize learning outcomes that relate to the adult learner's personal or professional life.*

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. As such, before the adult learner actively engages in (and takes ownership of) the learning experience, the adult learner must understand the dynamics of the learning experience that support achieving the learning outcomes, i.e., the when, where and how. More importantly, however, is the why, i.e., why must the adult learner be actively engaged in this learning experience, because adult learners are most often focused on real-world, practical learning experiences. As such, most learning experiences of the adult learner have learning outcomes that involve resolving issues that relate to the contemporaneous personal and professional life of the adult learner. Accordingly, to maximize the learning outcome benefits to the adult learner, the instructional design of an adult learner's learning experience should emphasize learning outcomes that relate to the adult learner's contemporaneous personal or professional life. In this instance, the adult learner will be more motivated to become actively

engaged in such a learning experience, because the adult learner can more easily relate the learning outcome benefits to his/her contemporaneous personal or professional life.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. Furthermore, the child learner lacks an assortment of prior learning experiences that would have provided him/her with an advanced experience level across a wide range of fields of study. Accordingly, across a wide range of subjects, the child learner lacks a developed knowledge base and skill set, which otherwise would have served as a learning resource.

Instead, for the child learner, learning outcomes of a learning experience are designed to impart to the child learner a basic knowledge base and skill set with regard to a particular field of study. Moreover, before the child learner engages in a learning experience, the child learner need not understand the dynamics of such learning experience, i.e., the when, where, how and why, because the child learner is most often focused on external motivators, e.g., good grades, financial incentives and other types of rewards.

Furthermore, as stated above, it is the teacher who knows what learning outcomes need to be achieved relative to a particular learning experience for the child learner. In other words, it is the teacher who knows the basic knowledge base and skill set needed by the child learner relative to a particular field of study. Accordingly, it is the teacher who must be responsible for the predetermined content and instructional design of the child learner's learning experience. It is also the teacher who must be responsible for guiding the child learner through such learning experience toward achieving the predetermined set of learning outcomes.

However, unlike adult learners, child learners are not seeking real-world, practical learning experiences. Instead, they are seeking learning experiences with sufficient external motivators. Accordingly, to increase the degree with which a child learner becomes engaged in a particular learning experience, the instructional design of a child learner's learning experience must focus on those external motivators. For the child learner, more learning outcome benefits accrue to the child learner that is more engaged in a particular learning experience. Thus, to ensure that the child learner is sufficiently engaged to achieve the predetermined learning outcomes of a particular learning experience, the teacher formulating the instructional design for such learning experience must adequately incorporate external motivators for the child learner.

4. *Because adult learners are seeking relevant learning experiences, the instructional design of an adult learner's learning experiences should emphasize learning outcomes that solve problems related to the adult learner's personal or professional life.*

As stated above, the adult learner has a developed mental image of himself/herself – a personal identity. As such, before the adult learner actively engages in (and takes ownership of) the learning experience, the adult learner must understand the dynamics of the learning experience that support achieving the learning outcomes, i.e., the when, where and how. More importantly, however, is the why, i.e., why should the adult learner be actively engaged in this learning experience, because adult learners are most often focused on relevant learning experiences. As such, most learning experiences of the adult learner have learning outcomes that involve solving problems that relate to the contemporaneous personal and professional life of the adult learner. Accordingly, to maximize the learning outcome benefits to the adult learner, the instructional design of an adult learner's learning experience should emphasize learning outcomes that solve problems related to the adult learner's contemporaneous personal or professional life. In this instance, the adult learner will be more motivated to become actively

engaged in such a learning experience, because the adult learner can more easily relate the learning outcome benefits to his/her contemporaneous personal or professional life.

In contrast, as stated above, the child learner does not have a developed mental image of himself/herself – a personal identity. . . *See* the discussion regarding child learners in Principle #3, above.

Unlike adult learners, however, child learners are not seeking relevant learning experiences. Instead, they are seeking learning experiences with sufficient external motivators. Accordingly, because the child learner is motivated to be engaged in a particular learning experience, based upon external motivators, the instructional design of the child learner's learning experience must emphasize those external motivators.

II. ARGUMENT
DIFFERENCES IN LEARNING THEORIES (ANDRAGOGY VS. PEDAGOGY) HAVE MEANINGFUL IMPLICATIONS FOR THE INSTRUCTIONAL DESIGN OF ADVANCED UNDERGRADUATE BUSINESS COURSES

Differences in learning theories (Andragogy vs. Pedagogy) have meaningful implications for the instructional design of advanced undergraduate business courses. Based upon Knowles' assumptions, each of Knowles' principles can be applied to assist educators and instructional designers to establish more efficient and effective curricula for adult learners. Specifically, if educators (a) accepted Knowles' five assumptions of adult learners (Knowles 1984) and (b) incorporated Knowles' four principles of Andragogy into the instructional design of advanced undergraduate business courses, especially advanced sequential undergraduate business courses, the learning outcome benefits to the undergraduate "student," as an adult learner, would be significantly increased. The underlying theory for such an argument is that by incorporating the four principles of Andragogy (Knowles 1984) into the instructional design of undergraduate business courses, especially advanced sequential undergraduate business courses, the undergraduate business educator maximizes learner engagement and motivation, which then leads to a significant increase to the learning outcome benefits to the undergraduate "student," as an adult learner.

III.

FUTURE EMPIRICAL RESEARCH THAT TESTS THE CURRENT HYPOTHESIS

An example of future empirical research that tests the current hypothesis could be to test whether the differences in learning theories (Andragogy versus Pedagogy) may explain the differences in student evaluations of undergraduate business tax courses (Tax II (the federal income taxation of corporations and partnerships with a VITA component) versus Tax I (the federal income taxation of individuals)), where Tax I (the federal income taxation of individuals) is taught by incorporating the principles of Pedagogy and Tax II (the federal income taxation of corporations and partnerships with a VITA component) is taught by incorporating the principles of Andragogy (Knowles 1984).

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