In this issue:

2021 ISCAP Board of Directors

INFORMATION SYSTEMS
EDUCATION JOURNAL

Editors

"BILT for Success": An Alternative Education Strategy to Reskill the Business and Technology Professionals for a Sustainable Future

Xiang (Michelle) Liu
xliu@marymount.edu

Diane Murphy
dmurphy@marymount.edu

School of Technology and Innvoation
Marymount University
Arlginton, 22207, USA

Abstract

Today's organizations are operating in a volatile, uncertain and complex digital environment. The outbreak of COVID-19 pandemic has exacerbated this situation. There is an urgent need for organizations to acquire a new generation of business and technology professionals that not only possess in-depth and current disciplinary specialization knowledge, but also are able to communicate and collaborate using skills across the organization in fields including business, innovation, leadership, and technology (BILT). It is recognized that the traditional pathway of getting a "full-fledged" master's degree within 18-24 months may not address the challenge in a timely manner. As educators working in the technology and business sectors of higher education, we aim to explore an alternative strategy to prepare the BILT workforce ready for the "new" economy. This article reviews several alternative education models that have been taken by different stakeholders to prepare the workforce to meet employers' quickly changing expectations. An "H-shaped" BILT model is illustrated as a modular curriculum structure to enhance and complement disciplinary specializations with a focus on combined skills across multiple domains. We present a case study with details on developing and implementing the BILT model at our school as an alternative pathway with greater degrees of flexibility and agility. Finally, we discuss the potential of generalizing this alternative education model in other settings and delineate several future research directions.

Keywords: alternative education strategy, reskill, stackable credentialing, modular curriculum, digital transformation, COVID-19

1. INTRODUCTION

We are all living in a rapidly changing world with constantly emerging technical, political, and economic challenges on a global scale (Van der Steege, 2017). Today's businesses and governments must operate in this volatile, uncertain and complex digital environment which is posing numerous "wicked problems" (Kraaijenbrink, 2019). Further, the outbreak of

COVID-19 pandemic has exacerbated the situation. While the use of digital technologies in business has been gaining traction since commercial use of the Internet began, digital transformation is expected to dominate as organizations (government and business) try to recover from the disruptions caused by the COVID-19 pandemic. Business disruption along with fast digital adoption by remote workers has made intricacy and uncertainty the "new" normal

(Wiles, 2020). It has also increased cybersecurity concerns with a large surge in fraud and phishing attacks (Radoini, 2020). The organizations facing such challenges need to rethink their business models and make effective, as well as economical, use of technology, to retain and enhance their competitive advantage. As a result, there is an urgent need for organizations to acquire a new generation of business and technology professionals that not only possess in depth and current disciplinary specialization knowledge, but also are able to communicate and collaborate using skills across the organization in fields including business, innovation, leadership, and technology (BILT).

The ensuing question challenging industry and academia is how to prepare our workforce, both existing and future, to enable our organizations to overcome today's challenges and adapt to disruption in an agile and cost-effective manner. A recent Gartner survey revealed that 80% of the workforce, 92% of managers and 77% of senior leaders already felt poorly prepared for the future (Wiles, 2020). Another strikingly notable result from the survey is that almost 50% of employees taking the survey said they frequently had to complete responsibilities outside of their perceived role. As the COVID-19 drives unprecedented business transformation, the need for critical skills has never been greater and the existing workforce will be less "fit for purpose" (Wiles, 2020). However, most higher education programs still focus on training professionals in silos of functional disciplines (Demirkan & Spohrer, 2018). To address the challenge, we need to create some innovative approaches to bridge gaps and disconnections between those silos by moving business professionals towards technology and technology professionals to business. A BILT workforce can maximize communication, ensure implementation of the right technology, and lead organizations effectively, all essential to business survival and government operational effectiveness in times of declining budgets.

It is recognized that the traditional pathway of getting a "full-fledged" master's degree within 18-24 months may not address the challenge in a timely manner (Arbeit, Bentz, Cataldi, & Sanders, 2019; Brown & Kurzweil, 2017; EdCast Team, 2018). Therefore, the need for some alternative education modules is pressing. As educators working in the technology and business sectors of higher education, we aim to explore an alternative strategy to prepare the BILT workforce ready for the "new" economy. No

business analyst or economist, in government or industry, can truly predict how and when the U.S. economy will recover from the pandemic. However, we know that implementing new technologies will be pivotal in the recovery process and that there will be a workforce gap in these important technologies (Horn, 2020). Information Technology (IT) professionals need to learn new methodologies, tools, and techniques, inside and outside their traditional knowledge areas, to power the future and ensure sustainability (Lanzolla et al., 2018; Marion, Fixson, & Brown, 2020). Business leaders must learn the power of these new technologies and the processes necessary for effective implementation in the organization's business practices.

This article first examines the "new" economy that today's organizations face, focusing on the impact of digital transformation and technological disruption. The next section reviews several alternative education models that have been taken by different stakeholders to prepare the workforce to meet employers' quickly changing expectations. The general requirements for traditional, mainstream master's degrees and graduate certificates at a business school are also discussed. We then present a case study on developing and implementing a modular curriculum structure at our school as an alternative pathway with greater degree of flexibility and agility. Finally, we discuss the potential of generalizing this alternative education model in other settings and delineate several future research directions.

2. THE CURRENT BUSINESS AND TECHNOLOGY ENVIRONMENT

Digital technologies are rapidly evolving and have dramatically affected society in the last few decades (Colbert, Yee, & George, 2016; Walter, 2016). Digital approaches, including efficiency technologies (e.g., "cloud technologies"), connectivity technologies (e.g., 5G technologies and IoT), and automation technologies (e.g., big data and DevOps) are driving forces that can transform industries and institutions profoundly (Lanzolla et al., 2018). Organizations are facing with massive changes introduced by artificial intelligence (AI), robotic process automation (RPA), telepresence systems, mobile computing, and cyber threats, all of which challenge existing capabilities and skills (Baralou & Tsoukas, 2015; Dougherty & Dunne, 2012). Several major factors shaping the current business and technology environment are discussed below.

A recent survey of more than 800 CEOs, senior executives, and directors showed that digital transformation risk was one of their top concerns for 2019 (Sun, 2018). Another report revealed that 70% of all data transformation initiatives did not reach their goals (ZoBell, 2018). A further analysis of the success cases led to the findings that digital transformation worked for those organizations that focused on changing the mindset of their employees, leveraging the insider knowledge of the organizations, and adjusting the organizational culture and processes strategically (Tabrizi , Lam, Girard, & Irvin, 2019). Strong business and technical leadership were a must and innovative approaches (thinking outside the box) was imperative. As digital transformation is a multi-faceted phenomenon, how the combined effect of digital technologies transforms organizations and impacts business success still remains unclear (Lanzolla et al., 2018).

Disruptive technologies such as AI and robotics have long been predicted to change the skills needed to perform today's jobs and reshape the workforce landscape (Brynjolfsson & McAfee, 2014). We are now seeing this happen. Intelligent software and smart robots are increasingly used to make complex decisions and take over previously human tasks (Schwarzmüller, Brosi, Duman, & Welpe, 2018). Gartner TalentNeuron data showed that AI was expected to be pervasive in new software products and services by 2020 (today) and become a positive net job motivator (Wiles, 2018). We were observing some shifts in workforces and workforce planning based on the impact of AI before the COVID-19 pandemic. These shifts will continuously evolve along with the increasing adoption of AI across different functions in organizations as automation initiatives gain momentum with mounting financial pressures. AI has, however, increased demand for the skills it cannot replace such as creativity (Frenkel, Korczynski, Donoghue, & Shire, 1995) and social interactions (Frey & Osborne, 2017). Therefore, the critical skills that can sustain our digital future are not siloed technical skills, but a broader perspective with a balance of technical skills, innovative thinking, communication skills, and business acumen, including leadership.

As technology has become commonplace in everyone's life, so has the number of cyberattacks increased and incidents of cybercrime have sky-rocketed during the Covid-19 pandemic (Bolster, 2020). The outbreak of COVID-19 resulted in dramatic changes to the business operations of organizations across the globe. This placed additional stress on the digital infrastructure caused by the large number of people working from home as well as cybercriminals taking advantage of the "fear" of the population.

Consequently, another major factor impacting the business and technology environment is cybersecurity capacity. One of the latest studies revealed that around 94% of security and IT professionals globally are concerned about their organization's cybersecurity after the outbreak of the COVID-19 pandemic (Tripwire, 2020). The study further showed that organizations are struggling to mitigate the risks of increased pandemic-related attacks, with 58% of security issues revolving around remote workers. Cybersecurity controls and policies in organizations are put under stress due to the disruption. The ongoing situation has significantly impacted employees across all the functions who need to deal with emerging cybersecurity challenges, which requires robust security measures in remote work environments, quick response capability to contain potential cyber risks, and business culture and strategy aligned with cybersecurity policies and measures.

New technologies adopted by organizations must co-evolve with the skills that those organizations need. Before organizations can rethink their strategies in sustaining growth, promoting innovations, and competing for talent, they must identify the core skills they need to innovate and survive. It has been found that the competencies companies need most are business-oriented rather than technical, even for brick-and-mortar companies that are trying to become more digital (Marion & Fixson, 2018). New technologies must be implemented strategically to align with business goals and an entrepreneurial spirit must be encouraged both inside and outside organizations. To drive innovation internally, an organization cannot only rely on hiring all-new workers because of the enormous expenses and deficit of qualified recruits (Marion et al., 2020). A more practical and sustainable approach lies in reskilling existing employees and other members of their communities. We need a cadre of talent who can lead innovations during the digital age, and they need to possess business acumen, an entrepreneurial spirit, leadership skills and technology (BILT) competence. This article, therefore, aims to demonstrate an alternative pathway the authors have created at their school to reskill technology and business

professionals to fill the ever-changing and challenging job market.

3. ALTERNATIVE EDUCATION AND TRAINING APPROACHES

A PwC CEO survey reported that 77% of surveyed chief executives think that a scarcity of people with key skills is the biggest threat to their business (PWC, 2017). However, 61% of CEOs revealed that they had not yet taken any additional steps at that time to attract and retain talent. A recent survey by Harvard Business Publishing Corporate Learning presented a similar concern from the employees' angle, in which nearly half of employees were disappointed in their employer's learning and development programs (Westfall, 2019). Employers believe that the need for qualified talent is so urgent that the traditional education system cannot keep abreast with the demand. We, as educators, need to rethink our curricular model and renovate the pathway to supply the needed workforce to support the new business models. This section provides an overview of several emerging, as well as well-established, alternative education and training models for adult learning and reskilling.

There is a well-researched and documented need for higher education to provide multiple pathways and techniques that have arisen including bootcamps, competency-based education, and stackable certificates (Brown & Kurzweil, 2017; Sandeen, 2013). These techniques are being used to help students learn academic content from where they are, regardless of time, place, or pace of learning. They provide flexibility in what is learned, many focusing on career prospects, how it is learned, and provide students with personalized learning opportunities.

Bootcamps/coding academies have been offered as an alternative training module in response to employers' quickly changing skill and credential requirements. Based on a study on 1,010 technology-related programs offered in the United States, Canada, and online, there is more diversity in terms of bootcamp providers, the mode of delivery (online vs. in person), intensity (part time/full time), cost, and program types than would be expected from public discourse (Arbeit et al., 2019). Based on the data they collected, they presented a classification structure for bootcamps as five distinct program types including: comprehensive career preparation program, standalone course, university-affiliated program, fellowship program, and postsecondary education replacement program. Despite the high expectation of bootcamps being used to reskill employees, this research showed that it does not align as well with the labor market demand as would be expected based on media coverage. These academies are generally lacking in accreditation standards resulting in very uneven quality levels.

Competency-based education (CBE) is another alternative model that has recently garnered recognition for its potential to offer flexible and affordable post-secondary educational options (Rivers et al., 2019). In the broadest sense, competency-based programs offer an alternative pathway to a degree by awarding academic credit when students demonstrate competency in designated learning outcomes rather than when they pass courses that meet requirements for instructional time (Brown & Kurzweil, 2017). CBE can take either a credentialing approach that awards students' academic credit based on assessment of their prior learning or an instructional approach in which students are taught material on a more flexible schedule than that of traditional academic programs. Generally, students are graded on a pass/fail basis and can repeat multiple times, making it difficult for employers to identify the high performers.

There has been a perceived gap between the skills demanded by the labor market and skills the workforce acquired from college degrees (Abel & Deitz, 2014; Cappelli, 2015; Horn, 2020). One proposed approach to address the issue is to develop "stackable" credentials. Stackable credentials are defined as "part of a sequence of credentials that can be accumulated over time and move an individual along a career pathway or up a career ladder" (Austin, Mellow, Rosin, & Seltzer, 2012). A series of stackable credentials can serve as part of a sequence of credentials that lead efficiently to a longer-term degree (Bailey & Belfield, 2017). More importantly, stackable credentials allow experienced workers to upgrade their skills without limiting long-term opportunities, and they are the most beneficial when the cumulative effect of all credentials is greater than the effect of each one separately and by itself (Accenture, 2016).

The challenges of time, distance, and costs associated with traditional degree completion make online delivery of instruction more a flexible pathway that is more accessible and potentially affordable (Rivers et al., 2019).

Online learning emerged over two decades ago as a technology category introducing disruptions to the traditional, classroom-bounding model. It is growing rapidly in postsecondary education. Today, roughly a third of students in the United States take at least one online course as part of their accredited higher-ed experience, and over 15% study exclusively online (Lederman, 2018). Many of those students are adult learners who are employed while taking online courses on platforms such as Coursera, Udemy, and edX. One interesting by-product of the online learning model is the creation of numerous organizations and offerings that support companies' talent development efforts (Horn, 2020). For example, organizations such as Pluralsight, LinkedIn Learning, Learn@Forbes, and Udacity focus on helping employers re-skill the workforce in cutting-edge fields.

4. THE BILT MODEL AS AN ALTERNATIVE PATHWAY

While many of these educational or training approaches enhance individual skills, they are very personalized and are primarily designed to provide fundamental skills such as learning to code in Python. They do not generally include developing soft skills such as oral communication, writing, and teamwork, all very important in today's workplace.

The question we posed is how can we apply these techniques to graduate education across the needed disciplines of business, innovation, leadership, and technology (BILT), given our technology programs are in a School of Business and Technology. We previously had developed and successfully implemented dual degree programs with some of the business programs, for example, a dual MBA/Information Technology program. But these are too long (2 -3 years) in many cases to meet the need for this "new" economy.

The BILT model we propose is driven by the fact that the skills, rather than roles, are becoming more and more relevant and useful to fuel competitive advantage in an organization, especially when tasks and responsibilities change quickly (Wiles, 2020). However, it is not practical to eradicate the existing workforce bounded by two distinctive silos of roles: technical professionals and business professionals. On the one hand, many people in the workforce have the technology framework and experiences. For example, they may have been coding in COBOL or they may have been maintaining servers and networks for years.

Such members of the workforce just need to be upskilled in the emerging technology of today and the business and security issues with their implementation. On the other hand, many people in the workforce have the business framework and experiences such as providing financial management support for their company or minimizing inventory to maximize sales and reduce overhead costs. Such business professionals just need to be upskilled in the application of emerging technology to their business. To achieve a sustainable workforce development goal, the BILT model is designed to provide an alternative "fast-track" enhancing and complementing disciplinary specializations with a focus on combined skills across multiple domains.

We researched the problem and identified three important factors impacting our consideration on skills and knowledge that need to be covered in the BILT model. First, everyone in management of an organization needs to understand the cyber risk associated with existing and emerging technology and the need for revised cybersecurity controls to protect that investment. Second, innovation is an important critical success factor in the new economy. There has been a shortage of graduates who are prepared to use entrepreneurial skills to help employers grow and meet the challenges of an ever-changing world. Students often feel left out from entrepreneurship programs because they want to use their entrepreneurial spirit and skills in existing organizations, rather than start their own. Intrapreneurship, defined as the application of entrepreneurial behavior to growth challenges in existing organizations, drives the growth of many successful area businesses in media, hospitality, government contracting, healthcare and IT (Seshadi & Tripathy, 2006). Third, new technologies, such as AI, are resulting in organizational disruption and so changing management and other leadership principles (Behreandt, 2019).

In summary, the BILT model can be depicted as an "H-shaped" curriculum model, with the technical and business domain knowledge as two vertical lines, bridged by a horizontal line of skills in different domains including business, innovation, leadership, and technology. The illustration of the model is shown in Figure 1.

Figure 1. The BILT Model (see appendix)

5. CASE STUDY: IMPLEMENTATION OF THE BILT MODEL

Stackable Credentialing
We ascertained that our current approach of masters' degree with specialties worked well for new entrants in the field, but not for existing workers looking for a quick sprint of additional knowledge and skills for the "new" economy workplace. We examined our existing master's level curriculum in IT and cybersecurity and recognized that our existing 12-credit specialties covered most of the content needed for some of these quick sprints. We decided, therefore, to separate them out into new certificates including:

- Cybersecurity
- Data Science
- Digital Health
- Digital Transformation

For the business and leadership aspects, we also looked at the masters' programs in the MBA, in the management and leadership program, and in the human resources program and identified courses that would give quick sprints, resulting in three new business certificates:

- Leadership
- Project Management
- Talent Management

Our last remaining gap was in the innovation area. The university had launched a new intrapreneurship initiative in September 2019 to address one of the most significant talent gaps in our region: - graduates who are prepared to use their entrepreneurial skills to help their employers develop new products and services to meet the challenges of today's digital world. Amazon, with its move of HQ2 to Arlington, had made it clear through public statements and its own publicized activities that it puts a premium on a workforce that has the ability to apply technology and business principles in a holistic manner, and integrate these skills to create innovation and deal with a rapidly changing work environment.

We had no specific curriculum in intrapreneurship, although innovation was covered in the MBA and in the masters in management and leadership. Based on this existing content, we developed five specific intrapreneurship courses. Three are required courses: "Entrepreneurship Thinking", "Intrapreneurship", and "Strategic Growth for Entrepreneurs and Intrapreneurs". The fourth allows students to select either the startup route with a course entitled "Emerging Business Formation and Financing" or focus on intrapreneurship within an organization focusing on leadership or management ("Dynamic and Adaptive Leadership").

Each of the certificates was created and approved through several layers of the university's curriculum approval process. Students can enroll in the certificates individually and get the master's level certificate in 2 semesters. Due to many recent revisions in the university's curriculum process to maintain the university's agility in today's environment, the certificate program was created and approved in less than one year and will begin in Fall 2020.

We also left it open that we will be adding additional certificates to the program over time, for example, graduate certificates in artificial intelligence and business foundations are in the works.

Diploma Plus
Most organizations will require many of their business and technology workers to have more than one new knowledge and skills: for example, digital transformation, cybersecurity, and project management to effectively implement new technology within an organization.

To incentivize this multi-skill acquisition, the program allows the technology students to take 3 of the certificates in a five-year span (at least 2 of which must be technical) to earn a MS in Emerging Technology. In addition, for business students we will implement a MS in Technology Management for those who take 3 certificates, at least 2 of which are in the business area.

Similarly, we will allow working adults in the MS in Information Technology and MS in Cybersecurity programs to earn certificates based on their chosen specialty, or to add a

second certificate to their current master's programs.

The conceptual framework of stackable credentialing and diploma plus is shown in Figure 2.
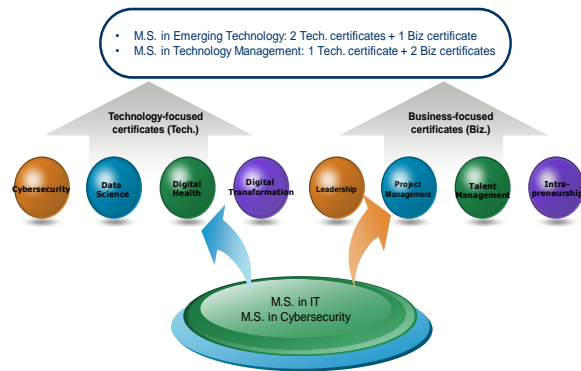
Figure 2. The Conceptual Framework of Stackable Credentialing (see appendix)

Hybrid Learning
The university has been moving to hybrid (sometimes referred to as blended learning) for the past few years, combining the advantages of remote access for some, or parts of some, courses without losing the enhanced learning experience of face-to-face classes. As for all other educational institutions, Covid-19 has accelerated our move to online education for all classes as universities shuttered their doors in the middle of the Spring 2020 semester. We have, however, continued to focus on our "high-touch" approach, albeit through remote tools such as Zoom.

The certificates will be offered in this hybrid format to maximize the learning and increase the flexibility for working adults. Our focus is not just becoming familiar with the new subject matter but also developing the 21st century skills, which are increasingly important in this fast-moving digital world. Communication skills, team work, critical thinking, and respect for diversity are important parts of our approach, and largely reinforced in the face-to-face or live remote class components.

6. FUTURE OF THE IT WORKFORCE

There is no doubt that IT budgets will be tight in the next few years as economies struggle to recover from the effects of the pandemic. Businesses will focus on digital transformation to improve their productivity and leadership will expect a higher return on investment (ROI) than in the past. Forbes reported that 70% of existing digital transformation initiatives were not expected to meet their stated goals resulting in over $900 billon of wasted investment (ZoBell, 2018). By integrating skills across the enterprise in business, innovation, leadership and technology (BILT) and stressing communication and teamwork, our reskilled workforce should be poised to meet these higher expectations.

While our focus has been on business reinvention in the new economy, our approach also applies to our system of government, federal, state and local, which faces many of the same workforce issues. In May 2020, the Federal CIO Council updated its thoughts on the future of the federal IT workforce (CIO Council, 2020). They recognized there are a number of federal employees who are ready to retire and who do not want to retrain for the constantly evolving IT environment. Many of these are the managers in the IT organizations and will need to be replaced by new IT talent that understands new technology and its implementation. However, they also recognize that attracting and hiring such talent may not be easy and that they will need to offer the existing IT workforce reskilling opportunities to enable them to understand and manage the new innovations and changes that must happen in the workplace.

7. CONCLUSIONS

We, as business and technology educators, must determine the best way to support the "new" economy with its focus on new business models and digital transformation. For probably one of the first times in history, in-demand workplace skills are fundamentally changing within an individual's work life, requiring additional learning past the traditional educational training. There are many options for learning now through Internet-based options including online courses, bootcamps, and for-profit certification programs.

As educators in the higher education system, we need to transform our educational offerings, what we teach and how we teach, to support the success of existing and new workers and to be sustainable as an institution. We first need to understand the in-demand work skills and be the first to the table with education that develops the worker outside their traditional stove-piped

role. We need to modularize our offerings to be manageable in today's fast changing field and to allow our students to make timely advances in their organization. We began by breaking down our master's graduate program into stackable certificates and will later be working on modularizing courses, for example, converting a 3-credit course into 3 1-credit courses so that each can be taken in a short sprint.

Finally, in this world of personalization, we need to understand the individual needs of students. There is so much diversity in the background of our graduate students: many are career-changes, others are looking for higher-level positions in their discipline, many need to develop soft skills to support today's team environments, while others our transitioning from technical to management positions. We need to understand individual student needs and career objectives and personalize their educational experience as much as possible. The concept of the "guidance counsellor" in high school may need to be reinvented at the graduate level and we will continue to research this concept as we formally assess the success of our stackable certificates.

9. REFERENCES

Abel, J. R., & Deitz, R. (2014). Do the Benefits of College Still Outweigh the Costs? *Current Issues in Economics and Finance, 20*(3), 1-11.

Accenture. (2016). Bridge the Gap: Rebuilding America's Middle Skills. Retrieved from https://www.hbs.edu/competitiveness/Documents/bridge-the-gap.pdf

Arbeit, C. A., Bentz, A., Cataldi, E. F., & Sanders, H. (2019). Alternative and Independent: The Universe of Technology-Related "Bootcamps". *RTI Press Publication No. RR-0033-1902. Research Triangle Park, NC: RTI Press.* Retrieved from https://www.rti.org/rti-press-publication/alternative-and-independent/fulltext.pdf

Austin, J. T., Mellow, G. O., Rosin, M., & Seltzer, M. (2012). *Portable, Stackable Credentials: A New Education Model for Industry-specific Career Pathways*. New York, NY: McGraw-Hill Research Foundation.

Bailey, T., & Belfield, C. R. (2017). Stackable Credentials: Do They Have Labor Market Value? *Community College Research Center Working Paper*. Retrieved from https://doi.org/10.7916/D8446038

Baralou, E., & Tsoukas, H. (2015). How is New Organizational Knowledge Created in a Virtual Context? An Ethnographic Study. *Organization Studies, 36*(5), 593-620.

Behreandt, D. (2019). The Age of Artificial Intelligence is Here. *New American, 35*(10), 10-19. Retrieved from https://www.thenewamerican.com/print-magazine/item/32202-the-age-of-artificial-intelligence-is-here

Bolster. (2020). State of Phishing and Online Fraud, Q1 2020 Report (COVID Edition). Retrieved from https://bolster.ai/reports

Brown, J., & Kurzweil, M. (2017). The Complex Universe of Alternative Postsecondary Credentials and Pathways. *Cambridge, MA: American Academy of Arts & Sciences*. Retrieved from http://www.amacad.org/sites/default/files/academy/multimedia/pdfs/publications/researchpapersmonographs/CFUE_Alternative-Pathways/CFUE_Alternative-Pathways_Landscape.pdf

Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Machines*. New York: W.W. Norton & Company, Inc.

Cappelli, P. (2015). *Will College Pay Off? A Guide to the Most Important Financial Decision You'll Ever Make*. New York, NY: PublicAffairs.

CIO Council. (2020). Future of the Federal IT Workforce Update, May 2020. Retrieved from https://www.cio.gov/assets/resources/Future_of_Federal_IT_Workforce_Update_Public_Version.pdf

Colbert, A., Yee, N., & George, G. (2016). The Digital Workforce and the Workplace of the Future. *Academy of Management Journal, 59*, 731-739. Retrieved from https://aom.org/uploadedFiles/Publications/AMJ/June_2016_FTE.pdf

Demirkan, H., & Spohrer, J. C. (2018). Cultivating T-Shaped Professionals in the Era of Digital Transformation. *Service Science, 10*(1), 88-109. Retrieved from https://doi.org/10.1287/serv.2017.0204

Dougherty, D., & Dunne, D. D. (2012). Digital Science and Knowledge Boundaries in Complex Innovation. *Organization Science, 23*(5), 1467-1484.

EdCast Team. (2018). Reskilling the Global IT

Workforce to be Future-Ready. Retrieved from https://www.edcast.com/corp/blog/reskilling-the-global-it-workforce-to-be-future-read/

Frenkel, S., Korczynski, M., Donoghue, L., & Shire, K. (1995). Re-constituting Work: Trends Towards Knowledge Work and Info-normative Control. *Work, Employment and Society, 9*(773-796). Retrieved from https://doi.org/10.1177/095001709594008

Frey, C. B., & Osborne, M. A. (2017). The Future of Employment: How Susceptible are Jobs to Computerization? *Technological Forecasting and Social Change, 114*(254-280). Retrieved from https://doi.org/10.1016/j.techfore.2016.08.019

Horn, M. B. (2020). Education, Disrupted. *MIT Sloan Management Review, 61*(2), 1-5. Retrieved from https://sloanreview.mit.edu/article/education-disrupted/

Kraaijenbrink, J. (2019). Strategy In A Volatile World. *Forbes*. Retrieved from https://www.forbes.com/sites/jeroenkraaijenbrink/2019/01/11/strategy-in-a-volatile-world/#46445484220b

Lanzolla, G., Lorenz, A., Miron-Spektor, E., Schilling, M., Solinas, G., & Tucci, C. (2018). Digital Transformation: What Is New If Anything? *Academy of Management Discoveries, 4*(3), 378-387. doi:10.5465/amd.2018.0103

Lederman, D. (2018). Online Education Ascends. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/digital-learning/article/2018/11/07/new-data-online-enrollments-grow-and-share-overall-enrollment

Marion, T., & Fixson, S. (2018). *The Innovation Navigator: Transforming Your Organization in the Era of Digital Design and Collaborative Culture*. Toronto, Canada University of Toronto Press.

Marion, T., Fixson, S., & Brown, G. (2020). Four Skills Tomorrow's Innovation Workforce Will Need. *MIT Sloan Management Review, 61*(2), 1-7.

PWC. (2017). The Talent Challenge: Harnessing the Power of Human Skills in the Machine Age. Retrieved from https://www.pwc.com/gx/en/ceo-survey/2017/deep-dives/ceo-survey-global-talent.pdf

Radoini, A. (2020). Cyber-Crime during the COVID-19 Pandemic. Retrieved from http://www.unicri.it/news/article/covid19_cyber_crime

Rivers, C., Gibson, S., Contreras, E., Livingston, T., & Hanson, P. (2019). Competency-based education: An evolutionary higher education business model. *Journal of Competency-Based Education, 4*(1), n/a-n/a. Retrieved from https://onlinelibrary.wiley.com/doi/full/10.1002/cbe2.1179

Sandeen, C. (2013). The New Postsecondary Landscape. *Continuing Higher Education Review, 77*, 28-39. Retrieved from https://files.eric.ed.gov/fulltext/EJ1089488.pdf

Schwarzmüller, T., Brosi, P., Duman, D., & Welpe, I. M. (2018). How Does the Digital Transformation Affect Organizations? Key Themes of Change in Work Design and Leadership [Article]. *Management Revue, 29*(2), 114-138. doi:10.5771/0935-9915-2018-2-114. (Accession No. 130683556)

Seshadi, D. V. R., & Tripathy, A. (2006). Innovation Trough Intrapreneurship: The Road Less Travelled. *Vikapla, 31*(1), 17-30. Retrieved from https://journals.sagepub.com/doi/abs/10.1177/0256090920060102

Sun, M. (2018). Businesses Predict Digital Transformation to Be Biggest Risk Factor in 2019. *The Wall Street Journal*. Retrieved from https://blogs.wsj.com/riskandcompliance/2018/12/05/businesses-predict-digital-transformation-to-be-biggest-risk-factors-in-2019/

Tabrizi , B., Lam, E., Girard, K., & Irvin, V. (2019). Digital Transformation Is Not About Technology. *Harvard Business Review*. Retrieved from https://hbr.org/2019/03/digital-transformation-is-not-about-technology

Tripwire. (2020). Remote Work And COVID-19 Cybersecurity Impact Report. Retrieved from https://www.tripwire.com/misc/covid-19-cybersecurity-report

Van der Steege, M. (2017). Introduction. In M. Van der Steege, R. Elkington, J. Glick-Smith, F. T. Moss-Breen, B. Krawchuk, N. von Stamm, S. Pearse, & E. Martin (Eds.), *Visionary leadership in a turbulent world: Thriving in the new VUCA context* (pp. 7–

24). Bingley, United Kingdom: Emerald Publishing.

Walter, A. (2016). How Will Digitalization Change Agriculture? *International Trade Forum, Special Report, 2*, 28-29.

Westfall, C. (2019). New Survey: Nearly Half of Workers Unsatisfied With Learning and Development Programs. *Forbes*. Retrieved from https://www.forbes.com/sites/chriswestfall/2019/10/08/new-survey-workers-unsatisfied-with-learning-and-development-programs-training-leadership/#3cb5d1f948a4

Wiles, J. (2018). Action Plan for HR as Artificial Intelligence Spreads. Retrieved from https://www.gartner.com/smarterwithgartner/action-plan-for-hr-as-artificial-intelligence-spreads/

Wiles, J. (2020). Build the Workforce You Need Post-COVID-19. Retrieved from https://www.gartner.com/smarterwithgartner/build-the-workforce-you-need-post-covid-19/

ZoBell, S. (2018). Why Digital Transformations Fail: Closing The $900 Billion Hole In Enterprise Strategy. *Forbes*. Retrieved from https://www.forbes.com/sites/forbestechcouncil/2018/03/13/why-digital-transformations-fail-closing-the-900-billion-hole-in-enterprise-strategy/#706753577b8b

Appendices and Annexures
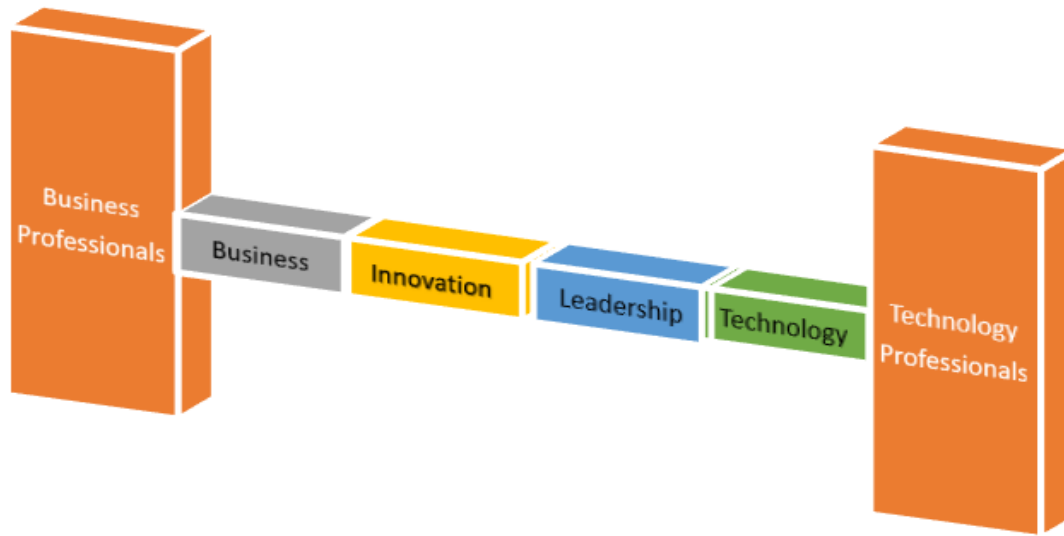
Figure 1. The BILT Model
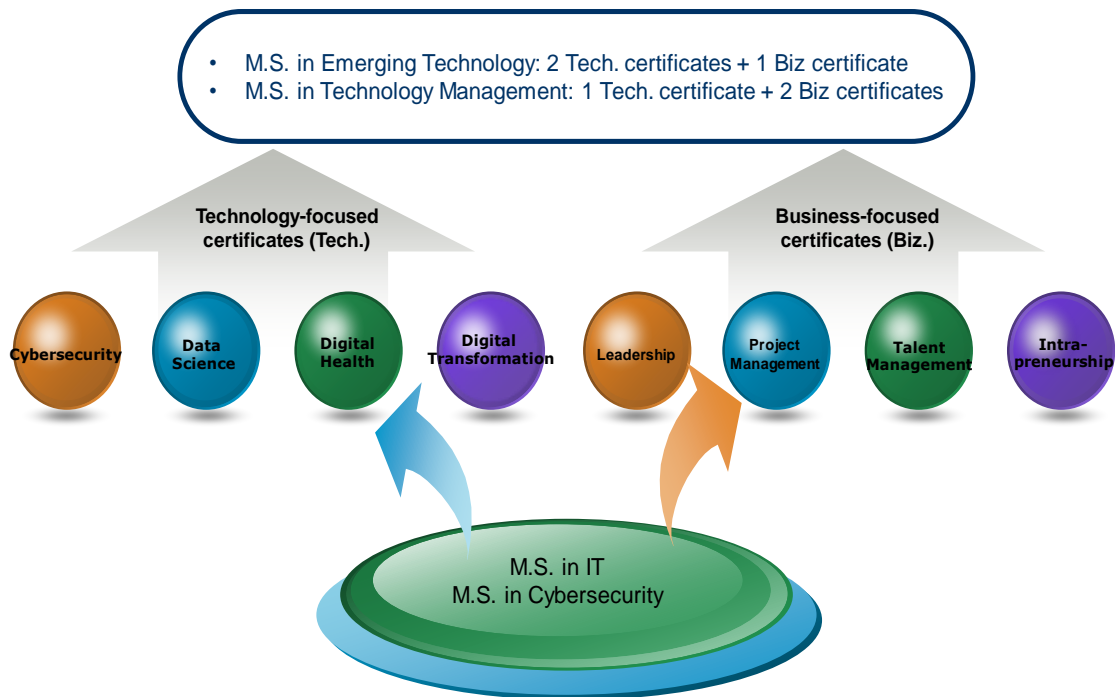
Figure 2. The Conceptual Framework of Stackable Credentialing

Using Student Choice in Assignments to Create a Learner-Centered Environment for Online Courses

Jamie Pinchot
pinchot@rmu.edu

Karen Paullet
paullet@rmu.edu

Computer and Information Systems Department
Robert Morris University
Moon Township, PA 15108 USA

Abstract

Learner-centered approaches have been found to be effective in online courses for encouraging a deep understanding of course content and for encouraging student engagement. Instructors of two information systems courses revised their online teaching methods to incorporate student choice in assignments. All assignments except a weekly quiz were made optional, and more assignments were provided than were necessary to obtain an A in the course. A variety of assignment types that would appeal to different learning styles were incorporated, allowing students the flexibility to choose assignments that most appealed to them. Findings show that students completed a range of assignment types, with 47% of students completing more assignments than were necessary to earn an A grade. Student reviews were extremely positive about the choice in assignments and noted that the flexibility gave them more control over their learning.

Keywords: assessment, alternative grading methods, cafeteria-style grading, online education, student engagement

1. INTRODUCTION

Creating a course format that allows for student choice in assignments can provide opportunities for creating a more learner-centered classroom. In a traditional course, there might be several required assignments, quizzes, or tests. Allowing student choice in assignments, sometimes referred to as cafeteria-style grading (Arendt et al., 2014), replaces each traditionally required assignment with a set of assignments that address the same course objective as the original assignment, but may offer different approaches to the material that could appeal to students with different interests and learning styles.

Individual learning styles should be taken into account in online education (Zapalska & Brozik, 2007). Learning styles are often categorized using the VARK model which includes: visual (V), aural (A), reading/writing (R), and kinesthetic (K). Individuals often tend to learn more effectively using their chosen learning style. Visual learners like to be provided demonstrations and images and like to use lists to organize their thoughts. Aural learners learn by listening and enjoy discussions and working out problems by talking. Read/write learners like to read content and often take notes and draw things to help remember them. Kinesthetic learners learn by doing and like hands-on tasks and tactile experiences (Drago & Wagner, 2004).

To implement learning styles, assignments could incorporate a variety of elements from reading, writing, oral presentation skills, discussion, hands-on demonstration of a skill, use of Internet search skills, and creation of videos and podcasts. Media such as videos and podcasts can be incorporated as appropriate. In some courses, it might be appropriate to allow students to conduct an interview about the lesson's topic with someone they know who has experience with the area that is the focus of the lesson. Many science and technology courses could offer a practical lab assignment that allows students experience with the lesson in a hands-on approach. Instructors could also consider offering assignments that use an element of gamification.

Gamification involves "using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems" (Kapp, 2012, p. 10). Opportunities abound for instructors to include assignment options that include some element of game play. Kahoot (Kahoot, n.d.) is a web site where instructors can create learning games and tutorials, or allow students to create these items. Possible assignments could include completion of a trivia game or interactive tutorial that reviews concepts on a certain topic, or asking the student to create a review game or tutorial. Templates can also be found online that allow creation of interactive crossword puzzles and other games that mimic television game shows such as *Jeopardy, Are you Smarter than a Fifth Grader?, and Wheel of Fortune* (Rusnak Creative, n.d.).

This study seeks to explore the potential benefits for students in courses that allow student choice in assignments, with the aim of appealing to a variety of student learning styles and thus increasing student engagement in online courses.

2. RELATED WORK

Arendt et al. (2014) studied 412 students in both traditional and online courses using this method of course structure and found that allowing students a choice in assignments encouraged them to excel in the course and go beyond expectations by submitting more assignments than were necessary to complete. In their sample, 49 percent achieved an A grade. Further, of these students who achieved an A, 37 percent scored beyond an A by completing additional assignments. The majority of these students completed one or two additional assignments, but 1 percent completed 16 or 17 additional assignments. Of the 412 students, only 14 percent received a grade of D or lower. Some students completed a greater variety of assignments than others, but the majority of students completed all online quizzes and exams. The researchers received positive feedback from students in course evaluations, with open ended comments noting enthusiasm and appreciation for the variety and choice in assignments. Arendt et al. (2014) found that this course structure has been equally successful in both traditional and online courses. Their findings indicated that giving students the freedom to learn in different ways encouraged learning in any form. This resulted in an increased desire from the student to learn and an increase in satisfied learning objectives.

Haniewicz et al. (2017) analyzed data from 140 students who participated in courses using cafeteria-style grading. Students were presented with assignment options in categories such as assessment, discussion, critical thinking questions, research paper, quiz, and final exam. Additional categories of "complete", "create", and "demonstrate" allowed for a variety of assignments involving hands-on activities such as completing an online tutorial. The final category was to interview a professional, which allowed students to reach out to experts in the field, or network with professionals at their own company. Notably, the only category required for the students to complete was the quiz category. A quiz was given for each module to ensure that all course material was covered. Of the 140 students, 36 percent ended the course with more points than needed for an A grade. The researchers analyzed the categories of assignments that students preferred. Other than the quiz category, which was required, the final exam category had the highest completion rate, with 79 percent of students completing this assignment. The discussion category was second with 51 percent, followed by critical thinking questions at 30 percent. The other categories were all represented, with complete at 28 percent, interview professional at 26 percent, demonstrate and create both at 21 percent, research paper at 19 percent, and assessment at 17 percent. Student feedback was overwhelmingly positive, but Haniewicz et al. (2017) noted that some feedback asked for specific assignments to be required to better address course objectives.

Some researchers note that a concern with this style of grading can be that students may complete all of their assignments in one half of

the course, causing them to miss exposure to concepts and course objectives covered throughout the course (Arendt et al., 2014). An approach that addresses this limitation would include some required assessments spaced strategically throughout the course, ensuring that course objectives are met.

Cafeteria-style grading is especially appropriate in the online learning environment, where it can serve as an aid to motivate students to be active participants in a virtual classroom. Researchers have found that online courses are not the best place for passive learning. Learner-centered teaching has been found to be more effective for online learners (Haniewicz et al., 2017). Teaching online requires an instructor to think differently about how to structure the learning environment and to consider new ways of teaching (Fish & Wickersham, 2009).

3. THEORETICAL FRAMEWORK

Weimer's (2002) model of learner-centered teaching (LCT) provides a theoretical foundation for this study. The LCT model calls for a shift in the role of the teacher and the balance of power between teacher and students. The traditional role of a teacher is to disseminate knowledge to students and this is often accomplished via lecture. The LCT model calls for the role of the teacher to change to one of facilitation. In this role, the teacher provides resources for students, designs engaging assignments, and facilitates peer-to-peer learning. Weimer (2002) also suggests that student learning is negatively impacted when the teacher holds too much control over the processes through which students learn. This speaks directly to the focus of this study. Allowing student choice in assignments is one way of shifting the balance of power in a classroom environment further toward the student. The LCT model also posits that the function of course content is to develop learning skills. Weimer (2002) notes that this may be a concept that receives resistance from many faculty members who feel that a certain amount of content must be delivered to students. The LCT model, in contrast to these views, supports the idea that using course content to help students learn how to learn is of more value to the student. Another tenet of the LCT model is that evaluation and assessment should not be used only for the purposes of assessment, but must also contribute to student learning. A suggestion for incorporation of this concept is to ensure that exams and other assessments are reviewed with students so that they can learn from any mistakes. Finally, the LCT model proposes that instructors must encourage students to accept the responsibility for their own learning (Weimer, 2002). Allowing student choice in assignments can be one way of promoting this tenet of the LCT model.

Active learning is defined as any instructional method that engages students in the learning process. Active learning focuses on how students learn rather than what they learn. This correlates closely with Weimer's (2002) LCT model tenet that the function of course content is to develop skills in how to learn. Active learning encourages students to think deeply about subjects and engage with course concepts rather than passively listen to information provided by the teacher. This includes adding activities into the classroom to replace or supplement lectures, and using a variety of techniques to promote student collaboration and engagement with the course content (Prince, 2004). Active learning has its basis in the theory of constructivism, which argues that learning is a process of "making meaning" and that learners "construct" their own understanding about subjects (McLeod, 2019).

Bigatel et al. (2012) surveyed 197 faculty with experience in online teaching and found that active learning was rated as one of the most relevant competencies for online instructors. Gold (2011) found that a constructivist, active learning approach can be used to promote deep understanding of course material in an online course. An active learning approach in an online course can take advantage of the unique environment to design learning activities that incorporate Internet searches and students' own experiences along with knowledge connections they make via interactions with classmates and the instructor. This allows for more self-directed learning (Hathaway, 2014).

4. PURPOSE

The purpose of this study was to explore the impacts of allowing online students the flexibility to choose assignments that appeal to their interests and learning styles while still meeting course objectives. Past studies have suggested that student choice in assignments can lead to a learner-centered teaching environment and encourage students to go beyond expectations in a course (Arendt et al., 2014; Hanewicz et al., 2017). However, a criticism is that students may focus on quantity rather than quality and earn enough points for an A grade via completion of additional assignments, but with a low level of effort. (Haniewicz et al., 2017). This

study addresses this with the following research question:

RQ1: How does an online course format allowing student choice in assignments impact the quantity and quality of assignments completed?

Another criticism of this course structure is that students may opt to complete assignments that are all of a singular type. For example, a student could select all writing activities rather than hands-on activities, which could be detrimental to their preparation for the workplace (Haniewicz et al., 2017). This study explores this issue with the following research question:

RQ2: How will online students in a course allowing student choice in assignments distribute their work among the offered assignment categories?

5. METHOD

This study analyzed the results of cafeteria-style grading in two undergraduate online courses in information systems offered by two different instructors during the 2019-2020 academic year. One of the courses was a course on mobile security policy and another was a course on cyberlaw. These courses are primarily taken by information systems students. Prior to beginning, the research study was reviewed and approved by the university's Institutional Review Board (IRB). Each instructor implemented a course framework within the Blackboard Learning Management System that offered multiple assignments as options for each weekly lesson module. The options utilized a variety of assignment categories designed to appeal to a variety of learning styles and interests, and incorporate active learning while still focusing on course content and objectives. Due to the need for a variety of assignments for each learning objective, course setup took a significant amount of additional time for instructors as they built these online courses.

Each instructor required weekly quizzes that focused on the content covered that week. All other assignments were optional. Point values for each assignment were established based on difficulty level and an estimate of time required to complete the assignment; not all assignments for a given week had the same point values. A grading scale was provided to students at the beginning of the course. The grading scale clearly listed the number of points required to achieve each letter grade.

Students also received clear instruction on the format of the course when the course began. A statement (adapted from Arendt et al., 2014) detailing "How this course works" was utilized in the course syllabi for both courses and prominently posted in Blackboard. This statement can be found in the Appendix. To ensure that students understood the grading scale and process by which assignments would be handled and graded, a course orientation quiz was also required in the first week. This quiz covered details about how the course format would be structured and students had the opportunity to review any items missed so that they would have a clear understanding of the course format from the start. The adaptive release feature in Blackboard was utilized to require that students had to complete this quiz before the first week's content would be opened for them in the course shell.

After the courses concluded, assignment and grade data was collected from the course Blackboard shells for analysis. No student names were kept with the final data set. It is important to note that these instructors were implementing assignment choice as a new active learning approach in their courses regardless of this research. The research simply looks at outcomes after the courses ended.

6. FINDINGS

Assignment Type	# of Assignments	# of Points
Quizzes (Required)	9	205
Discussions	3	125
Topic Papers	5	375
Games	4	300
Slide Presentations	5	300
Wikis	1	50
Critical Thinking Questions	4	140
Video Presentations	3	250
Interview of Professional	1	100
Projects	1	100
TOTAL	36	1,945

Table 1: Number of Assignments and Points Available in Each Assignment Category in Instructor A's Course

Instructor A's course included 10 assignment types: quizzes, discussions, topic papers, games, slide presentations, wikis, critical thinking questions, video presentations, interviews of professionals, and projects. Quizzes were the only required assignment in the course. The breakdown of number of assignments and points in each assignment type category is shown in Table 1.

Instructor B's course included 10 assignment types: quizzes, discussions, traditional assignments, games, slide presentations, wikis, video presentations, podcasts, interviews of professionals, and video critiques. Quizzes were the only required assignment in the course. The breakdown of number of assignments and points in each assignment type category is shown in Table 2.

Assignment Type	# of Assignments	# of Points
Quizzes (Required)	9	300
Discussions	2	200
Traditional Assignments	5	500
Games	2	200
Slide Presentations	3	300
Wikis	2	200
Video Presentations	4	400
Podcasts	2	200
Interview of Professional	2	200
Video Critiques	3	300
TOTAL	34	2,800

Table 2: Number of Assignments and Points Available in Each Assignment Category in Instructor B's Course

Addressing RQ1

The first research question asked, "How does an online course format allowing student choice in assignments impact the quantity and quality of assignments completed?"

Both Instructor A and Instructor B agreed upon a points-based grading scale to be utilized for each of their courses. As all assignments in these courses, with the exception of weekly quizzes, were optional, more points were available than were necessary to earn an A. In Instructor A's course, there were a total of 1,945 points available. This means that there were more than double the amount of points needed to earn an A that were available via optional assignments in the course. Approximately 200-250 points in assignments were offered each week in Instructor A's course. Assignments were due at the end of each week; so, students could only complete the assignments for a given week up until that due date. This prevented students from being able to wait until the end of the semester and turn in a grouping of assignments all at once. In Instructor B's course, there were a total of 2800 points available. This means that there were close to three times the number of points needed to earn an A that were available via optional assignments in the course. Approximately 350 points in assignments were offered each week in Instructor B's course. Assignments were due at the end of the week. Once a week had ended all assignments for that week were closed. The grading scale used is shown in Table 3.

Points	Grade
930+	A
900-929	A-
870-899	B+
830-869	B
800-829	B-
770-799	C+
700-769	C
590-699	D
0-589	F

Table 3: Points-Based Grading Scale

The 21 students in Instructor A's course collectively completed a total of 57% of the assignments offered in the course. In Instructor B's course, the 21 students completed a total of 61% of the assignments offered in the course. These may seem like a low percentage, but Instructor A's course offered 1,945 points and Instructor B's course offered 2,800 points in total, when only 930 points were required to earn an A grade. A better measure of quantity may be to note how many students in the course completed more assignments than needed to earn an A grade. In both Instructor A's and Instructor B's courses, 10 out of 21 students (48%) earned more than 930 points. Four of

these 10 students earned more than 1,000 points in Instructor A's course, with the highest score being 1,051. In Instructor B's course three out of the 10 students earned more than 1,000 points with the highest being 1,110. This was an extremely positive result, showing that nearly half the class completed more assignments than were necessary to pass the course with an A.

In Instructor A's course, the average number of points earned was 854, which was a B on the grading scale. The median number of points earned was 921, which was an A-. Of the students in the course, 47% earned an A, 14% earned an A-, 4% earned a B+, 10% earned a B, 10% earned a C+, 5% earned a D, and 10% failed the course with an F. In terms of quality of work, the students in this course performed extremely well, with 61% earning an A or A- grade.

In Instructor B's course, the average number of points earned was 833, which was a B on the grading scale. The median number of points earned was 914, which was an A-. Of the students in the course, 54% earned an A, 10% earned an A-, 6% earned a B+, 8% earned a B, 8% earned a C+, 4% earned a C, 2% earned a D, and 8% failed the course with an F. In terms of quality, 64% of the students in the course earned an A or A- grade.

Addressing RQ2

The second research question was, "How will online students in a course allowing student choice in assignments distribute their work among the offered assignment categories?"

There are some interesting findings regarding how the students chose to distribute their work amongst the assignment types. In Instructor A's course, the category with the highest percent completed was the quizzes category, at 95%, which is not surprising as the quizzes were required. Per the syllabus, if a student did not complete a required quiz, it would result in dropping a letter grade for their final course grade. The next highest percentage in Instructor A's course was in the category of slide presentations (65%), followed by discussions (63%), and critical thinking questions (60%). The games category was at 43%, followed by interview of professional (33%), and topic papers and video presentations (both at 27%). The lowest categories were projects (19%) and wikis (14%), both of which only had one assignment offered per category during the course.

Some areas of note were the high completion position of discussions. Online discussions are often anecdotally complained about by students as tedious, and yet when given the choice, 63% of discussion assignments in this course were completed by students. Of the game-based assignments offered, 43% were completed. For these assignments, students were asked to create a review game based on a topic from the week; they also had the opportunity to play review games created by their classmates. Based on literature surrounding the benefits and advantages of gamification in the learning environment, the instructors expected a bit of a higher completion rate for this category. Lastly, it was surprising that projects came in at only 19%. However, there was only one project offered in week 8 (the final week) of the course. This project is typically offered as a type of "final project" or capstone in the traditional version of the course. Projects have been well received in the past, but choosing to offer a larger project in the final week of this particular course with this new grading structure may have impacted students' willingness to take on a larger project-based assignment. Many students had already earned enough points to pass with an A before the final week of the course. In future iterations, the instructor would choose to offer more projects and place them throughout the different weeks of the course.

In Instructor B's course there were also some interesting findings. The category with the highest percentage, at 85% was the weekly quizzes. As noted earlier, this was the only required activity that the students had to complete. A failure to complete even one quiz would result in a student losing a letter grade. The next highest percentage in Instructor B's course was interviews of a professional (57%), followed by video critiques (45%), where students were required to find a video on a topic listed in the weekly readings. They were to post the video and critique the information. The next highest category was podcasts (27%) where students created a lesson of the weekly material followed by games at 25%. It is interesting to note that discussions came in at 23%. As noted earlier, discussions usually are what students often complain about the most when it comes to online courses. It was noted early in the course that students preferred answering the discussion questions. Instructor B decided to eliminate the discussions after the first three weeks to see what else the students would choose as options. The next highest category was slide presentations at 19% followed by traditional

assignments and video presentations (both at 18%), and lastly wikis came in at 6%.

The percentage breakdown by assignment type can be seen in detail in Table 4.

Assignment Type	% of Assignments Completed – Instructor A	% of Assignments Completed – Instructor B
Critical Thinking Questions	60%	N/A
Discussions	63%	23%
Games	43%	25%
Interview of Professional	33%	57%
Podcasts	N/A	27%
Projects	19%	N/A
Quizzes (Required)	95%	85%
Slide Presentations	65%	19%
Topic Papers	27%	N/A
Traditional Assignments	N/A	18%
Video Critiques	N/A	45%
Video Presentations	27%	18%
Wikis	14%	6%

Table 4: Percentage of Assignments Completed by All Students per Course by Assignment Type

Student Feedback
Based on the grades earned, students did well in this environment. Students also appear to have enjoyed the ability to select the assignments they wished to complete. Student feedback is solicited for all instructors at the university for each course taught during a given semester. These student evaluations allow students a place to write in anonymous comments to the instructor regarding the course, noting what they think the instructor had done well and what could be improved to make the course more effective. Instructors cannot view these course evaluations until after final grades have been submitted. For Instructor A's course, there were several comments that were very positive about the choice in assignments highlighted in the section asking what was done well:

"I liked the way the assignments were offered to the students. It put less pressure on us because we got to choose what we wanted to do instead of being forced into something."

"Giving us a variety of assignments each week. Giving us more than enough attainable points each week to achieve an A+."

"Many different types of assignments were available to do, which made the course much more exciting."

"I loved the a la carte type of assignments. Helped with learning and not being bored with the material. It also gave a sense of control."

One comment in Instructor A's course for improvement was:

"Change the grading system in a way to avoid the zeros for undone optional assignments."

This referred to the fact that Instructor A filled in a score for all assignments; so even if a student chose not to do an assignment, they received a zero. This appears to have been disappointing to at least one student and could be an issue to change in future courses.

Instructor B had similar feedback from the students. The students especially liked that they could choose assignments that best fit their learning style. Some comments included:

"I liked that I could pick assignments that fit how I like to learn. Creating games was fun, but creating podcasts was my favorite. Believe it or not, I actually learned more in this class than many other classes because I had a chance to teach."

"This class was fun and gave students a creative way to learn."

"I wish that the university would have more classes like this. I especially liked choosing the type of assignment."

"I was able to earn an A completing assignments at my speed. Having the choice helped a lot. If I saw that I needed more points for an A, I completed another assignment."

7. CONCLUSIONS

In this study, the authors analyzed the results of two online courses where they introduced student choice in assignments. They respectively implemented a variety of optional assignments to meet the learning objectives for each week of the courses. More assignments were offered than were needed to earn an A grade in each course. The assignments offered also spanned a

variety of types that would appeal to different student learning styles, such as creating videos and podcasts, writing papers, interviewing professionals, hands-on activities, building collective content in wikis, and developing their own games to review course material and playing games created by classmates. This allowed students to choose, a la carte, the types of assignments that they wished to complete to meet the learning objectives while appealing to their own learning styles and interests. This type of system has been referred to as cafeteria-style grading (Arendt et al., 2014).

Results indicated that students did well in this learning environment, with an average grade of B in both courses. In addition, there were 21 students in each course, and in both courses, 10 students chose to complete more assignments than were necessary to earn an A. The authors feel that this result is perhaps one of the best indicators of success in terms of student engagement within the courses, and this finding is also consistent with results found by Arendt et al. (2014) and Hanewicz et al. (2017).

In regard to assignment types, students did choose to complete a variety of types of assignments, ranging from those requiring writing skills to audio and video presentation skills to creative design and organization skills needed for developing slideshows. An interesting finding was that despite anecdotal remarks from students complaining about online discussion assignments, 63% of discussion assignments offered in Instructor A's course were completed. Presentations are another type of assignment that are typically disliked or feared by many students. However, 27% of the video presentations offered in Instructor A's course were completed by students and 27% of the podcast assignments were completed in Instructor B's course. Another interesting finding was in the category of games. A total of 43% of game assignments were completed in Instructor A's course and 25% were completed in Instructor B's course. These assignments required students to create games to review specific course material assigned for the week. They also allowed the opportunity for classmates to see and play the games created. While a good percentage of these assignments were utilized, the instructors were surprised that they were not more universally accepted by students due to the popular nature of gamification in learning. This may be due to the fact that the requirement included the creation of a game rather than simply the playing of one.

Anonymous student reviews of the courses were overwhelmingly positive in response to the a la carte style of assignments and grading. Further refinement of assignment types and offerings may prove to have even more benefits. Overall, the authors feel that cafeteria-style grading is a useful tool for creating a more active learning environment in online courses.

However, the authors note that the small sample size in this exploratory research is a limitation, and further studies are needed to fully understand the impacts of allowing student choice in assignments for online courses. Similar studies with larger samples would be helpful. Future studies may also wish to directly survey students taking such a course regarding their thoughts on assignment choice in regard to engagement.

9. REFERENCES

Arendt, A., Trego, A., & Allred, J. (2014). Students reach beyond expectations with cafeteria style grading. *Journal of Applied Research in Higher Education, 8*(1), 2-17.

Bigatel, P., Ragan, L., Kennan, S., May, J., & Redmond, B. (2012). The identification of competencies for online teaching success. *Journal of Asynchronous Learning Networks, 16*(1), 59-77.

Drago, W.A., & Wager, R.J. (2004). Vark preferred learning styles and online education. *Management Research News, 27*(7), 1-13.

Fish, W., & Wickersham, L. (2009). Best practices for online instructors: Reminders. *The Quarterly Review of Distance Education, 10*(3), 279-284.

Gold, S. (2011). A constructivist approach to online training for online teachers. *Journal of Asynchronous Learning Networks, 5*(1), 35-57.

Hanewicz, C., Platt, A., & Arendt, A. (2017). Creating a learner-centered teaching environment using student choice in assignments. *Distance Education, 38*(3), 273-287.

Hathaway, K. (2014). An application of the seven principles of good practice to online courses. *Research in Higher Education Journal, 22*, 1-12.

Kahoot! (n.d.). Kahoot. https://kahoot.com

Kapp, K.M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education.* Pfeiffer.

McLeod, S. (2019). *Constructivism as a theory for teaching and learning.* Simply Psychology. https://www.simplypsychology.org/construct

ivism.html

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education, 93*(3), 223-231.

Rusnak Creative. (n.d.). Powerpoint games. https://www.rusnakcreative.com/gameshows

Zapalska, A., & Brozik, D. (2007). Learning styles and online education*. Campus-Wide Information Systems, 24*(1), 6-16.

Editor's Note:

This paper was selected for inclusion in the journal as an EDSIGCON 2020 Distinguished Paper. The acceptance rate is typically 7% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2020.

Appendix

The syllabus statement used for the student choice in assignment courses in this study is provided here. This statement was adapted from Arendt et al. (2014):

How this course works

Selection of assignments to complete:
In this course, assignments are handled differently. Assignments are served up cafeteria-style. This means that you get to choose to do those assignments that appeal to your own learning interests and you do not need to complete all the assignments to get an A grade. Instead, you complete the assignments desired in order to earn the applicable points. A grading scale showing the number of points required for each letter grade is available in the syllabus and also in Blackboard. There are more points offered than what is required for an A. This gives you many options for earning your grade. You can do the amount of work you want to try to achieve the grade that you desire.

Required quizzes:
The only assignments that will be strictly required are the course orientation quiz in week 1, and weekly quizzes covering the reading assigned for that week. These items will be clearly marked as required   in   Blackboard.

Due dates for assignments:
Once an assignment's due date has passed, that assignment is no longer an option to complete. Period. You cannot resubmit or revise an assignment after its due date has passed. Further, you cannot resubmit or revise an assignment after it has been graded.

Plugin-based Tool for Teaching Secure Mobile Application Development

A B M Kamrul Riad
aislamri@students.kennesaw.edu

Md Saiful Islam
Mislam16@students.kennesaw.edu

Hossain Shahriar
hshahria@kennesaw.edu

Chi Zhang
czhang4@kennesaw.edu

Maria Valero
mvalero2@kennesaw.edu

Sweta Sneha
ssneha@kennesaw.edu

Kennesaw State University
Kennesaw, GA

Sheikh Ahamed
Sheikh.ahamed@marquette.edu
Marquette University
Milwaukee, WI

Abstract

Mobile device security has become increasingly important in mobile computing. Since the mobile devices and applications are growing rapidly, the security threats are intensified due to mobile app flaws and lack of security consideration in early stages of software development. The unsecure software development process creates a serious weak path that causes potential malicious attacks in mobile devices. To mitigate the mobile threats, it is essential for application developers to follow secure code development processes to alleviate data leakage or access control vulnerabilities. Secure Mobile Software Development needs to be emphasized and adopted for reducing security vulnerabilities. In this paper we present a development tool of secure code analysis for mobile application development. The tool is designed to find the security leakage of static code and implementation of plugins such as Droid Patrol. The proposed code analysis and design procedure in the early stage of application development can eliminate the weak security path in coding. Our experience of running the plugin in classrooms are discussed and student feedback are provided.

Keywords: Android, Secure software Development, SQL injection, IoT, Static analysis, data flow, secure coding.

1. INTRODUCTION

As mobile devices become ubiquitous, numerous major cyber-attacks, stolen sensitive information, unauthorized credit card transactions and security concerns have been reported (Meng et al., 2018). Android application is in the most vulnerable position in malware collection, where two or more malicious apps associate together for target attacking. With the conventional attack detection, each individual app may use the flexible inter-app communication infrastructural support, so called Inter-Component Communication (ICC). However, potential leak may not be able to be tracked by ICC detection. (Elish et al, 2018; Tian et al., 2018). Android devices has a big share of the global smart devices market. There are about 2.2 million apps in Google Play Store and around 1.5 million apps are free. These free applications may have a dark side because the application codes may not be built with consideration of security that may lead to the potential malicious data flows (Tian et al., 2018).

Therefore severe data breach are found in mobile devices including health monitors and trackers when these health devices communicate with the databases. The data security and privacy are serious concerns. The vulnerabilities are due to poor security code, firmware system in the software, and malicious code injected while devices are connected to the apps (Zhang et al., 2020). In 2017, a popular virtual keyboard app leaks 31 million user's personal data because its database was not protected with a password, and Android users around the world were affected (Whitaker, 2020). Also, the analysis of the recent cyber-attacks in financial and healthcare organizations indicates that secure software development is important to protect the widespread cyber-attacks.

There are not many security measurements and tools that application developers use to ensure the essential data protection. Various apps for keeping Coronavirus test and diagnoses have been available to be downloaded since COVID-19 pandemic started. EFF (Electronic Frontier Foundation) warns COVID-19 tracing apps pose security and privacy risks. Despite that Google and Apple have transparent security and privacy policies, industries stakeholders along with security scientists warn the potential security threats that developer must take higher technical measures and tools while developing software applications. Currently smart devices are unable to verify any Proximity Tracking System (PTS) that checks a public database of keys against Rolling Proximity Identifiers (RPIDs) on a user device (Davis, 2020).

Most mobile security vulnerability should be addressed and fixed in the software development phase. In general, the security threat and vulnerability can be reduced during the application development phase. But such an effort to develop secure code requires ground support and tools from both educational institutions and training communities (Shahriar et al., 2019). Four most prominent Integrated Development Environments (IDE): Eclipse, IntelliJ IDEA, Visual Studio and Netbeans, help developers check for security flaws and determine input-validation-related vulnerabilities in code. Android Studio provides FindSecurityBugs plugin which analyzes the static byte code to look for bugs in java code from within IntelliJ IDEA and Findbugs, a security detect detection tool for java code, is used for static analysis to look for more than 200 bugs patterns such as recursive loops, null pointer differences, bad uses of java libraries and deadlocks. Android Studio plugin specializes in finding the static code bugs and inconsistency of code structure to ensure the code quality from the application development stage (Baset & Denning, 2017; Pfeiler, 2020).

However, there is not a code analysis tool that can automatically identify all the security flaws in the source code for developers to analyze vulnerabilities and security bugs in the initial phase of the mobile software development. In this paper, we design and implement the DroidPatrol which is an integrated plugin with the Android Studio to perform tainted data flow-based static analysis. DroidPatrol is the build in plugin in Android Studio for Intellij IDEA that allows code developers to identify a list of source code and sinks so developers can see the possible leak path within the source code and manipulate the related bugs to fix (Talukder et al., 2019).

We organize our paper as follows. In Section 2, we provide background and relevant work, in Section 3, we analyze the mobile application architecture and threat, in Section 4 we provide DroidPatrol tools model overview that including DroidPatrol architecture, features, Data leak detection test and analysis result, Section 5, we provide conclusion and future work.

2. BACKGROUND AND RELATED WORK

In recent years, several research for Android app analysis technologies have been proposed. In this section we consider background code analysis into two parts: i) static code analysis and ii) dynamic code analysis. Static code analysis generally conforms to coding standards without executing the program and dynamic code analysis provides a real or simulated environment where apps can be installed virtually (Talukder et al., 2019; Ashfaq et al., 2019).

Static code analysis generally conforms to coding standards without executing the program. The main advantage of the static analysis is the control-flow and data-flow analysis. Control flow helps identify the possible execution path of the target app and data flow analysis can specify the possible predicted values of variables at the location of execution of the target app (Fan et al., 2020). For example, StubDroid (Arzt & Bodden, 2016), is a method for automatically generating correct and precise models for android applications using precise and extendable inheritance capabilities. StubDroid approaches the inferring library specification from binary distribution that can handle callbacks, a library method invokes client code. FlowDroid is an open source Java based static analysis tool that can detect the potential data leakage in source code of an Android application. While FlowDroid tool can detect and analyze data flow in the full lifecycle of the application development phase, it is not a highly potential data security tool that can detect the common security bugs in Android applications such as intent leakage, SQL injection, output encoding for secure communication (Shahriar et al., 2019; Talukder et al., 2019).

DroidSafe (Mumtaz, & El-Alfy, 2017) detects Android capability leaks to uncover the malicious code using Control Flow Graph (CFG) and static taint analysis. CFG can track data flows from source to sink and helps security analysts to assess the effectiveness of information leakage. Compared to other tools such as FlowDroid and IccTA, DroidSafe can detect the significant number of malicious information flaws approximately 69 malicious whereas FlowDroid and IccTA can detect only six malicious flows. DroidSafe still suffers from imprecision due to unacceptable numbers, false positive alarm and silent mode that may leave errors uncovered.

TrustDroid (Zhao, & Osono, 2012) is a taint tracking static code analyzer that statically performs semantic analysis of a compiled Android application (APK file). It can determine the leakage of sensitive information in two modes: i) off-line mode while analysis of the static resources and the performance indicates no such problem ii) real-time mode, it is reliable in considering the performance of the algorithm in terms of speed and battery/resource consumption. TrustDroid analyzes the byte code by searching the entries that manipulate sensitive data information source code marked as tainted with taint tag so the data is manipulated by bytecode when this tag propagates. If tainted data flows out through a predefined taint sinks such as network interface, the flag is created and a function is called for the process of copying one variable to another variable or to another memory location.

TaintDroid (Enck et al., 2010) is an implementation of dynamic taint analysis for Android applications, an extension of Dalvik virtual machine (DVM) to optimize efficient storage and memory-mappable execution memory, battery life and performance. It also protects sensitive user information from untrusted code that shares the limitation of dynamic taint analysis. TaintDroid uses the concepts of taint sources from which sensitive information e.g, text message, IMEI, GPS data or picture and contact information from mobile devices are obtained. TaintDroid issues a potential warning to the users when tainted data reaches a taint sink. On the other hand, TaintDorid's performance overhead occurs due to application wait state and heavyweight operations (Beal 2020; Babil et al., 2013). To minimize the overhead performance, TaintDroid only tracks explicit data flow but does not control flaws (e.g., implicit flaws). Full traffic control flaw requires static analysis, a challenge for third-party applications. Only direct control flaws can be tracked dynamically if taint scope is determined. In addition, TaintDroid creates significant false positives if the tracked information contains configure identifiers.

Although static analysis is faster than dynamic analysis for comprehensive code coverage in analyzing the apps for exploring different execution paths, it is not effective on dynamic loading where dynamic analysis is useful for runtime behavior of java code. As TaintDroid cannot handle dynamic payloads to run the native code level, DroidTrace (Zheng et al., 2014) can monitor and detect the behaviors of dynamic payloads. In addition, DroidTrace can

use Process Trace (Ptrace) to monitor the system calls of the target process while running the dynamic payloads. DroidTace is also compatible with different hardware platforms without restoring emulation.

Cuckoo Sandbox (Jamalpur et al., 2018), a widely used malware analysis tool based on dynamic analysis, runs applications under test in a control emulator, such as virtual platforms Virtual box, VM ware and KVM on Windows, Linux, and Mac. Cuckoo sandbox provides a flexible solution for malware detection while writing code in notepad and executing files in a virtual platform where the cuckoo agent acts as a communication medium between the cuckoo host (actual network) and cuckoo guest (operating system). It chooses the guest and uploads code samples when the host launches a new analysis and generates a complete report based on a series of tests made during execution of the malicious code sample.

In Secure Mobile Software development, many Android plugin tools emerge in recent years. For the Application Security IDE (ASIDE), Eclipse IDE extension and plugin help warn developers of potential vulnerabilities and helps detect potential bugs and fix the code quality issue during development. SonarLint (Vermeer, 2019) is an Eclipse IDE plugin that provides instant feedback for the most commonly used languages including Python, JavaScript and Java. The Snyk (Vermeer, 2019) plugin for Eclipse can scan the code dependencies with dependency trees and can check vulnerabilities with suggesting possible fixes. The most significant feature is an integrated view that provides the origin of vulnerabilities and how many layers deep. The plugin also provides the link to Snyk website when vulnerability is found and its severity that helps developers to make secure code for apps developing. However, Eclipse plugin tools do not support Android Development Studio.

3. ANALYSIS OF MOBILE APPLICATION THREATS

The main concern of mobile applications is vulnerability. Most of these applications have a client server architecture. The server side component is a web application that interacts with mobile clients through Application Programming Interface (API). Although the mobile OS has various security mechanisms, errors made by developers in designing and writing code for the mobile application caused loopholes in user data protection which may be exploited by attackers. The common attack scenario is malware infection that escalates the administrator privilege (root or jailbreak) when malware requests permission to access user data and sends data to the attackers if granted. Figure 1 shows how the client server interacts with app distribution platforms through mobile devices (Positive Technology, 2019).

Figure 1. Client–server interaction in a mobile application

The maximum risk level of vulnerabilities occurs in both client and server. 60% of vulnerabilities occur from client server; 89% of vulnerabilities are the exploited without physical access, and 56% of vulnerabilities are exploited without administrative privileges such jailbreak or root access (Positive Technology, 2019). In general, android applications contain more vulnerabilities than those applications are written for iOS (43% vs 38%) but the difference is not significant and the overall apps security level for both are roughly the same (Figure 2).
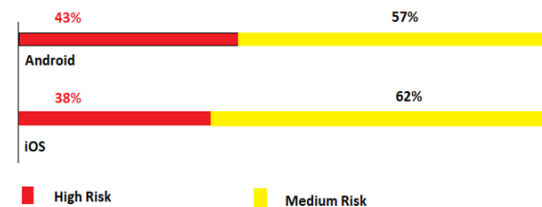

Figure 2: Maximum risk level of vulnerabilites (percentage of client-side components)

Figure 3 shows the statistical trends of the percentage of web applications that contain high risk vulnerability from 2015 to 2019. It shows the high risk vulnerabilities fall significantly by 20% compared to that in 2015 (Positive Technology, 2019).
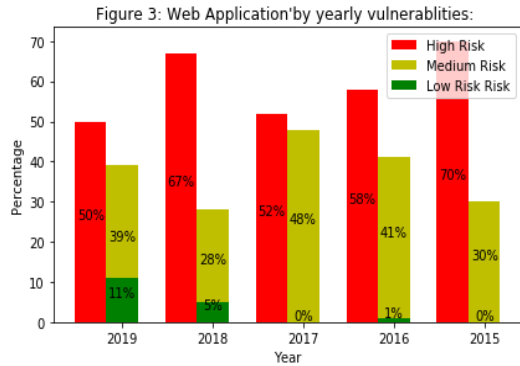
Figure 3. Website by maximum severity of vulnerabilities

This indicates that the percentage of sites containing server vulnerabilities gradually reduces, showing the consistency of improvement of web application security in the last five years.

The security threat is approached on a regular basis in web applications that cause severe financial losses at various levels of Financial Institutes, IT, manufacturing, Telecom and Government. Many organizations from private to the government rely on web apps for their regular business transactions and customers' access of the relevant information. Such communication and payment activities are the target for cyber- attacks and many attempts to access the application server due to the poor code security patches configured in the application development phase. Figures 4 and 5 (extracted from (Statista, 2019) show the vulnerabilities in organizations and the most common causes of security threats and malicious attacks.
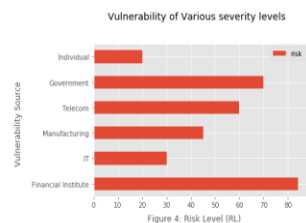
Figure 4 shows the vulnerability risk levels faced by organizations. For example, financial institutes are at high risk for cyber-attack at above 80%, and government institutes are in high-risk vulnerability too (70%). Figure 5 shows the web application vulnerabilities in which SQL injection is the major security threat globally. 42% of the threats are carried out through SQL injection, 19% are caused by
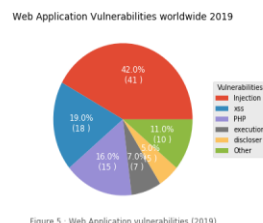
cross-site scripting, and 16% by PHP vulnerabilities (Statista, 2019). Since Android has a complex system in both inter and intra application for sending and sharing data, the static analysis usually is limited to detect the malicious application due to build in application (e.g., Intent object broadcast which can be intercepted by malware running on the same device). Informed by the prior studies, we propose an Android Application tool, DroidPatrol, which offers more features to analyze static code for detecting the known Android security bugs based on OWASP guidelines.

4. DESIGN OF DROIDPATROL

We divide the DroidPatrol model into four parts: i) design of DroidPatrols, ii) features of the plugin iii) test Data leak detection: SQL injection, and iv) results from analysis. The basic code analyses focus on the possible malicious injection. The main idea is that DroidPatrol first uses static analysis to discover functions of dynamic loading behavior. For user apps and detection technique, there exist four steps:

DroidPatrol is an open source plugin for Android applications which can detect resource leakage during the application development phase. It analyzes two apk bases: source and sinks by the developer. It generates a call graph between the source and sinks that produces the output of leakage data. Since the Android application is based on Java, we use the static analysis library APIS which basically is Soot as a static analyzer for java-based applications. DroidPatrol requires two dependency libraries for jar files i) an android jar ii) an analysis-jar.

Figure 6 : Architure of DroidPatrol
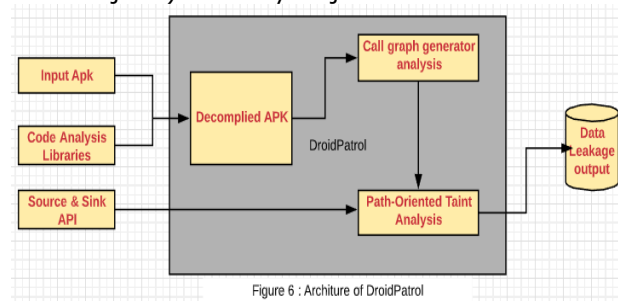
Figure 6 shows the basic architecture of Droid patrol that depicts the workflow on an apk file. The input apk is basically app-debug.apk file. DroidPatrol decomposes the apk and Code Analysis Libraries (DroidPatrol _Aanlyzer.jar and DroidPatrol_Android.jar) files, source and sink API declarations in text files. Then DroidPatrol decompiles the apk and generates a call graph and path. Finally, it generates a list of tainted data leakage output for users.

DroidPlatrol plugin applies tainted data flow analysis of android application with Tainted data flow analyzer. It intends to identify Android application security bugs based on Open Web Application Security Project (OWASP) to allow developers and security teams to use the resources they need for developing secure mobile applications. The application developers need to understand the security risks faced by the mobile apps globally. OWASP provides ten guidelines for developers to build secure applications and incorporates essential coding practices (Android Studio, 2020; Basatwar 2020). Figure 7 highlights the top 10 security risks that needs to practice by developers for application development phase.
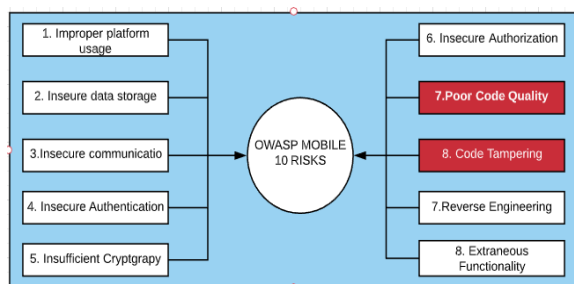
Figure 7: 10 Risks for mobile application development

The DroidPatrol plugin minimizes the mobile application security risks for SQL injection, unintended data leakage, and insecure data storage vulnerability. Diagram 1 shows how the data flow leakage from the source and sinks for extraneous functionality, improper platform usage, extraneous functionality, insecure data storage, insecure authorization and insecure communication.

Diagram 1: Data Flow Leakage Ditector Structure
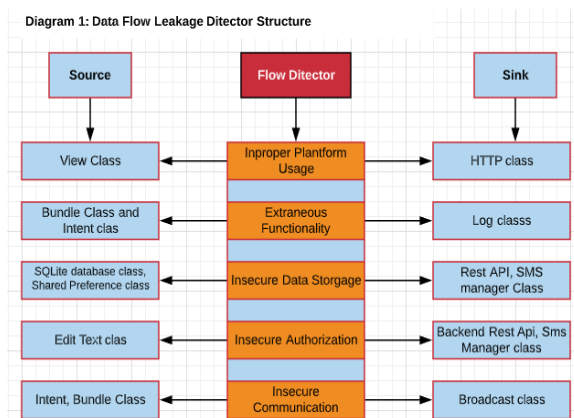
DroidPatrol can manage the SQL injection and data leakage vulnerability in mobile applications that are under security threat from cyber criminals who pass the potential malicious injection. DroidPatrol can create the flag warning

to the developers in the code line. Application developers can maintain the secure code for the development by following OWASP guidelines. A build package can also be loaded into the Android Studio IDE, which results in parsing Android java source code to identify specific API calls and guide the code to replace what causes the potential vulnerability in the application development phase. A build package can also be tested into the Android Studio IDE, which will result in parsing Android java source code with notifying the potential code vulnerabilities, identifying the specific API call and suggesting the secure code replacement.

5. EXAMPLE MODULE USING DROIDPATROL

In this section we analyze the web application vulnerabilities worldwide in 2019. It shows that the SQL injection is the major security vulnerability that leads to many data leakage from the user end. SQL injection is a code insertion technique in which is used to attack data driven applications. The malicious code is inserted by cyber-hacker to normal SQL statements to dump content from the database. The SQL injection exploits security vulnerabilities of the mobile application such as taking use of user input to embed to malicious code to a hard code SQL statement. The method of SQL injection takes into many forms that consists of i) Incorrectly filtered escape characters, ii) Incorrect type handling. The DroidPatrol tools that we developed can be found at:
1.https://sites.google.com/site/droidpatrolproject/sql-injection/pre-lab?authuser=0
2. https://github.com/saiful-sdsl/ResearchProjects/tree/master/DroidPatrol

Incorrectly filtered escape character form occurs if user input is passed to a SQL statement without filtering escape character. The following is the example showing how this type of SQL injection takes place.

```
$statement = "SELECT * FROM users WHERE username = '$user' AND password
              '$password' ";
```

This type of SQL statement is passed to a function which in turn sends the string to the connect data where it is parsed, executed and returns the results:

```
#Define POST variables
uname = request.POST['username']
passwd = request.POST['password']

#SQL query vulnerableto SQLi
sql = "SELECT id FROM users WHERE username='"" + uname + "' AND password='" + "'"

#Execute the SQL Statement
database.execute(sql)
```

If input is not sanitized properly but the application, the attacker can easily insert crafted value as input as following SQL statement possible to be injected:

```
$statement = "SELECT * FROM users WHERE username='wanqing' OR '1'='1' '--'
              AND password = 'wanqing'";
```

The attacker input contains two parts:

1. OR '1' = '1' is a **condition** which will be always **true** and it is accepted as a valid input by application
2. "- -" (Double hyphen) instructs the SQL parser that the rest of the line is a comment and it should be executed.

When the query is executed, the SQL injection removes the password verification, so the injection bypasses user authentication resulting in the whole database returning as the invalid input always returns true. In this way, the consequence becomes a successful SQL injection attack (Choudary, 2020; Droidpatrol, 2020).

Incorrect type handling injection is the same type of implementation of incorrectly filtered escape character, but injection takes place without appropriate type checking. There are many other forms of SQL injection, in which an injection is executed by prematurely terminating a text string and appending a new command.

The DroidPatroltool we developed tests data flow analyses to determine the tainted data flow from every possible point of access. As we defined the sources and sinks respectively where source means the location to get the data from external input such as user database query. Obtaining data from source can be transferred to a third party via SMS messaging. Figure 8 shows the sources as database Cursor object which allows to retrieve data. SmsManager is used to require SEND_SMS permission which is the sink list. Figure 8 shows the Source and sink process.

Figure 8 : Source and Sink process

The DroidPatrol tool provides a data flows list where information flows between source and sinks. We ran the analysis to build the apk first from the menu in the top right corner where it shows the plugin named Droid Patrol. Under the

DroidPatrol the button is a command called Eye which is the code vulnerabilities analyzer.
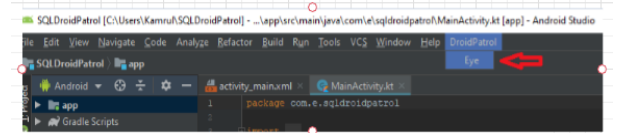
Figure 9: DroidPatrol Analyser

We prebuilt DroidPatrol "source" and "sink" files that require the process of code analyzer. The following steps are executed in the analysis process when the Eye analyzer starts in DroidPatrol. The pop-up window asks the Drive name for analyzer and android jar files. It then asks for the files that contains pre-build **SourcesAndSinks** txt file which creates the Android project folder. The text files are:

*<android.app.Activity: android.view.View findViewById(int)> -> _SOURCE_*
*<android.database.sqlite.SQLiteDatabase: android.database.Cursor rawQuery(java.lang.String,java.lang.String[])> -> _SINK_*

After analyzing the files, the DroidPatrol shows the result with 0 leaks. Therefore at the next step, we change the code in the source and sink files and the test run shows the following output: the application one data leak from input field to SQLite database query. Figure 10 shows the process of analysis by DroidPatrol.
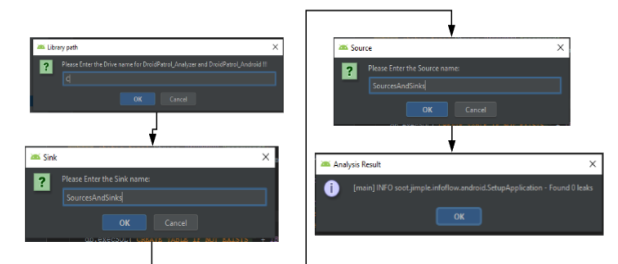
Fig 10 : DroidPatrol Analysing process

The next screenshot contains one data leak from the input field in the SQLite database query.
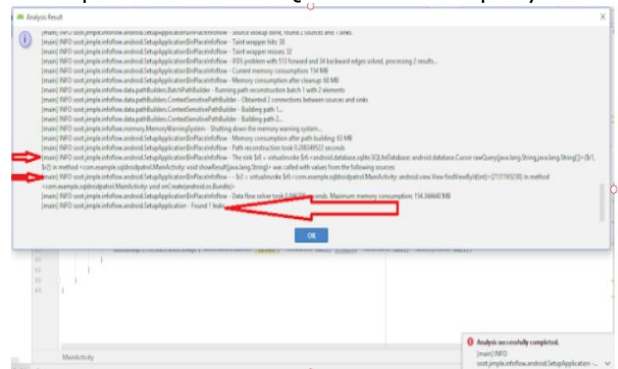
6. STUDENT FEEDBACK

We integrated the DroidPatrol hands-on module in three courses in the summer 2020 term: IT 6513 (Electronic Health Record and App Development), IT 6843 (Ethical Hacking & Networking Security), and IT 3503 (Foundations of Health IT). To assess the effectiveness of the DroidPatrol materials and hands-on exercises, we collected student feedback. The key questions driving the survey are: What are students' knowledge levels of the specific technologies? Did the materials help students learn about the topics/technologies for analyzing application security? Did each new exercise help?

The survey was created in the University's Qualtrics system. Students were provided the link to the survey and they completed the survey online. Five questions to assess students' learning are included and the responses were collected using the Likert scale that uses a 5-point scale, 1 (Highly disagree) to 5 (Highly agree).

Q1. I like working with this hands-on labware.

Q2. The hands-on labware helped me understand SQL injection attack in mobile application and sources/sinks for SQL injection.

Q3. The real-world mobile security threats and attacks provided in the labs help me understand better the importance of static analysis.

Q4. The hands-on labs help me gain authentic learning experience to detect data flow via SQL injection and preventing it.

Q5. The online lab helped me set up the needed environment for monitoring mobile security detection.

The sample size of the survey was 65 for the three course sections. The results show that most students agreed that the DroidPatrol-based hands-on labware enabled them to learn SQL injection and detection by using statics analysis. The plugin tool also helped them prevent the data flow through SQL injection.
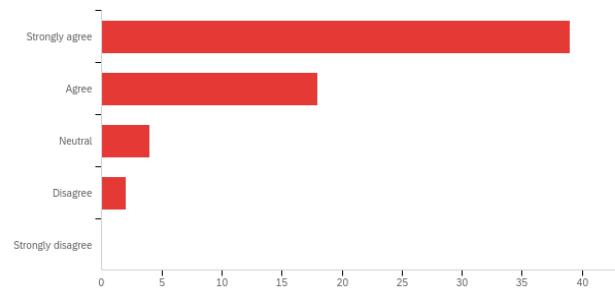
Figure 11: Survey results of Q1
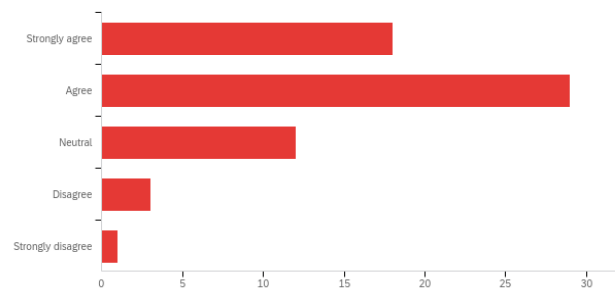
Figure 12: Survey results of Q2
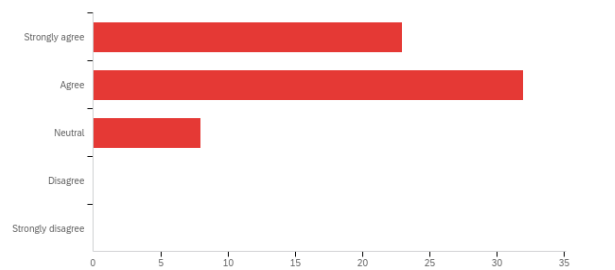
Figure 13: Survey results of Q3
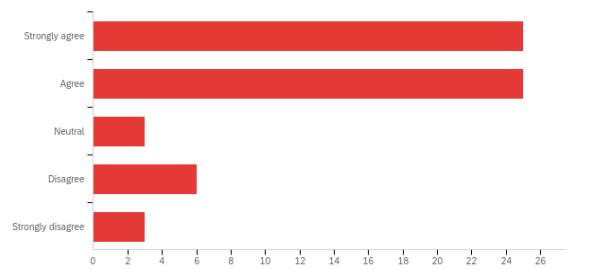
Figure 14: Survey results of Q4

Students also provided comments on their experience of using static analysis plugin tool in the hands-on labware.

- *That is a great start for software developer who can take care of security issues while developing code.*

> - *The lab is great. We need more like this in the future.*
> - *Lab is very good with all the necessary instructions.*
> - *I am taking training on SQL this summer. This lab helped me in gaining more knowledge of it.*
> - *Hands on is the best learning tool.*
> - *I really liked doing this hands-on lab. I think it is easier to learn this way compared to by reading about how to set up an environment or prevent an SQL attack.*
> - *I liked the variety of attacks in this lab.*

The survey shows that students are interested in learning by doing, and the plugin-based tool helps student learn developing secure mobile applications.

7. CONCLUSIONS

Currently, there is no available plugins for Android Development Studio that can be integrated for static data flow analysis. In this paper, we analyzed mobile application threats and applied a test method to find the data leakage through the DroidPatrol plugin that we developed, based on OWASP security risk analysis and guidelines. We plan to make the DroidPatrol as an open source plugin tool for application developers. The tool can perform tainted data flow analysis of applications that would help developers to detect various security bugs in static code currently leading to a number of privacy and data leaks. In addition, DroidPatrol helps developers to flag the code alarm that would be vulnerable for application.

ACKNOWLEDGEMENT

8. REFERENCES

Ashfaq, Q., Khan, R., & Farooq, S. (2019). A Comparative Analysis of Static Code Analysis Tools that check Java Code Adherence to Java Coding Standards, Proc. of 2nd International Conference on Communication, Computing and Digital systems (C-CODE), pp. 98-103, doi: 10.1109/C-CODE.2019.8681007.

Arzt, S. & Bodden, E. (2016). StubDroid: Automatic Inference of Precise Data-Flow Summaries for the Android Framework, Proc. of 38th IEEE/ACM International Conference on Software Engineering (ICSE), Austin, TX, pp. 725-735, doi: 10.1145/2884781.2884816.

Babil, G., Mehani, O., Boreli, R. & Kaafar, M. (2013). On the effectiveness of dynamic taint analysis for protecting against private information leaks on Android-based devices, Proc. of International Conference on Security and Cryptography (SECRYPT), Reykjavik, Iceland, pp. 1-8.

Baset, A. & Denning, T. (2017). IDE Plugins for Detecting Input-Validation Vulnerabilities, 2017 IEEE Security and Privacy Workshops (SPW), San Jose, CA, pp. 143-146, doi: 10.1109/SPW.2017.37.

Basatwar, G. (2020). OWASP Mobile Top 10: A Comprehensive Guide For Mobile Developers To Counter Risks, https://www.appsealing.com/owasp-mobile-top-10-a-comprehensive-guide-for-mobile-developers-to-counter-risks/.

Beal, V. (2020). Dalvik, Available: https://www.webopedia.com/TERM/D/Dalvik.html.

Choudary, A. (2020). What Are SQL Injection Attacks And How To Prevent Them?, Available: https://www.edureka.co/blog/sql-injection-attack.

DroidPatrol. (2020). https://sites.google.com/site/droidpatrolproject/sql-injection/pre-lab?authuser=0.

Davis, J. (2020). EFF Warns COVID-19 Tracing Apps Pose Cybersecurity, Privacy Risks,Available:https://healthitsecurity.com/news/eff-warns-covid-19-tracing-apps-pose-cybersecurity-privacy-risks.

Elish, K., Cai, H., Barton, D., Yao, D., & Ryder, B. (2020). Identifying Mobile Inter-App Communication Risks, IEEE Transactions on Mobile Computing, vol. 19, no. 1, pp. 90-102.

Enck, W., Peter, G., Byung-Gon, C., Cox, L., & Jaeyeon, J., McDaniel, P., & Sheth, A. (2010). TaintDroid: An Information-Flow Tracking System for Realtime Privacy Monitoring on Smartphones.

Communications of the ACM. 57. 393-407. 10.1145/2494522.

Fan, W., Zhang, D., Chen, Y., Wu, F., & Liu, Y. (2020). EstiDroid: Estimate API Calls of Android Applications Using Static Analysis Technology, IEEE Access, Vol. 8, pp. 105384-105398, 10.1109/ACCESS.2020.3000523.

Jamalpur, S., Navya, Y., Raja, P., Tagore, G., & Rao, G. (2018). Dynamic Malware Analysis Using Cuckoo Sandbox, Proc. of 2nd International Conference on Inventive Communication and Computational Technologies, Coimbatore, pp. 1056-1060, doi: 10.1109/ICICCT.2018.8473346.

Meng, X., Qian, K., Lo, D., Bhattacharya, P., & Wu, F. (2018). Secure Mobile Software Development with Vulnerability Detectors in Static Code Analysis, International Symposium on Networks, Computers and Communications (ISNCC), pp. 1-4.

Mumtaz, H. & El-Alfy, E. (2017). Critical review of static taint analysis of android applications for detecting information leakages, Proc. of 8th International Conference on Information Technology (ICIT), Amman, pp. 446-454, doi: 10.1109/ICITECH.2017.8080041.

Pfeiler, A. (2020). FindBugs-IDEA, Available:https://plugins.jetbrains.com/plugin/3847-findbugs-idea/

Shahriar, H., Riad, A., Talukder, A., Zhang, H., & Li, Z. (2019). Automatic Security Bug Detection with FindSecurityBugs Plugin. Conference on Cybersecurity Education, Research and Practice. http://par.nsf.gov/biblio/10156137

Statista. (2019). Global web application vulnerability taxonomy, Available: https://www.statista.com/statistics/806081/worldwide-application-vulnerability-taxonomy/.

Studio, Android. (2020). Report a bug, https://developer.android.com/studio/report-bugs.

Talukder, A., Shahriar, H., Qian, K., Lo, D., Ahamed, S., & Rahman, M. (2019).

DroidPatrol: A Static Analysis Plugin For Secure Mobile Software Development, Proc. of 43rd IEEE Annual Computer Software and Applications Conference (COMPSAC), Milwaukee, WI, USA, pp. 565-569, doi: 10.1109/COMPSAC.2019.00087.

Technologies, Positive. (2019). Vulnerabilities and threats in mobile applications, 2019, Available:https://www.ptsecurity.com/ww-en/analytics/mobile-application-security-threats-and-vulnerabilities-2019/

Tian, C., Xia, C., Duan, Z. (2018). Android Inter-Component Communication Analysis with Intent Revision, IEEE/ACM 40th International Conference on Software Engineering: Companion (ICSE-Companion), Gothenburg, pp. 254-255.

Vermeer, B. (2019). 10 Eclipse plugins you shouldn't code without, Available: https://snyk.io/blog/10-eclipse-plugins-you-shouldnt-code-without/

Whittaker, Z. (2020). A popular virtual keyboard app leaks 31 million user's personal data, ZDNet. [Online]. Available at https://www.zdnet.com/article/popular-virtual-keyboard-leaks-31-million-user-data/

Zhang, C., Shahriar, H., & Riad, A. (2020). Security and Privacy Analysis of Wearable Health Device, Proc. of 44th IEEE Annual Computers, Software, and Applications Conference (COMPSAC), Madrid, Spain, pp. 1767-1772.

Zhao, Z. & Osono, F. (2012). TrustDroid: Preventing the use of SmartPhones for information leaking in corporate networks through the used of static analysis taint tracking, Proc. of 7th International Conference on Malicious and Unwanted Software, pp. 135-143, doi: 10.1109/MALWARE.2012.6461017.

Zheng, M., Sun, M., & Lui, J. (2014). DroidTrace: A ptrace based Android dynamic analysis system with forward execution capability, International Wireless Communications and Mobile Computing Conference (IWCMC), Nicosia, pp. 128-133, doi: 10.1109/IWCMC.2014.6906344.

Building a Cybersecurity Apprenticeship Program: Early-Stage Success and Some Lessons Learned

Geoff Stoker
stokerg@uncw.edu

Ulku Clark
clarku@uncw.edu

Manoj Vanajakumari
vanajakumarim@uncw.edu
Congdon School

William Wetherill
wetherillw@uncw.edu
Information Technology Services
University of North Carolina Wilmington
Wilmington, NC 28403, USA

Abstract

The United States, along with the rest of the developed world, is experiencing a shortage of cybersecurity talent in the workforce ((ISC)^2,2019). Among the strategies being encouraged and used to close this workforce gap are work-based learning programs like cybersecurity apprenticeships. Well-designed apprenticeships can provide a win-win-win situation for employers, students, and schools. This article describes our experiences to date working to establish a meaningful cybersecurity apprenticeship program. We share the early success we have found as well as some lessons learned.

Keywords: Cybersecurity, Apprenticeship, Work-based Learning

1. INTRODUCTION

Our university was designated in September 2018 as a Center of Academic Excellence in Cyber Defense Education (CAE-CDE) by the National Security Agency (NSA) and Department of Homeland Security (DHS). The CAE designation criteria checklists, which assign points for meeting programmatic criteria, provide credit for existing internships (and, by extension, apprenticeships) related to cybersecurity (Criteria for Measurement, 2019), but do not require they exist for designation if aspects related to providing students access to cybersecurity practitioners and facilitating business/industry collaboration are met in other

ways (e.g. guest speakers/lectures, obtaining curriculum input). However, once designated and immersed in the CAE in Cybersecurity Community, it is clear that internships and apprenticeships are key among the strategies being heavily emphasized for accelerating the growth of the nation's cybersecurity workforce.

The heavy emphasis on internships and apprenticeships is part of the response to the large cybersecurity talent gap that currently exists in the United States and throughout the rest of the developed world. The International Information System Security Certification Consortium (ISC)$^{2®}$ reported in their 2019 Cybersecurity Workforce Study ((ISC)^2,2019),

that a global cybersecurity workforce gap of over 4 million currently exists while a gap of ~561,000 skilled cybersecurity workers exists in North America (up from ~498,000 the year before ((ISC)[2],2018)). While CyberSeek, a project supported by the National Initiative for Cybersecurity Education (NICE), a program of the National Institute of Standards and Technology (NIST) in the U.S. Department of Commerce, maintains a cybersecurity supply/demand heat map that indicates there were over 500,000 cybersecurity job openings listed from October 2018 through September 2019 in the United States ("Cybersecurity Supply and Demand Heat Map," n.d.). The site also notes that openings requesting various common cybersecurity-related certifications typically outnumber current certification holders. For example, the CyberSeek site indicates that there are 84,802 Certified Information Systems Security Professional (CISSP) certification holders vs. 112,428 job listings requiring the certification. Cybersecurity company Tripwire surveyed 342 security professionals for its 2020 Skills Gap Report and noted that 85% of the respondents found it harder to hire IT security staff with needed skills now than it was a few years ago (Tripwire, 2020). Making matters worse, 55% responded that the workers they are able to recruit need extensive training to get them up to speed.

The importance of reducing the gap is recognized at the highest level of the government. On May 2, 2019, the President of the United States signed an executive order (Exec. Order No. 13870, 2019) that included the following in Section 1. Policy. (d) (**emphasis** added):

> The Nation is experiencing a shortage of cybersecurity talent and capability, and innovative approaches are required to improve access to training that maximizes individuals' cybersecurity knowledge, skills, and abilities. Training opportunities, such as **work-based learning**, **apprenticeships**, and **blended learning approaches** must be enhanced for both new workforce entrants and those who are advanced in their careers.

That same day, following the signing of the executive order, all National CAE-CDEs were invited to attend a White House telecon briefing on the order's importance. Apprenticeships were not the only thing discussed, but it was clear that they are to be a key pillar in the effort to strengthen the nation's cybersecurity workforce.

There is extensive literature demonstrating the benefits of work-based learning (WBL) and applied learning for producing work-force ready graduates (Raelin, 1997; Costley, 2007; Lester & Costley, 2010; Brook & Corbridge, 2016). WBL practices help students build on the theoretical knowledge gained in the classroom and integrate theory with its industry implementation by building pathways to careers.

Though internships and apprenticeships are widely recognized as being valuable, well-established plans that layout steps for building a cybersecurity internship and apprenticeship program seem hard to come by. The NICE Apprenticeship Group recently conducted a survey to better understand WBL in higher education. Figure 1 shows the distribution of participating colleges by type where WBL exists in institutions with cybersecurity programs.

(N=94)

- 🔵 A tribal college
- 🔴 A special focus institution-Two year
- 🟠 A special focus institution-Four year
- 🟢 An associate's college
- 🟣 A baccalaureate/associate college
- 🔵 A baccalaureate college/university
- 🩷 A master's college or university
- 🟢 A doctoral university
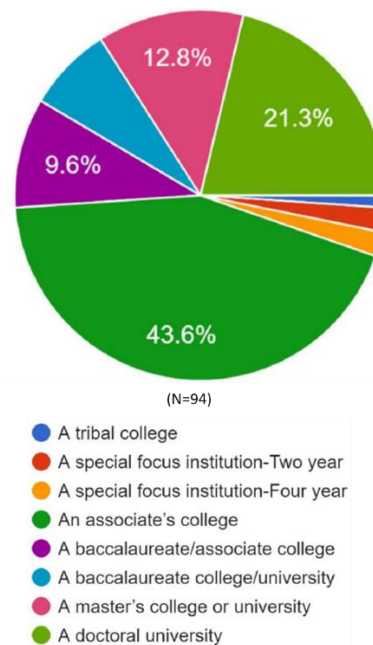
Figure 1 – WBL in participating colleges (by type) with cybersecurity programs (chart from Seshagiri, et al., 2020)

Figure 2 shows the density among NICE suvey respondents of the different types of WBL offered. It is not readily apparent how internship, apprenticeship, and externship were defined, but however defined, apprenticeship programs (20% of institutions) noticeably lag internship programs (78%).

The Department of Labor (DOL) initiated a number of projects to increase the number of apprenticeship programs. Even though there are no federal apprenticeship programs established, there are a few nationally recognized registered apprenticeship programs (RAP) like IBM's New Collar Apprenticeship program. There are a number of motivating factors for companies to partner with education institutes and become a part of a registered apprenticeship program. Some of these are the local labor shortage, opportunity to test potential employees, and access to a pool of qualified workers. Despite these benefits, many companies are hesitant to initiate a program due to concerns, such as, lost productivity for trainers, lack of staff/time/money to be dedicated to WBL, uncertain economic climate, and student knowledge/maturity levels.
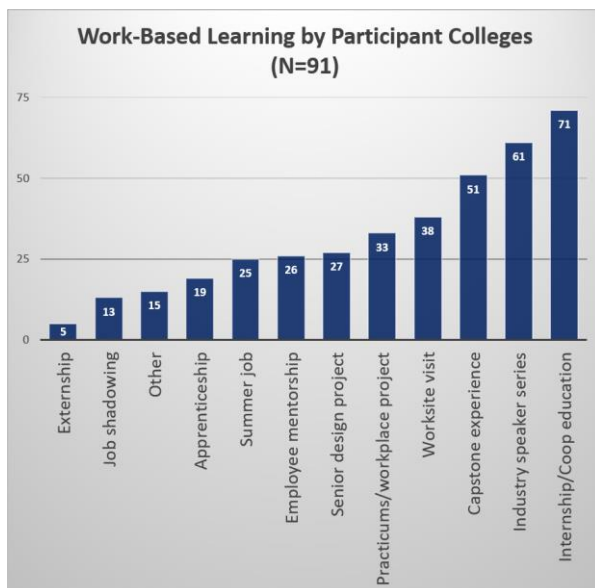
Figure 2 – types of WBL offered by NICE survey respondents (data from Seshagiri, et al., 2020)

DOL RAP's key elements can be summarized as (Jones & Lerman, 2017):

1. Apprentices are full time employees
2. Apprentices need to have at least 2,000 hours on the job training
3. Apprentices need to be paid at least the minimum wage
4. On the job training needs to be a formal and structured training

Recognizing the benefits and challenges of starting an apprenticeship program in a small city that is ~150 miles away from the closest metropolitan area, we have spent the past two years working to build our program and in this

paper, we share the details of some of our early success in the hopes of benefiting the larger cybersecurity education community. Due to the geographical limitations, which impact the number and size of potential recruiters, and hesitation on the part of companies to commit to the minimum 2,000 hours on the job training requirements, we initially steered away from RAP, but still followed some of the key RAP guidelines. Along with our successes there have been missteps as well which we will present more thoroughly in the future.

This paper is organized as follows: section 2 briefly describes the history of apprenticeship in order to establish a working definition for this discussion; section 3 provides details of several of our experiences with organizations and programs that support/promote apprenticeship programs; section 4 presents a reflection of our progress thus far and offers some lessons learned; section 5 concludes the paper.

2. APPRENTICESHIP VS. INTERNSHIP, A QUICK DISCUSSION OF TERMS

Ancient in origin and universal across world cultures, apprenticeship is at its essence, learning by doing (Douglas, 1921). The Code of Hammurabi (King, 2008) from ancient Mesopotamia dating to ~1750 BC includes rules related to the regulation of apprenticeship arrangements:

> 188. If an artizan has undertaken to rear a child and teaches him his craft, he can not be demanded back.
> 189. If he has not taught him his craft, this adopted son may return to his father's house.

Intern, according to TIME® (Haire & Oloffson, 2009), is a term that initially meant a person with a medical degree, but still without a license to practice. Following World War I, it simply meant a physician in training. Politicians subsequently borrowed the word as an alternative to apprentice and now the word often means something like an apprentice, but with differing details which only the speaker may truly understand.

The distinction between interns and apprentices can be somewhat blurry today and the words, when used loosely, are often interchangeable. To generalize the difference, we might say an intern is most commonly understood to be someone working to gain experience and an apprentice might fundamentally be thought of as

someone learning a specific skillset by doing. The purpose and process of the internship might be said to involve surface-level exploration of a possible field of interest in order to "gain experience" while an apprenticeship often involves in-depth, hands-on skill accrual in a selected career. The U.S. Department of Labor (DOL) enumerates six key (general) differences between internships and apprenticeships as follows in Table 1 (Apprenticeship, 2019):

Internship
1. Length:
1-3 months
2. Structure:
Often unstructured with focus on entry-level general work experience
3. Mentorship:
Generally, not included
4. Pay:
Often unpaid
5. Credential:
No credentialing
6. College Credit:
Often granted

Apprenticeship
1. Length:
1-3 years
2. Structure:
Structured training plan with focus on mastering specific skills that an employer is typically looking to fill
3. Mentorship:
Individualized training is provided/ overseen by an experienced mentor
4. Pay:
Paid experience that can often lead to full-time employment
5. Credential:
Often leads to an industry-recognized credential
6. College Credit:
Often granted; sometimes significant

Table 1 – DOL differentiation between internship and apprenticeship.

For the purposes of this paper, we will lean most heavily on the first three points when differentiating between the two.   An apprenticeship is meant to:

1. operate over a longer time horizon (6+ months).

2. focus on gaining skills specific to cybersecurity entry-level occupations (vice general office experience).

3. provide oversight from an experienced cybersecurity professional.

3. APPRENTICESHIP EFFORTS

Overview
In this section, we will detail some of our experiences engaging with various organizations and programs that promote cybersecurity internship/apprenticeship opportunities. These include:

-nationwide bank headquartered locally that specializes in originating business loans guaranteed by the Small Business Administration (hereafter referred to as SBA-Bank).

-specialized cybersecurity and cybercompliance company built to serve the banking community that provides banks and credit unions a co-managed, cloud-based compliance-automated solution that unifies detection, investigation, resolution, reporting, and compliance (hereafter referred to as C&CC).

-national gamified cybersecurity pilot initiative – CyberStart.

Our university is part of a 17-campus system and currently offers 56 baccalaureate, 36 masters, and 4 doctoral degrees to its ~14,700 undergraduates and ~2,700 graduate students. It is located in a city of ~120,000+ and county of ~230,000+ residents.   The Information Technology (IT) degree is an interdisciplinary program offered by the Business School and the College of Arts and Sciences.   The particular curriculum path mapped to the CAE-CDE Knowledge Units (KU) is the BS in IT with Cybersecurity Minor.   There are currently 35 students following this path.

For a little over two years, our faculty, especially those associated with the University's Center for Cyber Defense Education (CCDE), have been working to build a cybersecurity apprenticeship program for the students involved in our CAE-CDE designated curriculum path (IT major with cybersecurity minor). In this section, we will enumerate many of the steps taken during this time in order to illuminate how some fairly innocuous steps end up having a big impact, while other, seemingly promising steps have yet to bear much fruit.

C&CC Apprenticeship
In fall 2017, our Department of Computer Science from the College of Arts and Sciences and the School of Supply Chain, Business Analytics, and Information Systems from the Business School reinvigorated pursuit of CAE-CDE designation by creating a full-time designation committee.   One of many actions

resulting from this effort was that the first cybersecurity subcommittee was created, and a meeting held during the spring 2018 advisory board meeting for our Information Systems (IS)/Master of Science in Computer Science and Information Systems (MS CSIS) programs. Key events from this timeline are enumerated in Figure 3. In the run-up to this meeting, current advisory board members and faculty reached out to cybersecurity professionals from local/regional businesses/organizations to invite them to attend. Among the many who answered the call to advise us in our cybersecurity education efforts was the Chief Information Security Officer (CISO) of SBA-Bank. This nascent organizational effort led directly to the first substantial cybersecurity apprenticeship outcome for our students and largely flowed through the relationship with the CISO.

In the fall of 2018, we were notified of our designation as a CAE-CDE, news we shared with the attendees from the spring meeting and which seemed to help bolster and/or solidify our cybersecurity bona fides with them. By mid-October of 2018, we were able to hold the first cybersecurity advisory board meeting – an outgrowth of the subcommittee meeting from the spring. During that meeting, participants began to speak and brainstorm more broadly about many aspects of our burgeoning cybersecurity program, including potential interactions between local/regional businesses and cybersecurity students. A key outcome of the meeting, which we learned more fully about later, was that the SBA-Bank CISO departed motivated to seek to create more concrete links between the local cybersecurity professionals and our students.

At the spring cybersecurity advisory board meeting in mid-February 2019, we came up with an idea to hold a cybersecurity workshop in April 2019 as an opportunity for local cybersecurity professionals and students to meet and interact. As well, the CISO informed us that he had been working with C&CC, a cybersecurity startup, to create a local/regional security operations center (SOC) and was promoting the idea of establishing an apprenticeship program. A meeting in late February 2019 quickly followed, hosted by the CISO and including members of the leadership of C&CC. At that meeting, representatives from our university, SBA-Bank, and C&CC sketched out a process to explore the creation of a cybersecurity apprenticeship program for our students.

Step one in the process involved using the April 2019 workshop to expose university students to key cybersecurity professionals from local/regional businesses as well as provide an opportunity for those professionals to get a sense of the students. During that workshop, the following sessions were held by representatives from local businesses:

- "Cyber Resilience – How to Respond and Recover During a Breach"
- "Know Thyself: The Art of Risk Assessment and Threat Modeling"
- "Prioritizing Security – How Security is Integrated into the Software Development Lifecyle at an Agile Company"

Figure 3 – C&CC Apprenticeship key event timeline

Step two was a meeting in late May 2019 where the CISO convened a meeting at SBA-Bank with

key personnel from the university cybersecurity advisory board, C&CC and two other local businesses tied to the fintech industry:

   -a software company specializing in delivering an end-to-end bank operating system to financial institutions around the world (hereafter referred to as BankOS).
   -a digital banking services and support company for banks and credit unions (hereafter referred to as DigiSVC).

In advance of the meeting, the CISO laid out our CAE-CDE background, the general apprenticeship idea, and the potential value (win-win-win for students-businesses-school) in setting up a local security operations center (SOC) and staffing it with university cybersecurity students overseen by C&CC cybersecurity professionals. The meeting concluded with strong support from all attendees and a general agreement to move ahead with implementation. SBA-Bank leased building space on their campus to C&CC for the establishment of a SOC to serve SBA-Bank cybersecurity/cybercompliance needs as well as other local/regional customers like BankOS and DigiSVC.

Step three involved SBA-Bank and C&CC visiting our campus in September 2019 to interview about a dozen students, from which they ended up directly hiring a senior (with fairly extensive past work experience) graduating in December 2019 as a cybersecurity engineer and selecting three seniors (May 2020 grads) to participate in the apprenticeship program for six months.

In February 2020, C&CC began a company reorganization which has delayed a second round of apprentice selections (and now further delayed due to Coronavirus Disease 2019 [COVID-19] impacts), but in May, all three initial apprentices were hired full-time as cybersecurity analysts. And, in July, one other student slated to be an apprentice was instead interviewed for and offered a full-time position that starts in August.

CyberStart Apprenticeship
The CAE in Cybersecurity Community sends out weekly digest emails. The digest on October 28, 2019 included in the Recent News section an announcement titled, CyberStart Student Apprentice Workshop and Onboarding NSF. The notice presented an opportunity for 10 universities to attend a workshop at New York University (NYU) Tandon School of Engineering to facilitate implementing a program similar to

one done as a proof-of-concept at Stony Brook University (SBU).

In a March 2019 article, Matt Nappi, SBU CISO, described how he ran a student employment/apprentice/intern program, but that it didn't seem to be attracting candidates from a sufficiently wide pool (Nappi, 2019). So, partnering with the SysAdmin, Audit, Network, and Security (SANS) Institute, he advertised a gaming/pizza party for student participants to find out if they were an "extraordinary problem solver." He emphasized no prior technical experience was necessary and that if the game playing went well, it could potentially lead to a paid apprenticeship with his office. The web banner (Figure 4) is well-crafted to catch students' interest and reach out to those who had not previously thought they may have cybersecurity interest or skills.

Figure 4 – CyberStart web banner

The game, called CyberStart Go, features 12 introductory problem-solving challenges (5 easy, 6 medium, 1 hard) related to subjects like cryptography, forensics, and Linux. For example, one of the medium challenges categorized under cryptography displayed the electronic keypad in Figure 5 and asked players to help determine the four-digit PIN using the fingerprints as a clue. Readers curious about the game can peruse it here: https://go.joincyberstart.com/.
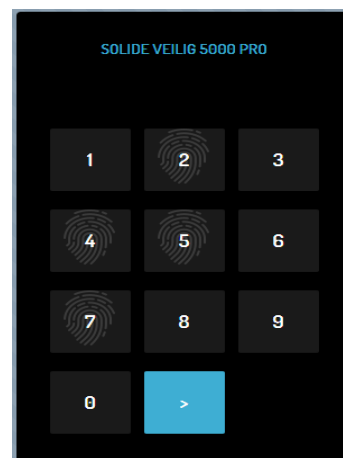

Figure 5 – CyberStart Go medium challenge

What we found compelling about Matt's story was his report that the game-based program generated "a buzz around campus, catching the attention of non-STEM as well as STEM students." Too often students with exceptional problem-solving skills, but low/no tech skills self-select out of cybersecurity-related programs. The CyberStart program strongly appealed to us since we had been looking for ways to excite latent interest, provide affordable (and fun!) IT/cybersecurity fundamentals training in an engaging and easily accessible platform format, and identify those truly interested students for potential engagement as university apprentices/interns and/or student employees.

Partnering with our university's Director of Information Security, we generated the required letter of intent with a brief summary of why we were interested/committed to participate in the program. We submitted the letter in November, heard back that we were selected in December, and attended the workshop on January 9, 2020.

On January 31, 2020 we held the game/pizza party and then left the game open until February 22. Participants who enjoyed the 12 problem-solving challenges could submit an online form noting their two favorite challenges and requesting full access to the game. We had 100 students request full game access. The full game (approximately 300 challenges) could be played until May 31, 2020 at which time elite performers were given tokens to CyberStart Essentials curriculum. Of those who requested full game access, we had 61 students play it to some degree. Elite scorers (about 10 students) completed over 40% of the challenges with the top performer completing 75% of the challenges. These candidates will also have interview opportunities for the apprenticeship program with the Information Technology Services (ITS) – primarily centered about SOC operations which monitor over 300 million network events each day.

The COVID-19 impacts resulted in campus operations being mostly closed since mid-March, so ITS has yet to actually interview and on-board any interns/apprentices.

NICE Apprenticeship Subgroup
The National Initiative for Cybersecurity Education (NICE) has an official working group (NICEWG) comprised of six subgroups that meet independently of the NICEWG. The Apprenticeship subgroup is one of the six and was created to assist anyone interested in learning more about how apprenticeships work in technology occupations. There are no special requirements for joining the NICEWG and the subgroup beyond personal interest. It is a relatively simple matter of sending some emailing requests (Petrella, 2020).

We did not become aware of the Apprenticeship subgroup until early in 2020 and were especially interested in the fact that one of the focus areas was discussion of the steps to building a cybersecurity apprenticeship program. Though we have only participated in the subgroup for a couple of months, it seems likely to be helpful. And, while there is no particular published set of steps advocated for creating apprenticeship programs, the subgroup has turned us on to a couple of initiatives to investigate such as the Inner City Fund (ICF) Cybersecurity Youth Apprenticeship Initiative (CYAI) and IQ4.

The CYAI initiative was launched in June 2019 by ICF with support from the DOL, Employment & Training Administration, Office of Apprenticeship. Their specific goal is to create at least 900 new cybersecurity apprenticeships by the year 2024 by supporting educational institutions wanting to expand the number of cybersecurity registered apprenticeship programs (RAP) serving in-school youth ages 16-21. In addition to providing technical assistance to schools developing cybersecurity RAPs, ICF will reimburse $350 to the apprentice business/sponsor for each new enrolled youth. Participation in this program requires completion of an application cover page and a 1-2 page narrative covering basic information about the apprenticeship program being registered.
IQ4 founded the Cybersecurity Workforce Alliance (CWA) in 2015 with a mission to ramp up the development of the cybersecurity workforce. It provides a workforce platform that offers solutions to students, academia, and industry. For academia they offer internship modules that review the NICE framework. Throughout the program the students investigate each framework function using a case study and present their findings as a cybersecurity consulting firm (each student has a different cybersecurity professional role) to the mentors, who are seasoned cybersecurity professionals that are partnered with IQ4.

4. REFLECTION AND LESSONS LEARNED

Building a cybersecurity apprenticeship program is neither simple nor straightforward. Even with governmental advocacy and a like-minded support community, much of the guidance feels

ad-hoc and efforts seem like discovery learning. After reflecting on our two years of effort so far, we feel we can offer the following lessons learned/recommendations.

Apprenticeship Is Very Valuable

This might be obvious, but it merits explicit assertion. The three students in the first cohort of C&CC apprentices were good students in our classes – diligent, motivated, and conscientious. But, once they were working on real-world problems with real effects and consequences for live business operations their motivation, understanding, and learning all spiked. The increase in the apprentices' ability to link theory, practice, and outcomes became more obvious the longer they were engaged in the program. So, the complexity and difficulty of building an apprenticeship program is worth it, at least so far.

Building An Apprenticeship Program Is Somewhat Like Sales

Building an apprenticeship program seems to resemble the sales process. Though the authors' experience with the sales process is quite limited, as much as we are aware of sales steps that include understanding a customer's goals, challenges, and budget we see parallels in trying to build an apprenticeship program. With the C&CC program, the concept of finding a champion (Weinstein, 2014) was particularly germane. The CISO of the SBA-Bank was clearly the champion with this program and without them, it is not clear we would have had the relationships, credibility, and business process understanding to establish the program as rapidly – if at all. We really do believe the apprenticeship programs can be win-win-win for employers-students-schools, but it is the employers that require the convincing and at the end of the day, it is a bit like sales. While this particular example (bank CISO champion) may not be replicated by readers, we believe the general "sales process" is and recommend approaching the challenge with this mindset.

Identify Potential Apprenticeship Partners

An apprenticeship program is obviously going to need partners from industry, government, non-profit, etc. to provide apprentice opportunities for students. A key aspect of identification is having labor market information for your geographical area. With a report like that, you will be able to identify the companies that are hiring for cybersecurity positions or that are likely to be. Data like annual revenue, industry, current employment, projected employment, etc. can be used as indicators to help you prioritize which organizations you approach with partnership in mind. Some organizations may be obvious fits and could be immediately approached regarding apprenticeships. Others will be better cultivated with invitations to campus cybersecurity events or advisory board meetings to expose them first to university capabilities and allow them to warm to the idea of partnering. Being and staying open-minded is key to finding the people with whom you can create a connection that will potentially lead to an apprenticeship program champion-style relationship.

Prime the Pump

Eventually, we hope to have a robust apprenticeship program in which all students can participate and from which all partner companies will benefit. It became clear during the interview process with the first round of C&CC apprentices that the stakeholders were a bit cautious and really wanted (needed?) a win with the first group. To that end, even with the interviews, they sought a lot of our input regarding the students' hard skills, soft skills, and ability to perform in a team environment. We were much more heavily involved in helping determine students who were a "best fit" than expected. And, while we did not play favorites with anyone, we realized the importance of getting it right with the inaugural group, so worked very closely with C&CC and provided as much relevant information as possible. Recognize with the first steps of a program that you are building trust and reputation. Without these things, the program will likely not last.

Join the NICE Apprenticeship Subgroup

It probably took us longer to discover that this group existed than it should have. Unsurprisingly, there are a lot of benefits to being part of a subgroup with like-minded people. These include networking with other institutions (academic and business) that have apprenticeship programs; learning about DOL apprenticeship updates; and hearing about, as well as getting involved with, new national apprenticeship-related initiatives.

5. CONCLUSIONS

With our world becoming more digital every day, cybersecurity graduates seeking entry level jobs in the US need to be prepared to rapidly translate their academic knowledge into specific skills useful to employers. WBL training gives students the opportunity to implement the theory learned in class to real-world situations

and become workforce ready. The companies that provide apprenticeship programs benefit from the training offered to the participants and have highly skilled hires that are experienced in the specialty areas that they need filled and have previously had a hard time filling. Most companies are not aware of the programs or hesitant to start one due to lack of knowledge, but with the lead of the educational institutions, the companies that have the capacity to start apprenticeship programs can become long-term partners and this relationship would lead to a highly qualified cybersecurity workforce.

6. REFERENCES

Apprenticeship, O. of. (2019, November 13). What is the difference between an apprenticeship and an internship? Retrieved May 22, 2020, from https://www.apprenticeship.gov/faq/what-difference-between-apprenticeship-and-internship.

Brook, C. & Corbridge, M. (2016) Work-based Learning in a Business School Context: Artefcats, Contracts, Learning and Challenges. Higher Education, Skills and Work-Based Learning, Vol. 6 No. 3, pp. 249-260. https://doi.org/10.1108/HESWBL-12-2015-0060

Costley, C. (2007). Work-based learning: assessment and evaluation in higher education, Assessment & Evaluation in Higher Education, 32:1, 1-9, DOI: 10.1080/02602930600848184

Criteria for Measurement (2019). National IA Education & Training Programs Web site. Retrieved from https://www.iad.gov/NIETP/documents/Requirements/CAE-CDE_Criteria_2020.pdf

Cybersecurity Supply and Demand Heat Map. (n.d.). CyberSeek Project Web site. Retrieved May 22, 2020, from https://www.cyberseek.org/heatmap.html

Douglas, P.H. (1921). American Apprenticeship and Industrial Education [Google Books version] Retrieved from https://books.google.com/books?id=uQIwYkwa4cwC&dq=apprenticeship&lr&pg=PA209

Exec. Order No. 13870, (2019, May 2). American's Cybersecurity Workforce. Retrieved from https://www.whitehouse.gov/presidential-actions/executive-order-americas-cybersecurity-workforce/

Haire, M. & Oloffson, K. (2009, July 30). Brief History, Interns. TIME. Retrieved May 22, 2020, from http://content.time.com/time/nation/article/0,8599,1913474,00.html

(ISC)[2]. (2018, October 17). International Information System Security Certification Consortium (ISC)2® Web site. Retrieved from https://www.isc2.org/News-and-Events/Press-Room/Posts/2018/10/17/ISC2-Report-Finds-Cybersecurity-Workforce-Gap-Has-Increased-to-More-Than-2-9-Million-Globally

(ISC)[2]. (2019). Strategies for Building and Growing Strong Cybersecurity Teams, (ISC)2 Cybersecurity Workforce Study, 2019. Retrieved from https://www.isc2.org/-/media/ISC2/Research/2019-Cybersecurity-Workforce-Study/ISC2-Cybersecurity-Workforce-Study-2019.ashx?la=en&hash=1827084508A24DD75C60655E243EAC59ECDD4482

Jones, D. & Lerman, R. (2017, June). Starting a Registered Apprenticeship Program. The Urban Institute. Retrieved from https://innovativeapprenticeship.org/wp-content/uploads/2017/06/Employer-Guide_June-2017.pdf

King, L. W. (Trans.). (2008). The Code of Hammurabi. Lillian Goldman Law Library, Yale Law School, Avalon Project Web site. Retrieved May 22, 2020, from https://avalon.law.yale.edu/ancient/hamframe.asp

Lester, S. and C. Costley. (2010). Work-based learning at higher education level: value, practice and critique. Studies in Higher Education. 35, no 5: 561-575

Nappi, M. (2019, March 11). Cybersecurity Apprentice Program: A CyberStart JumpStart. Retrieved May 22, 2020, from https://you.stonybrook.edu/matthewnappi/2019/03/11/cybersecurity-apprentice-program-a-cyberstart-jumpstart/

Petrella, E. (2020, June 11). National Initiative for Cybersecurity Education (NICE) Working Group. Retrieved June 24, 2020, from https://www.nist.gov/itl/applied-cybersecurity/nice/about/working-group

Raelin, J. (1997). A Model of Work-Based Learning. Organization Science. https://doi.org/10.1287/orsc.8.6.563

Seshagiri, G., Ghosh, T., & Aliaga, O. (2020, June). Survey results on work-based learning in colleges with cybersecurity programs.

Tripwire. (2020, February). Cybersecurity Skills Gap Report 2020. Retrieved from https://3b6xlt3iddqmuq5vy2w0s5d3-wpengine.netdna-ssl.com/state-of-security/wp-content/uploads/sites/3/Tripwire-Dimensional-Research-Skills-Gap-2020.pdf

Weinstein, P. V. (2014, November 05). To Close a Deal, Find a Champion. Retrieved June 24, 2020, from https://hbr.org/2014/09/to-close-a-deal-find-a-champion

Effects of Teaching and Practice of Time Management Skills on Academic Performance in Computer Information Systems Courses

Sean L. Humpherys
shumpherys@wtamu.edu

Ibrahim Lazrig
ilazrig@wtamu.edu

Computer Information and Decision Management
West Texas A&M University
Canyon, TX 79016, USA

Abstract

This study proposes a time management intervention for college students that includes 1) identifying academic deliverables with due dates, 2) preplanning specific study times each week in advance, 3) and sharing the plan with the instructor. Results show a decrease in missing assignments and an increase in course grades even when controlling for graduate/undergraduate status. Both undergraduate and graduate students perceive the intervention as positive. Students practice time management skills which are critical to their academic success and success as professional developers.

Keywords: time management, academic performance, procrastination

1. INTRODUCTION

Trait procrastinators are slower to act than non-procrastinators and demonstrate a propensity for being behind schedule on personal projects (Lay, 1990), studying fewer hours for exams (Lay & Burns, 1991), and turning in assignments later than others (Ferrari, 1993). Students frequently struggle to manage and balance their study time and their workload (Van der Meer et al., 2010). These behaviors can have deleterious impacts on a student's learning and academic performance. In contrast, students who perceive control of time report greater evaluation of their performance, greater work and life satisfaction, less overload, and fewer job-induced tensions (Macan et al., 1990).

Time management can be defined as setting goals and priorities, the use of mechanics to manage time, and perception regarding the ability to control time (Lay & Schouwenburg, 1993). As applied to academics, this definition prescribes that students should learn to define goals for their academic success, identifying academic tasks, and prioritizing them.

2. LITERATURE REVIEW

Time management training in the workforce can have positive impacts on time management behaviors. Hall and Hursch (1982) evaluated the effect of a training manual and weekly consultation on workplace effectiveness. They observed that time spent on high-priority tasks increased as did self-rated productivity and satisfaction. Employees who attended a 3-day training program improved how they manage time at work demonstrating that interventions can improve behavior (Orpen, 1994). Van Eerde

(2003a) observed a 1.5-day time management training seminar significantly reduced avoidance behavior, reduced worry, and increased employees ability to manage time at work. Time management intervention helps employees avoid procrastination (Lay & Schouwenburg, 1993; Van Eerde, 2003b). Lang (1992) demonstrated that time management techniques significantly lowered anxiety.

García-Ros, Pérez-González, and Hinojosa (2004) call for instructional proposals aimed at improving college student's time management behaviors. They identified three subcomponents of time management for students: short-range planning, long-range planning, and time attitudes. Short-range planning is concerned with the management of tasks and time ranging from one day to one week. Long-range planning is focused on their goals over the academic year. Time attitudes are regarding their perceptions of control over time and self-efficacy.

Seven Habits of Highly Effective People (7HHEP) provides a useful framework for teaching time management skills to students. According to Covey (1989), Habit 1 is "Be Proactive," which means taking responsibility for one academic performance and that a student can influence their academic outcomes. Habit 2 is "Begin with the End in Mind" or goal setting. This habit relates to García-Ros et al.'s long-range planning. For students, long-range planning can include setting goals for the academic semester or academic year and setting milestones to meet academic deadlines. The activity of identifying what is due in a semester and the due dates can be considered short-range and mid-range planning.

Habit 3 is "Putting First Things First," which is a behavior of prioritizing activities that are in alignment with the student's academic goals. The activity of preplanning when to study and executing the plan can be considered a Habit 3 activity. Time management has mechanics like lists and schedules and perceived control of time (Macan et al., 1990). Bacon, Fulton, and Mallot (1983) used a checklist system to improve employee performance. Their system included a checklist of tasks and periodic supervisor review. The percentage of completed tasks increased by 29%. For our research purposes, we propose a time management intervention for college students which includes learning about 7HHEP, identifying what academic deliverables are due and when (short-range to mid-range planning), and to specifically preplan study time for the coming week (prioritizing). It is anticipated that

the success in developing these habits in academics will also prepare them for the workforce where large software development projects often include setting short-range milestones and prioritizing tasks.

In this study we aim to experimentally test if learning about and practicing time management skills will have a positive impact on students' academic performance. The rationale for how a time management intervention may positively affect academic performance is as follows. Some researchers consider time management as one of the factors that influence students' study efforts and teaching students how to monitor their time and study environment will enhance their ability to make wise decisions about their study times (Risko et al., 1991). Higher scores on the scales of setting goals and establishing study priorities were correlated with greater percentage of planned academic work actually accomplished (Lay & Schouwenburg, 1993). Some components of time management could be used to predict college grade point average and time-management practices may influence college performance (Britton & Tesser, 1991).

Students who regularly identify what assignments are due and when may be more aware of their academic demands and may be less likely to forget to submit an assignment. Turning in more assignments will result in fewer zero grades and consequently a higher course grade. Students who regularly preplan their study time are more likely to follow through with their plan and actually study, which should increase their knowledge attainment and their assessment grade. Identifying their academic demands may influence students to purposefully load balance their study plans with work and life demands, potentially minimizing time conflicts, and avoid procrastination. The following hypothesis is testable.

H1. Students who learn about and practice time management skills will have fewer missing assignments and higher course grades.

Perceived control over time leads to reduced overload and greater work and life satisfaction (Macan et al., 1990). Time management interventions have the potential to increase a person's feeling of satisfaction (Hall & Hursch, 1982) and to decrease anxiety and stress (Macan et al., 1990; Van Eerde, 2003a). Studies also showed that procrastination is usually associated with anxiety and low grades (Häfner et al., 2014). We predict that as students

receive training and implement the time management training, they will express positive sentiments towards the intervention.

H2. Students who learn about and practice time management skills will express positive sentiments towards the intervention.

3. METHODOLOGY

Students at a southern, regional college of business participated (N = 331). Undergraduate students (n = 174) were from six sections of a digital collaboration course and three sections of an intermediate programming course. Graduate students (n = 157) participated in seven sections of an IT in healthcare course. All the source sections except two were delivered online. Demographic data were not collected as there is no theoretical reason to do so and because the treatment was to be applied to all students equally in a course regardless of their demographics. IRB approved the research protocol.

In the treatment group (n = 210), the professor taught aspects of time management in a 15-minute lecture. The topics are loosely based on 7HHEP habits 1-3: Be Proactive, Begin with the End in Mind, and First Things First. Students were asked to identify the deliverables for their class(es) (quizzes, exam, homework, anything that needed to be turned in for a grade). Analogy was drawn to a professional developer tracking deliverables for clients. Students were also asked to preplan their study time for each week. Students were taught that effective preplanning includes specific day and time, e.g., "study Tuesday 4:00pm-5:30pm, Saturday 11:00am-2:00pm" as opposed to ineffective planning, e.g., "study on Tuesday and Saturday." Analogy was drawn to successful athletes who arrive at the gym each day at 6am or at a team practice at a specific time not a general time. Each week of the course the students delivered to the professor the two, time management tasks (identify deliverables and preplan study time) through a simple quiz with a short-answer text box. The questions were as follows.

Quiz Question 1: What are the deliverables due next week? Just write or list them in this text box. In business, knowing what deliverables are due to the client and by when helps you plan the tasks and insure you produce quality deliverables by the due date. Many studies and experiences have demonstrated that when you preplan a goal, it gets accomplished. When you don't preplan, you lose your way. So, answer this question to demonstrate and practice time management and project management skills.

Quiz Question 2: When will you study next week? Specifically, what days and what times? This is a promise you make to yourself, not to the professor. Poor Answer: "I'll study on Tuesday and Thursday"---Poor because it is not specific enough and distractions will stop you from succeeding. Poor Answer: "I don't know because my schedule changes each week." ---That's the exact reason to preplan! You can change it as needed but preplan. Great Answer: "I will study on Monday at 9pm-10pm; Wed from 8am-10am; Thu from 8am-10am; Sat from 8pm-10pm. "

In one section of intermediate programming course, the professor administered the same time management treatment and added that the students were to identify the deliverables for all their academic classes and preplan study time on an electronic or paper calendar. Students delivered a screenshot of their calendar instead of taking the short-answer quiz, but the learning objectives were the same as the other sections: identify deliverables and preplan study time.

The variable *treatment* (yes, no) identifies who received the time management treatment. Two students were removed from the treatment group for failure to accomplish more than 50% of the treatment quizzes. The control group included students from the same courses but different sections and did not receive the treatment.

Missing assignment percentage is the count of assignments not turned-in by the student divided by the total count of assignments. The time management quizzes were not included. *Final grade percentage* is the overall grade each student received in the course. *Is_Undergraduate_Student* (yes, no) identifies the student as an undergraduate student or graduate students. This value was identified by the course the student was enrolled in. This variable is used as a control with the assumption that graduate students will have more experience with time management and naturally have fewer missed assignments despite the treatment. Estimates of the mean missed assignment percentage should be more accurate when accounting for undergraduate or graduate status.

The *sentiment* variable (positive, neutral, or negative) was derived from a reflective exercise at the end of the course for the treatment group. The question was "Each week you were asked to preplan your study schedule and identify your deliverable. Did this activity help you improve your time management skills? Why or why not? You get points for participation not for any predefined answer." Three raters independently read the student's reflection and judged the sentiment as positive, neutral, or negative. Instructions and examples were provided to the raters. Positive means the student expressed improvement in time management, positive results, or valuable learning experience. Neutral means the student expressed no improvement in time management or indifference to the learning experience. Negative means the student expressed a decrease in time management, negative results, or dissatisfaction with the learning experience.

4. RESULTS

Prior to the analysis, data were screened for missing data and outliers. Eleven participants were removed as multivariate outliers using Mahalanobis distance. Data was found to be multivariate normal and linear but homogeneity was not met (Levene's $p < .001$). A MANOVA was analyzed with treatment (yes, no), Is_Undergraduate_Student (yes, no), and their interaction predicting missing assignment percentage and final grade percentage. Alpha was 0.05 and Wilks' lambda was chosen as the test statistic. Because of the non-homogeneity and unequal group sizes, a non-parametric equivalent of the MANOVA was also conducted and results compared.

Significant multivariate main effects were found for treatment ($F(2, 315) = 4.81$, $p = .009$, $n_p^2 = .03$) and for Is_Undergraduate_Student ($F(2, 315) = 36.42$, $p < .001$, $n_p^2 = .19$), but not for the interaction ($F(2, 315) = 1.82$, $p = .16$, $n_p^2 = .01$). Univariate ANOVAs examined individual dependent variables. Treatment scores showed a significant difference on missing assignment percentage ($F(1, 316) = 9.49$, $p = .002$, $n_p^2 = .03$) and on final grade ($F(1, 316) = 4.56$, $p = .033$, $n_p^2 = .01$). Students who received the treatment had lower missing assignment percentages (M = 2.5, SD =5.1) than the control group (M = 5.5, SD = 6.7). Students who received the treatment had higher final grade percentages (M = 94.9, SD =6.1) than the control group (M = 92.1, SD = 7.5).

Is_Undergrate_Student scores showed a significant difference on missing assignment percentage ($F(1, 316) = 57.47$, $p < .001$, $n_p^2 = .15$) and on final grade ($F(1, 316) = 58.77$, $p < .001$, $n_p^2 = .15$). Undergraduate students had higher missing assignment percentages (M = 6.0, SD =7.2) than graduate students (M = 1.1, SD = 2.5). Undergraduate students had lower final grade percentages (M = 91.1, SD =7.5) than graduate students (M = 96.7, SD = 4.5). Figure 1 and Figure 2 show the mean difference for missing assignment percentage and final grade grouped by treatment.

A non-parametric equivalent of the MANOVA was conducted. The R-version of the non-parametric test used (nonpartest() in the npmv package) only allows for one independent variable but does not require the same assumptions as the parametric tests (Burchett et al., 2017). Since treatment is the phenomena of interest, treatment was used as the independent variable predicting missing assignment percentage and final grade. The test confirmed the results from the parametric MANOVA. A significant multivariate main effect was observed for treatment ($F(2, 317) = 17.2$, $p < .001$). The function ssnonpartest (npmv package) is equivalent to the follow-up ANOVA tests to determine which dependent variable is significantly different. The analysis confirmed that both missing assignment percentage and final grade are statistically significant and the hypotheses of equality are rejected for both. Because of the internal algorithm, a t-statistic is not reported. Instead the function returns a "reject" or "failure to reject" message at an alpha of 0.05.

Figure 1. *Students Receiving the Treatment Submit More Assignments*
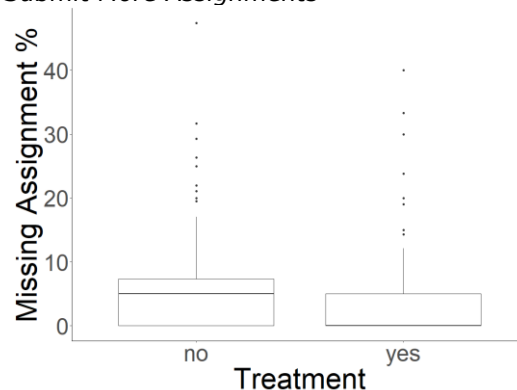
Note. The treatment has students regularly identify academic assignments with due dates and preplan weekly study time.

Figure 2. *Students' Final Grade is Higher When Taught Time Management.*
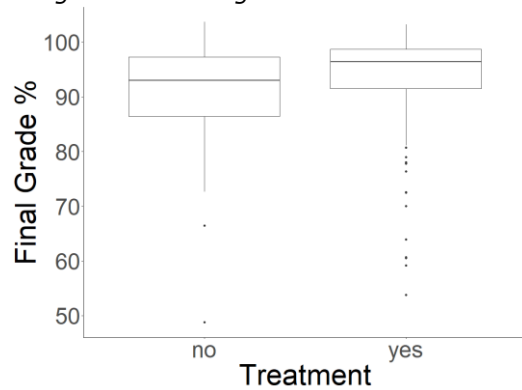
The percentage of students' sentiments are calculated based on the resulted rating by each of the three raters. The final sentiment is calculated using majority rule. For example, two positive ratings lead to a positive sentiment, and if the three ratings are different (i.e. one positive, one negative, and one neutral) the final sentiment will be neutral. The percentages shown in Figures 3 and 4 were obtained using undergraduate and graduate students' sentiments. The results show that the majority (85% or more) of students find the activity very helpful and improved their time management skills.

Figure 3. *Majority of undergraduate students expressed improvement in time management and valuable learning experience.*
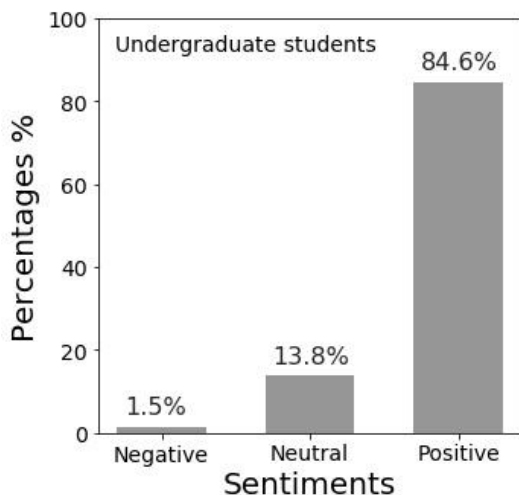
Figure 4. *Majority of graduate students expressed improvement in time management and valuable learning experience.*
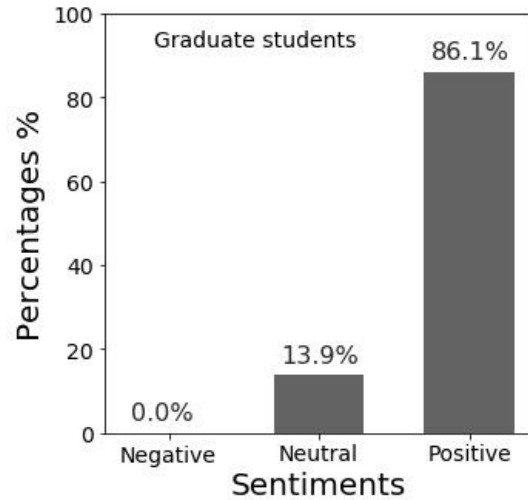
An interrater reliability analysis using Fleiss (multi-Kappa) metric was performed to determine consistency among raters. The interrater reliability for the raters was found to be 0.68 which means a substantial agreement between the three raters.

5. DISCUSSION AND CONCLUSION

García-Ros et al. (2004) call for more instructional proposals designed for teaching time management to college students. This request is increasingly important for Information System students as their professional skills often require working on large, lengthy development projects where goals and milestones need to be identified and prioritization of time is critical to success.

This study proposes a time management intervention for college students that includes 1) identifying academic deliverables preferably for a month at a time and for all the courses that a student is enrolled in, 2) preplanning specific study times a week in advance, 3) and sharing the plan with the instructor through a checklist or calendar system. We recommend that the first three habits of 7HHEP provide a good framework for learning about time management. Useful videos are available at https://www.franklincovey.com/the-7-habits.html.

Results indicate that students who participated in the time management intervention missed fewer assignments and scored higher on the final course grade (H1), although the effect is smaller than that of being a graduate student with more life experience. On average, undergraduate students fail to submit more assignments than graduate students. Yet, both undergraduate students and the vast majority of graduate students self-reported that the time management intervention had a positive impact on their performance (H2). Many students report that this intervention was a worthwhile activity even at the graduate level. Graduate students appreciate the intervention because they reported greater conflicts with full-time work, family, and academic demands. Some students reported that the time management skills had an overflow effect that positively impacted their work and life time management. Some students self-reported decreased stress consistent with past studies on time management.

Study time duration is not the only consideration when teaching college students about time management. How to study and the activities in effective studying are important qualitative factors that impact academic success (García-Ros et al., 2004). Some students reflected that their preplanned study time was not successful because work or life demands made following the plan difficult. Instructors should emphasize that adjustments and flexibility are successful management behaviors.

Some instructors may opine that the responsibility to teach time management lies with the academic counselor or solely with the student. To this position we have two responses.

First, each instructor has the opportunity to evaluate why students do not perform well in their course. Making adjustments is an instructional responsibility. Helping students succeed is an instructional opportunity. One factor motivating this research was a problem observed in our Computer Information Systems program's ABET and AACSB accreditation process. Through annual faculty assessments and reflections, we discovered that the number one reason for our failure to obtain student outcomes was the fact that students failed to turn in assignments. Note that the reason was not poor learning or poor performance on an assessment but the failure to submit the assignment. This behavior is a classic failure of time management and procrastination, which

had negative effects on a student's academic success and potentially on our program's accreditation. This study demonstrates that with a simple intervention the number of missed assignments decreased because of student's awareness of academic deliverables, identification of due dates, and preplanning of their study time. This study may also suggest that training alone is not enough to effect change. Being accountable to the professor and receiving a small grade for participation in the weekly or monthly exercises also helps motivate students to implement time management practices. Van de Meer and Torenbeek (2010) argue that universities and instructors should play a more active role in helping students learn and practice time management.

Secondly, professional success relies on similar time management skills as described in this paper. By practicing these skills in our courses, students have the opportunity to mature the skills and attitudes needed to be successful developers, network administrators, and data scientists. Benefits of workplace time management include increased performance and decreased stress, overload, work-family conflicts, and family-work conflicts (Jex & Elacqua, 1999). We encourage instructors to teach about time management from an academic perspective and professional perspective. We also encourage instructors to use simple assessment tools to motivate students to implement time management skills.

6. REFERENCES

Bacon, D. L., Fulton, B. J., & Malott, R. W. (1983). Improving Staff Performance through the Use of Task Checklists. *Journal of Organizational Behavior Management*, *4*(3–4), 17–25. https://doi.org/10.1300/J075v04n03_03

Britton, B. K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of Educational Psychology*, *83*(3), 405–410. https://doi.org/10.1037/0022-0663.83.3.405

Burchett, W. W., Ellis, A. R., Harrar, S. W., & Bathke, A. C. (2017). Nonparametric Inference for Multivariate Data: The R Package npmv. *Journal of Statistical Software*, *76*(1), 1–18. https://doi.org/10.18637/jss.v076.i04

Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Free Press. https://www.franklincovey.com/the-7-habits.html

Ferrari, J. R. (1993). Christmas and procrastination: Explaining lack of diligence at a "real-world" task deadline. *Personality and Individual Differences*, *14*(1), 25–33. https://doi.org/10.1016/0191-8869(93)90171-X

García-Ros, R., Pérez-González, F., & Hinojosa, E. (2004). Assessing Time Management Skills as an Important Aspect of Student Learning: The Construction and Evaluation of a Time Management Scale with Spanish High School Students. *School Psychology International*, *25*(2), 167–183. https://doi.org/10.1177/0143034304043684

Häfner, A., Oberst, V., & Stock, A. (2014). Avoiding procrastination through time management: An experimental intervention study. *Educational Studies*, *40*(3), 352–360. https://doi.org/10.1080/03055698.2014.899487

Hall, B. L., & Hursch, D. E. (1982). An Evaluation of the Effects of a Time Management Training Program on Work Efficiency. *Journal of Organizational Behavior Management*, *3*(4), 73–96. https://doi.org/10.1300/J075v03n04_08

Jex, S. M., & Elacqua, T. C. (1999). Time management as a moderator of relations between stressors and employee strain. *Work & Stress*, *13*(2), 182–191. https://doi.org/10.1080/026783799296138

Lang, D. (1992). Preventing short-term strain through time-management coping. *Work & Stress*, *6*(2), 169–176. https://doi.org/10.1080/02678379208260351

Lay, C. H. (1990). Working to Schedule on Personal Projects: An Assessment of Person-Project Characteristics and Trait Procrastination - ProQuest. *Journal of Social Behavior and Personality*, *5*(3), 91.

Lay, C. H., & Burns, P. (1991). Intentions and Behavior in Studying for an Examination: The Role of Trait Procrastination and its Interaction with Optimism - ProQuest. *Journal of Social Behavior and Personality*, *6*(3), 605.

Lay, C. H., & Schouwenburg, H. C. (1993). Trait procrastination, time management, and academic behavior. *Journal of Social Behavior & Personality*, *8*(4), 647–662.

Macan, T. H., Shahani, C., Dipboye, R. L., & Phillips, A. P. (1990). College students' time management: Correlations with academic performance and stress. *Journal of Educational Psychology*, *82*(4), 760–768. https://doi.org/10.1037/0022-0663.82.4.760

Orpen, C. (1994). The Effect of Time-Management Training on Employee Attitudes and Behavior: A Field Experiment. *The Journal of Psychology*, *128*(4), 393–396. https://doi.org/10.1080/00223980.1994.9712743

Risko, V. J., Alvarez, M. C., & Fairbanks, M. M. (1991). External factors that influence study. *Teaching, Reading, and Study Strategies at College Level*, 195–236.

Van der Meer, J., Jansen, E., & Torenbeek, M. (2010). 'It's almost a mindset that teachers need to change': First-year students' need to be inducted into time management. *Studies in Higher Education*, *35*(7), 777–791. https://doi.org/10.1080/03075070903383211

Van Eerde, W. (2003a). Procrastination at Work and Time Management Training. *The Journal of Psychology*, *137*(5), 421–434. https://doi.org/10.1080/00223980309600625

Van Eerde, W. (2003b). A meta-analytically derived nomological network of procrastination. *Personality and Individual Differences*, *35*(6), 1401–1418. https://doi.org/10.1016/S0191-8869(02)00358-6

Development of a Flexible Point-based Tenure and Promotion Document in the Age of Societal Uncertainty

Kevin Dickson
kdickson@semo.edu

Nick Johnston
njohnston@semo.edu

Heather McMillan
hmcmillan@semo.edu

Dana Schwieger
dschwieger@semo.edu

Steven Stovall
sstovall@semo.edu

Department of Management
Southeast Missouri State University
Cape Girardeau, MO 63701, USA

Abstract

The evolving landscape of higher education has forced many institutions to reorganize, remove administrative layers, and subsequently, reexamine criteria and processes. In particular, efforts to consolidate and combine departments has prompted a need to explore options for a systematic and objective framework for evaluating performance. This paper explores the process of restructuring tenure and promotion documents to accommodate a variety of programs with varying accreditation requirements brought together due to institutional restructuring. The authors utilized a modified version of the Input Process Output (IPO) logical model to facilitate the creation of a mixed method (narrative and point-based) tenure and promotion (T&P) document that satisfied requirements for AACSB and non-accredited programs. The outcome produced a guide that is adaptable, minimizes subjectivity, and is easier to interpret for those within and outside the department. This paper extends the current literature by offering a review of current T&P practices by four-year institutions and presenting a modified version of the IPO model designed to facilitate the process of crafting a new T&P document. Suggestions for use by other departments and institutions as well as direction for future research are also presented.

Keywords: Tenure and Promotion, Evaluation Framework, Points-based System

---

1. INTRODUCTION

Responding to institutional changes due to statewide budget cuts, the authors' institution, like many others, reduced budget expenses by removing administrative layers. One such move involved restructuring the university from a five colleges and one school, 29 department layout to five colleges consisting of 25 departments. The College of Science, Technology and Agriculture was divided across the new five college structure with the ABET accredited computer science program landing in the AACSB accredited College of Business. During this time, the departments within the College of Business were further restructured to accommodate programs, growth, and enrollment patterns.

The reorganized departments (institution-wide) were asked to evaluate their tenure and promotion (T&P) guidelines to develop new documents to accommodate their new program structure. Rather than merging the existing programs' T&P documents into one, the authors' department started from scratch to develop a point-based system unlike any used in their previous departments.

In this paper, the authors detail the process their department underwent to develop flexible guidelines acceptable to both tenure and non-tenure track faculty in AACSB and non-AACSB accredited programs. With the COVID-19 healthcare crisis, universities may be faced with making tenure and promotion evaluation process adjustments to accommodate lost opportunities (e.g. service or limited conference travel) resulting from imposed social distancing requirements. Such flexible guidelines are also beneficial at times of reducing state appropriations or declining enrollments. They also allow a method to recognize the variability in departments where scholarship may be completed as creative works in addition to research activities. The authors propose their process and resultant guidelines as a starting point for programs evaluating their current processes.

2. LITERATURE BACKGROUND

To ensure the quality of faculty at a university, having standards for tenure and promotion are critical (Perri, 2018). Such standards are not based on past performance, but also consider the promise of future performance and contributions (Dennis, Valacich, Fuller, & Schneider, 2006). The tenure document for academics is often based on research, teaching, and service. Peer reviewed research remains the barometer for measuring scholarly output, but with the proliferation of open access journals, spread of predatory journals, and publications that charge sometimes substantial fees for inclusion, the ability of a T&P committee to successfully evaluate a tenure portfolio has become murkier (Bales, et. al., 2019).

Consequently, institutions rely on measures that rate or rank the efficacy of journals such as ABDC Journal Quality List produced by the Australian Business Deans Council (ABDC), impact factor published by JCR, Academic Journal Guide published by the Chartered Association of Business Schools, and others (Millet-Reyes, 2017). These provide some structure for academic institutions to evaluate the quality of publications listed by candidates for tenure or promotion but do not address other output such as trade publications, monographs, books, and other forms of scholarly work. In addition, a limitation of such lists is the reliance on ratings over an actual review of the candidate's research. They also instill a constraint on what a candidate might, or will publish, based upon inclusion on the appropriate list (Bales, et.al., 2019).

AACSB Guidelines
For any AACSB accredited program, alignment between T&P documents and AACSB standards is a paramount consideration. The gold standard for AACSB is the scholarly academic (SA) faculty qualification. This is described in Standard 3 of the 2020 standards effective July 28, 2020. Only a faculty member classified as SA meets all required ratios for faculty classification for AACSB accreditation. Qualified faculty status is "based on both the initial academic preparation or professional experience, and sustained academic and professional engagement…" (AACSB Guiding Principles, 2020, 27).

SA status is based on sustaining "currency and relevance through scholarship and activities related to the field of teaching" (AACSB Guiding Principles, 2020, 27). SA status can also be given to newly-hired faculty members "for five years from the date of conferral of the terminal degree" (AACSB Guiding Principles, 2020, 29). The specific qualification for SA status is based on criteria developed by the school "consistent with the mission of the school and comparable

to peer schools" (AACSB Guiding Principles, 2020, 30). For SA status, the standards indicate academic engagement activities such as scholarship outcomes, editorships, editorial board service, leadership in academic societies, research awards, etc. (AACSB Interpretive Guidance, 2020, 13).

ABET Guidelines
The 2020-2021 ABET Guidelines for accrediting Computing programs promotes similar requirements as those of AACSB. ABET loosely defines the requirements for computer science faculty as demonstrating competence through "… such factors as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills." (ABET, 2020, 6)

Different Types of T&P Documents
Universities have instituted various methods of evaluation of research, teaching, and service. Some utilize a narrative format where faculty describe their contributions to each area. Others assign weights to different categories. And still others, use a scoring or point system to quantify the value of each item on a promotion or tenure application. The following describes narrative forms of documents and those with points, scales, and scores. Examples presented were publicly available and retrieved via the Internet in May 2020 and may no longer be in use if updated or modified since the files were accessed.

Narrative-based T&P Documents
A common type of T&P document is the narrative. In this format, the candidate responds to a series of prompts provided by the university, college, and/or department. Most typically cover all three categories of research, teaching, and service, although some may put greater weights on one or two of the categories. However, institutions like Clemson University's Economics Department expand these three to seven different categories including: teaching, research, service (professional, university and public), external funding, and special recognition (Clemson University, 2020). The Department of Management at Auburn University utilizes a narrative format and states that "there is no single model of excellence in teaching, scholarship, and service accomplishments" (Auburn University, Management Department,

2020, p. 2). This epitomizes the narrative format, giving a candidate an opportunity to elaborate more in one category than another, yet still maintaining a strong record of research, teaching, and service. At the same university, in the Marketing Department, special attention is paid to research with less weight being on the number of publications, but rather citation scores, grants, and outside reviewers (Auburn University, 2020; Marketing Department, 2020).

Some institutions, such as the W. Frank Barton School of Business at Wichita State University, use a narrative form and denote that teaching and research are weighted more heavily than service (Wichita State University, 2020). The Statistics Department at the University of Georgia places high importance on research and teaching, with an expectation of publication in top peer-reviewed journals (University of Georgia, 2020). At Towson University, in the College of Business and Economics, the narrative format includes a description for teaching highlighting student evaluations and "three or four published (or forthcoming) peer-reviewed articles in quality journals" for research (Towson University, 2020, p. 8). The Computer Science Department – ABET accredited – at Appalachian State University weighs teaching highest with scholarship and service supporting instruction. For each category, a candidate may receive a designation of Excellent, Satisfactory, or Needs Improvement (Appalachian State University, 2020). In the Gordon Ford College of Business at Western Kentucky University, the narrative requirements offer a list of criteria for the three categories. In service, candidates seeking a promotion to associate professor are expected to achieve a minimum of ten "service activities." Each department assesses the quality of scholarly activities (Western Kentucky University, 2020). Across the state, at Eastern Kentucky University, the Department of Communication, requires a minimum of three scholarly activities from a list. Two from the list must be peer reviewed, and three or more may be from items including chapters in texts, a textbook, case analyses, and book reviews (Eastern Kentucky University, 2020).

Points-based T&P Documents
Though the narrative is common, some institutions utilize a point or scoring system to evaluate the candidate. A numerical value is

assigned to various accomplishments in a checklist. Typically, the candidate must achieve a score greater than a predetermined level to be considered for tenure or promotion.

San Francisco State University uses a combination of narrative and point systems. In the Marketing Department, candidates provide a narrative for teaching and service, but scholarly activities are based upon a point system. For example, if a candidate publishes an article in a "True A" journal as defined by the ABDC, that article is worth 2 points. A "B" level journal is worth 1.25 points and so on. (San Francisco State University, 2020).

University of North Texas' Department of Management utilizes a scale system throughout its T&P guidelines. For all three major categories, candidates can be designated as exceptional (9 to 10 points), excellent (≥8, but <9 points), good (≥7, but <8 points), satisfactory (≥6, but <7 points), and unsatisfactory (<6 points). Then, under each category, criteria are provided denoting what is considered "exceptional" versus "excellent" (University of North Texas, 2020).

Finally, in the Department of Management at James Madison University, scales are used in all three main categories, with specific points in scholarly activities enumerated. Additionally, weights are approximately 50/30/20 concerning teaching, scholarly activity (for tenure or tenure track), and service respectively. The scales for teaching, scholarly activity, and service are excellent (5, 6, or 7 rating points), satisfactory (2, 3, or 4 rating points), and unsatisfactory (1 rating point) (James Madison University, 2020). In the next section, the authors briefly describe the elements of the modified Input Processing Output model and then apply the model to the development of their tenure and promotion guidelines.

3. DESCRIPTION OF A MODIFIED INPUT PROCESS OUTPUT MODEL

As indicated in the previous section, tenure and promotion are important processes requiring clear expectations, open communication, consistency, fairness and value judgments. To evaluate candidates' dossiers completely and fairly requires a significant contribution of faculty time, both individually and collectively.

However, increases in faculty workload due to growing documentation requirements and decreasing budgets result in faculty spreading their time across multiple demands. Under these conditions, a T&P review may result in either the candidate or the process being short changed. Thus, a structured approach helps to develop or modify a T&P document to be clear and effective.

In this section, the authors describe a slightly modified Input Processing Output Model, a structured approach common to the field of MIS. The authors selected this model to apply to the development of the T&P document process due to its brevity, directness and familiarity.

Modified IPO Model
Using a combination of logical models, the authors propose a modified Input Processing Output (IPO) model (Figure 1) to describe the process through which their department developed their current T&P guidelines.
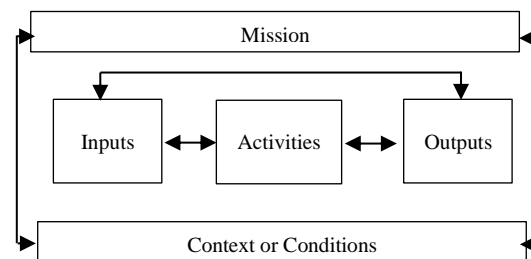
Figure 1

Model Elements
The Mission in the IPO model focuses upon the purpose of the process considering the situation and the conditions under which the process is taking place.

Inputs to the process include both those expected and initially introduced to the process as well as those incorporated through multiple iterations.

Activities represent the multiple tasks that were undertaken to generate the output from the input. Because the standard IPO model usually addresses one process, the authors incorporated the wording of other logical models and used "Activities" to represent multiple separate tasks.

Output consists of multiple artifacts as the process progressed through multiple iterations.

Context or Conditions account for mitigating

circumstances factored into the logical process and its approach to following the mission. These factors might include the people affected, accreditation guidelines, the circumstances forcing the process, and environmental issues that must be considered, to name a few.

Interrelationships are depicted in the model between the mission and the context or conditions. In some situations, the mission will have no direct effect on the context or conditions. However, the mission may affect the approach taken to address the context or conditions. It is also possible for the context or conditions to inform the generation of the mission such as in the relationship accreditation guidelines have on the mission.

Feedback was generated throughout the iterative guideline development process as feedback drove data collection and guideline development.

In the next section, the authors apply the modified model to the development of their department T&P guidelines.

4. APPLICATION OF THE MODIFIED MODEL TO THE T&P CRITERIA

In this section, the authors discuss the application of the modified Input Processing Output (IPO) model described in Section 3 to the authors' department T&P criteria development process (Appendix 1). This section also provides details about the process for the development of a committee tasked with creating the new T&P documents.

Committee
Each department in the authors' institution was tasked with reviewing and updating their T&P documents. The Department of Management created a review committee consisting of four full-time faculty members selected to ensure proper representation. Faculty were chosen from AACSB and non-AACSB accredited programs and represented the major areas of study in the department including entrepreneurship, management information systems, human resource management, healthcare management, and hospitality management. While the department, as a whole, followed the guidelines of AACSB, the hospitality management and Bachelor's and Master's in healthcare management are not AACSB accredited programs. Thus, departments without AACSB accredited programs or those

consisting of ABET and non-ABET accredited programs can follow similar processes.

In addition, the mix of committee members consisted of those with varying ranks and years of service with the University. At the time of formation, there were two tenure-track assistant professors, one associate professor, and one full professor. The number of years employed at the University ranged from one year or less to over 15 years.

Mission
The institution is classified on the Carnegie scale as a teaching institution. Faculty are evaluated on their contribution to the teacher-scholar model with a combination of quality teaching, professional growth and research, and service to the students, university and academic community.

Context or Conditions
Over the course of two years, the University underwent a restructuring process to adjust to budget cuts and program growth. The overall University makeup went from five colleges and one school to a five college structure with adjustments at the department level. The College of Science, Technology and Agriculture had experienced programmatic increases with minimal structural changes. To accommodate the University's new college format, some of the departments and programs in the College of Science, Technology and Agriculture were integrated into other repositioned colleges. One of these was the ABET accredited Department of Computer Science being moved to the revised AACSB accredited College of Business and Computing as a new department to join the newly restructured Department of Accounting Economics and Finance, Department of Management, and Department of Marketing. As a result of the structural changes, the colleges were tasked with revisiting and updating their T&P guidelines.

The newly formed Department of Management was tasked with creating T&P guidelines to match the mix of programs and accreditation requirements. The department consisted of 16 full-time faculty (12 tenure/tenure-track and 4 non tenure-track) in the undergraduate majors of management (general and human resource concentrations), entrepreneurship, hospitality management, healthcare administration, and healthcare management. The department also serves as the new home of the faculty teaching support courses in management information

systems. In addition, the department housed Master's programs in healthcare management and general management. The degrees in hospitality management, healthcare management and the Master of Science in healthcare management were not accredited by AACSB. The new department used multiple criteria originally based on where the faculty had been housed before the reorganization.

In Spring 2019, a committee was formed to create the T&P document for the restructured Management Department. As discussed previously, special attention was paid to ensure the committee represented department subgroups and all levels of the promotion process. This facilitated incorporating the more rigorous research requirements of the AACSB research guidelines, while also being fair to those faculty not teaching in AACSB accredited programs. At this time, the committee began the process by surveying department members about what the new requirements in teaching, research, and service should include (Appendix 3). Additionally, members of the committee began researching T&P requirements at AACSB peer institutions.

Inputs
The committee began the process of revising the T&P criteria with a thorough examination of the existing document that included an analysis of where the committee determined the document was antiquated based on changes in the college and university environment. This review created a series of questions the committee determined needed to be addressed through peer institution research (Appendix 2) and a faculty survey (Appendix 3). The committee also found that criteria in the current document allowed for potential subjectiveness in the review process, as well as the ability for faculty to "double-count" activities to their individual gain. The committee desired a document allowing an individual faculty member freedom to present their dossier as desired, while providing a structure to aid both the faculty member and potential reviewers, particularly those outside the department.

Prior to surveying Department of Management faculty, a review of peer institutions (using the list defined by the HCBC as peer schools) and in-university departmental T&P criteria was conducted. Emphasis was placed on those schools utilizing a teacher-scholar model for faculty T&P processes. Analysis of those documents found that while requirements at

peer institutions were similar to the authors', some schools had moved to a point-based system for T&P documents, as well as included a broader selection of activities as "scholarly." The criteria of other departments in the authors' university were examined to ensure that the Management Department's criteria maintained the rigor expected of the university's faculty.

Based on information gathered during the external criteria review, a survey (Appendix 3) was created and distributed to the Department of Management faculty to determine what the most important considerations were for the new T&P document. Survey questions were formulated after finding some similar institutions using point-based systems and identifying the manner in which they handled various promotion criteria. Department of Management faculty were provided copies of existing criteria and instructed that the goal of the survey was to collect their thoughts on current processes prior to creating a new document.

Activities
The Management faculty survey (Appendix 3) garnered a 71.4% response rate (10/14 eligible faculty responding). The committee determined the response rate was sufficient to continue the process. Results of the survey (with full unedited comments) were shared in the next scheduled department meeting after collection.

Results of the survey (Appendix 3) were fairly consistent across faculty. The faculty were asked for their thoughts regarding expectations for how their time should be distributed (Question 1):
- Teaching-related activities: 57.16% of their time should be spent in teaching-related activities (range of 40 – 66.66%),
- Research activities: 21.29% of their time in research-related activities (range of 10 – 40%), and
- Internal and external services activities: 24.67% of their time in internal and external service activities (range of 5 – 35%).

Additionally, respondents were asked for their opinion about the previous requirements (Question 2, 3 & 4).
- 60% of respondents felt that teaching requirements in the new T&P criteria should be similar to those in the existing criteria,
- 70% noted that research requirements should be less rigorous in the new criteria due to increasing faculty workloads.

- 66.67% felt that service requirements should be less rigorous in the new criteria.
- 90% of the faculty who completed the survey felt a point system was, or could be, a good idea for the new criteria.

Finally, faculty were asked open-ended questions on what they liked and did not like about the current criteria, and what changes they would like in the new criteria (Questions 5 – 7 and 9). Respondents reported far more negative (i.e., dislike) comments than positive comments about the current process including the amount of documentation required, how cumbersome the process was, criteria weighting that didn't support tenured and non tenure-track staff, and the amount of ambiguity and subjectivity in the criteria. Positive comments addressed the current level of rigor and the focus on teaching. Faculty's comments regarding the development of the future T&P document, overwhelmingly focused upon the necessity to lower research requirements due to increased teaching loads, and create a simpler process with less paperwork and more objective criteria guidelines. Based on the feedback, the committee began creating a new T&P document.

Outputs

The inputs (initial review and peer institution research) and activities (faculty survey and feedback) generated rich data used by the committee to craft the T&P guidelines. The process generally flowed in the following manner. First, the committee met to compile and discuss current evidence as well as formulate a plan of action or iteration. Next, the plan of action (or iteration) was presented, informally, to the chairperson and his feedback was incorporated before sharing with the department. The committee would then present their plan of action (or iteration) to the department and collect feedback from faculty. The loop was closed multiple times as all feedback was considered and the document was adjusted accordingly.

Including the initial survey, the process of collecting feedback and adjusting occurred three times. More importantly, the feedback and adjustment process ended once saturation was achieved and no novel ideas or concerns were presented. A final draft was then presented to the department and passed by majority vote. Afterwards, the new guidelines were sent to the college tenure and promotion committee, college dean, university tenure and promotion committee, and university provost for approval (per the Authors' University policy). T&P criteria must be approved by all these levels and can be sent back by any level for revision.

Feedback

Considering the context and conditions, the committee made an effort to elicit different forms of feedback throughout the entire process. Once formed, the committee immediately began discussing the process and determining research responsibilities. Afterwards, multiple meetings were held where each committee member was able to present their findings. After deliberations, a draft proposal was formulated and formally presented to the department members. The document again went through multiple iterations based upon the outputs (feedback) until consensus was reached.

As previously mentioned, multiple methods for collecting feedback were employed. Specifically, the committee collected data indirectly via an anonymous survey administered to the Department of Management faculty, and directly through formal meetings, email, and informal interviews. Feedback was collected before and after each activity and iteration. The feedback process produced rich data that subsequently drove the process and the development of the T&P guidelines. The implementation of the model also demonstrates good principles of shared governance in the generation of the T&P criteria document. The next section outlines the final T&P document and briefly discusses the differences between the old and new versions

5. OUTPUT: T&P DOCUMENT

Utilizing the data collected through the IPO process, the committee created a document (Appendix 4) radically different from its predecessor (Appendix 5). The section of teaching effectiveness remained the most unchanged and continued to recommend qualitative (e.g. student comments) and quantitative (e.g. course evaluation scores) artifacts. Perhaps the most significant change occurred in the sections of professional growth and service, in which a point-based system was developed to assist the candidate in the selection of supporting materials. All sections included benchmarks to indicate level of performance. Levels of rank included outstanding, superior, good, and unacceptable determined by criteria specific to each section.

Similar to the previous T&P document, the section of teaching effectiveness suggested

candidates present evidence in the form of teaching evaluations (qualitative and quantitative), peer evaluations, course development and improvement materials, as well as an option for self-reflection. Considering the nature of the University and diversity of the department, this approach provides candidates the most flexibility for crafting their proposal.

Significant changes were made in the section of professional growth. Most notably, this section introduces the point-based system, which quantifies activities and benchmarks. Similar to the previous document, contributions were segmented and weighted by level of rigor and significance. For example, an "A" level publication (as defined by an external list such as Australian Business Deans Council (ABDC) Journal Quality List), was given a higher point value than a refereed conference proceeding.

In addition, benchmarks were developed and designed to control the amount of points one can earn from a specific activity. This was included to avoid an individual simply completing a single activity multiple times. For instance, a single "A" level publication has the same point value as five conference proceedings. However, only three conference proceedings can be used and at least two publications must be included in the point total. As introduced in section two, benchmarks were influenced by AACSB standards for the scholarly academic (SA) designation. In this case, to receive the highest designation (outstanding), during the review period the candidate must have published at least two manuscripts and earned at least 15 points using the defined items and point scale.

The final section, service, also added a point-based system and redesigned the list of suggested service activities. Similar to the previous section, the list of activities was redeveloped, individual activities were quantified, and benchmarks were set. The new document added an additional category that highlighted student-focused service activities, which was previously under-represented and combined with service to the university. The remaining categories of service to the university, profession, and community were expanded based on inputs collected (e.g. faculty feedback and committee discussions).

Similar to professional growth, each service activity was evaluated to determine appropriate weight and expectations were set about the range of activities needed. For example, an alternate for a university or college committee held a lower weight than service as chair of a university or college committee. Also similar to the professional growth section, the distribution of points was defined and emphasis was placed on activities from the service to students section. For example, to achieve a superior rating in service the candidate must obtain at least 33% of their points from service activities that directly involve students and the remaining 67% are earned from the remaining three sections.

By utilizing the IPO model, the committee was able to craft a new document designed to fit the experiences of faculty with a variety of backgrounds and areas of focus. The addition of the point-based system, redefined lists of activities, and new benchmarks were included to clarify the process for the candidate and others who evaluate T&P documents. The robustness of the document allows it to be applied during times of normality, change, and crisis.

6. APPLICATION TO PRESENT AND FUTURE CHANGES

The new T&P document was originally approved by the department not long before the campus shut down due to the COVID-19 pandemic in early 2020. It was reviewed again afterwards and after additional input and feedback was modified and approved in the fall 2020 semester. The document allows for greater flexibility and less subjective review. This allows faculty to focus their efforts where they are most impactful. For example, this would have benefitted faculty members with increased workload due to transitions from teaching in the classroom to remotely during the middle of the spring 2020 semester and those teaching in the fall 2020 semester in the classroom under COVID-19 inspired limitations to prevent the spread of the disease. This flexibility will also help faculty and review committees during any change in higher education due to decreases in funding, faculty resources, enrollments, etc.

7. CONCLUSIONS

Developing flexible, yet effective, T&P guidelines is an important task. In this article, the authors proposed a modified logical framework for developing departmental guidelines such as the T&P document. The authors then applied the model to the development of their point-based system to address the needs of both tenure and non-tenure track faculty as well as AACSB and

non-AACSB programs. Even with unforeseen circumstances beyond a university's control such as economic downturns, reduced student populations, budget cuts and pandemic health issues developing flexible T&P guidelines can facilitate administrative functions in fluctuating environments.

8. REFERENCES

AACSB Guiding Principles, (2020). *2020 Guiding Principles and Standards for Business Accreditation*. Retrieved December 5, 2020 from https://www.aacsb.edu/accreditation/standards/business

AACSB Interpretive Guidance, (2020). *2020 Interpretive Guidance for AACSB Business Accreditation*. Retrieved December 15, 2020 from https://www.aacsb.edu/accreditation/standards/business

ABET, (2020). *Criteria for Accrediting Computing Programs*, *2020-2021.* Retrieved May 26, 2020 from https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-computing-programs-2020-2021/#GC6

Appalachian State University. Department of Computer Science (nd.). Guidelines for Faculty Evaluation. Retrieved May 26, 2020 from https://compsci.appstate.edu/ faculty-staff/
promotion-and-tenure

Auburn University, Department of Management. (nd). *Promotion and Tenure Guidelines*. Retrieved May 25, 2020 from http://www.auburn.edu/academic/provost/departmentp&t/Business/MGT.pdf

Auburn University, Department of Marketing. (2011). *Promotion and Tenure Guidelines*. Retrieved May 25, 2020 from http://www.auburn.edu/academic/provost/departmentp&t/Business/Marketing_P&T.docx

Bales, S., Hubbard, D., vanDuinkerken, W., Sare, L., & Olivarez, J. (2019). The use of departmental journal lists in promotion and tenure decisions at American research universities. *Journal of Academic Librarianship*, 45, 153-161.

Clemson University. (nd). *Promotion and Tenure Guidelines: Department of Economics.* Retrieved May 25, 2020 from https://www.clemson.edu/faculty-staff/faculty-senate/shared-governance/documents/tpr/economics.pdf

Dennis, A., Valacich, J., Fuller, M., & Schneider, C. (2006). Research standards for promotion and tenure in information systems. *MIS Quarterly*, *30*(1), 1-12.

Eastern Kentucky University. (nd). *Department of Communication: Criteria for Promotion and Tenure College of Business and Technology*. Retrieved May 25, 2020 from . https://communication.eku.edu/sites/communication.eku.edu/files/files/PT%20department%20guidelines.pdf

James Madison University. (nd). *Department of Management: Promotion and Tenure Evaluation Guidelines*. Retrieved May 25, 2020 from https://www.jmu.edu/academic-affairs/_documents/PT-MANG.pdf

Millet-Reyes, B. (2017). International reputation and ranking of finance journals. *Northeast Business & Economics Association Proceedings*, 203-205.

Perri, T. (2018). Economics of Evaluation (with Special Reference to Promotion and Tenure Committees). *Economics of Governance, 19*(1), 1-19.

San Francisco State University. (nd). *Guidelines for Retention, Tenure, and Promotion: Marketing Department*. Retrieved May 25, 2020 from https://facaffairs.sfsu.edu/sites/default/files/Marketing_FA2017.pdf

Towson University. (nd). *College of Business and Economics: Promotion, Tenure, Reappointment, and Merit Procedures and Standards.* Retrieved May 25, 2020 from https://www.towson.edu/about/administration/senate/committees/documents/uptrm_committee_documents/uptrm_college_ptrm_policies/cbe_college_2-10-17.pdf

University of Georgia. (nd). *Promotion and Tenure Criteria for Department of Statistics*. Retrieved May 25, 2020 from

https://provost.uga.edu/_resources/documents/Statistics_2015.pdf

University of North Texas. (nd). *Merit, Promotion, Tenure, and Workload Guidelines*. Retrieved May 25, 2020 from https://cob.unt.edu/sites/default/files/docs/dean/MGMT%20MPTW%202015-May.pdf

Western Kentucky University. (nd). *Promotion and Tenure Guidelines: Gordon Ford College of Business*. Retrieved May 25, 2020 from https://www.wku.edu/business/faculty-and-staff/documents/gfcb-promotion-and-tenure-guidelines.pdf

Wichita State University. (nd). *Tenure and Promotion Document of the W.* Retrieved May 25, 2020 from https://www.wichita.edu/academics/business/documents/Tenure_PromotionGuidelinesBSB.pdf

Appendix 1 – Application of Model
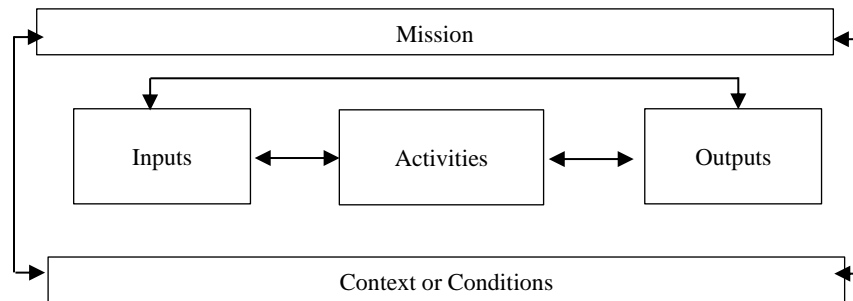
Mission: To develop tenure and promotion guidelines to accommodate a department with mixed majors and accreditation policies with respect to the University's interpretation of the teacher-scholar model.

Inputs	**Activities**	**Output**
• Review of narrative-based T&P Guidelines	• Formation of committee	• Survey Instrument
• Review of point-based T&P Guidelines	• Development of survey	• Iterations of T&P Documents
• Review of Peer Institution Guidelines	• Development of initial T&P instrument	
• Review of AACSB Guidelines	• Departmental Evaluation of Initial T&P Instrument	
	• Committee Revision of T&P Instrument	
	• Departmental Evaluation of Revised T&P Instrument	
	• Committee Revision of T&P Instrument	
	• Vote by Department on Revised Document	

Context or Conditions: In light of budget cuts and program growth, the university underwent a restructuring process moving from a five college and one school to a five college format. The newly formed Department of Management was tasked with creating tenure and promotion guidelines to accommodate AACSB accredited and non-accredited programs.

Appendix 2 - Questions arising from review of existing document

Teaching Effectiveness
1. Do we want point system here?
    a. Difficult because FS forbids mandated evaluation scores.
2. Focus on BSBA core courses – we are a diverse department, we need to incorporate more than just BSBA curriculum
3. Does developing new courses actually contribute to currency?
4. Accessibility to students
    a. Point value for # of office hours per semester? 3 hours = superior?

Professional Growth
1. HCBC research release = outstanding?
2. Release "light" = superior?
3. Do we keep category 1 and 2?
4. Inclusion of professional education presentations?
5. Citations as indicator of impact of research?

Service
1. Pure point system?
2. Reduction of ambiguity – what exactly is a student recruitment activity? Is taking a one-on-one through admissions the same value as Show Me day?
3. Should student-centered service be its own category?
4. Where do professional programs go?

General
1. Isn't the whole record of service self-assessment? Does this really need a separate category?
2. Contribution of three categories to overall score. Contribution of sub-categories to individual area scores?

Appendix 3 - Faculty Survey

P&T Criteria

Because of the redesign of the management department, it is necessary to revise our P&T criteria. We currently have the faculty under the Management & Marketing and Accounting department criteria.

The department P&T criteria committee has created this survey to get your input prior to editing our current P&T requirements.

Below are links to both sets of criteria if you would like to review them before

completing the survey.

Management and Marketing Criteria

Accounting Criteria

1. Based on recent changes to teaching loads, what should be our target time allocation? (percentages should sum to 100)

Teaching   [   ]

Research   [   ]

Service   [   ]

2. Considering teaching requirements for P&T, should future (new) criteria be:

   ○ More rigorous?

   ○ The same?

   ○ Less rigorous?

   ○ I have no opinion

   Other (please specify)

   [   ]

3. Considering research requirements for P&T, should future (new) criteria be:

○ More rigorous?

○ The same?

○ Less rigorous?

○ I have no opinion

Other (please specify)

[ ]

4. Considering service requirements for P&T, should future (new) criteria be:

○ More rigorous?

○ The same?

○ Less rigorous?

○ I have no opinion

Other (please specify)

[ ]

5. What do you like about the current P&T guidelines?

[ ]

6. What do you dislike about the current P&T guidelines?

[ ]

7. What changes would you like to see to the current P&T guidelines?

[ ]

8. What would you think about a point system for P&T, with values associated with activities based on department-determined significance? Overall standards (i.e., outstanding, superior, good) will have minimum point requirements, and supplementary documentation could be limited to activities contributing to points. Not only could this reduce the amount of documentation necessary, but it could also reduce subjectiveness in the evaluation process.

○ Yes, I think this a good

idea.

○ Absolutely not.

○ Maybe, depending on

what proposal looks like.

9. Do you have any other suggestions/examples for the new guidelines? Please include links to or email examples to the committee.

Appendix 4 - New Tenure and promotion Document

**CRITERIA FOR TENURE, PROMOTION, AND
POST-PROFESSORIAL MERIT
DEPARTMENT OF MANAGEMENT
SOUTHEAST MISSOURI STATE UNIVERSITY**

Introduction

This document is intended to achieve the following four objectives:

1. Set forth a tenure, promotion, and post-professorial merit program that is consistent with university, AACSB, and other accrediting agency guidelines.

2. Provide guidance for candidates for tenure, promotion and post-professorial merit.

3. Highlight activities in teaching, professional growth, and service viewed as more important to attaining tenure, promotion, and post-professorial merit to help candidates plan and organize their dossier.

4. Provide a guide for tenure and promotion committees and administrators to evaluate faculty performance, approve tenure, recommend promotion, and award post-professorial merit.

The *Faculty Handbook* indicates departmental criteria are developed with an acknowledgment that on rare occasions a faculty member who does not meet minimum standards in every area may be able to support such a powerful case for promotion that his or her application deserves consideration through the regular promotion process. In those unusual instances, the dossier must indicate that the objective criteria are not completely met, and the faculty member's dossier must unequivocally demonstrate exceptional merit. Faculty performance shall be evaluated using the terms good, superior, and outstanding.

Furthermore, if within any area (teaching, professional growth, or service) the candidate's qualifications satisfy the criteria for two or more categories of performance (outstanding or superior, or superior or good, etc.), the candidate will be judged to have attained the higher category.

Requirements for Promotion

Consideration for tenure, promotion or post-professorial merit will be based primarily upon the candidate's demonstration of an "effective" record of achievements relating to professional growth, teaching effectiveness, and service over the review period based on university guidelines. For purpose of this document, "per year" refers to the calendar year.

"Effective" means achieving attainable outcomes that benefit students in teaching, research and practice in scholarship, and the community in service.

Because of the inter-connected nature of the teacher-scholar model, items could be placed in multiple categories (e.g., teaching effectiveness and service to students). It is at the candidate's discretion to report evidence in the category that best supports the overall narrative of the dossier. Evidence may not be included in more than one category.

Professor:	To achieve promotion to professor, the candidate must obtain a minimum rating of outstanding in one of the two areas of teaching effectiveness or professional growth, and ratings of superior in the remaining two areas.
Associate Professor:	To achieve promotion to associate professor, the candidate must obtain a minimum rating of superior in the two areas of teaching effectiveness and professional growth, and a rating of good in service.
Assistant Professor:	To achieve promotion to assistant professor, the candidate must obtain a minimum rating of good in each of the three areas.
Post-Prof Merit:	Criteria established in the *Faculty Handbook* are used for determining post-professorial merit.

Teaching Effectiveness:

Effective teaching may be demonstrated through use of a variety of sources indicating (A) delivery of effective instruction, (B) currency in the instructional field, and (C) accessibility to students. For promotion, tenure, and or post-professorial merit, candidates shall submit a portfolio of output measures providing evidence of teaching effectiveness.

For guidance on using student evaluations of instruction in the promotion and tenure dossier refer to the *Faculty Handbook*.

Note: Teaching effectiveness is an important criterion in the overall evaluation of a faculty member, and is also the most difficult to evaluate. For this reason, such evidence might include, for example, student learning such as pre- and post-tests and samples of student work, peer observations, student ratings, and testimonials from current or former students. Since student ratings are influenced by many non-academic variables, their ratings should never be used as the sole measurement of teaching performance.

Requirements for all submissions:

1. The candidate is required to list all courses taught during the evaluation period, including delivery format, enrollment number and number of credit hours.

2. Provide evidence of effective instruction. For example, evidence might include evaluation from students, peers, or self-evaluation.

A. Delivery of effective instruction

Delivery of effective instruction is typically demonstrated by the faculty member through a combination of measures such as, but not limited to, the following:

1. Student evaluations (if included, should be submitted in accordance with *Faculty Handbook* guidelines).
2. Interpretation/explanation of the most recent student evaluations, and modifications made to address problems or concerns of prior evaluations (if included).
3. Number of course preps, level and type of courses taught (e.g., required/elective, undergraduate/graduate, seniors/freshmen, etc.), class size, and any other descriptive that may have affected teaching success.
4. Degree of challenge, extent of manual grading for learning artifacts, material currency requirements, etc. related to the amount of effort required to maintain relevancy and provide instruction.
5. Unique challenges, special circumstances, and supplemental teaching-related activities faced or undertaken by the faculty member.
6. Chairperson, peer, and/or dean evaluations (including classroom observation reports).

7. Participant evaluations of teaching effectiveness during workshops and/or seminars conducted.
8. Student and/or alumni responses to assessment instruments (alumni surveys, etc.) used by various university entities.
9. Effective course-planning activities and materials (class syllabi, course outlines, bibliographies, assignments, exams, graded student work, course materials, etc.)
10. Integration of activities and information focusing upon the various areas associated with CLOs and/or PLOs.
11. Conversion of a course to a different delivery mode (online, blended, time-frame, etc.).
12. Evidence regarding field trips and experiential learning opportunities outside the classroom (e.g. to the Douglas C. Greene Center for Innovation and Entrepreneurship or Catapult Creative House).
13. Other evidence to support effective delivery of instruction.

B. Currency in the instructional field

Currency in the instructional field is typically demonstrated by a variety of measures, such as, but not limited to, the following:

1. Development of new courses and/or proposals for new courses.
2. Major revisions to existing courses.
3. Development or modification of new or existing academic programs.
4. Teaching in one of the university's study abroad programs, or in a departmentally approved study abroad program.
5. Teaching as a visiting professor at another institution.
6. Attendance at conferences, seminars, and workshops related to maintaining currency in the instructional field.
7. Development of innovative instructional techniques and/or course materials.
8. Application of new instructional technologies in the classroom.
9. Integration of "real-world" examples or practical applications in classes.
10. Completion of published textbook reviews.
11. Achievement of professional certification.
12. Continuing professional education (CPE) required to maintain professional certification.
13. Attendance at conferences, seminars, and workshops for gaining new knowledge in the discipline and/or for improvement of teaching.
14. Other evidence of currency in the instructional field.

C. Accessibility to students

Accessibility to students may be demonstrated by the faculty member through a combination of measures, such as, but not limited to, the following:

1. Quality academic/career advisement of students (up-to-date advising of students regarding course selection, program changes, career opportunities, and information on graduate programs).
2. Assistance in helping students secure internships, employment and/or graduate school admission.
3. Supervision of student projects, papers, theses, independent studies, student internships and/or serving on student graduate committees.
4. Involvement in student programs, such as the Jane Stephens Honors Program, international programs, and the mentoring programs.
5. Involvement in university/HCBC-approved student organizations, including learning communities.
6. Supervision of students in state, national and/or international competitions.
7. Providing assistance to students outside of the classroom.
8. Conducting tutoring or other learning sessions outside the regular course schedule.
9. Other evidence to support accessibility to students (e.g., extended office hours, after hours support, virtual office hours).

D. Other factors for consideration (optional)

If there is additional information the candidate feels should be considered that does not fit in a category provided above or unique circumstances the candidate would like to explain, the candidate may include that content in this section of the document.

The information presented in the three categories above (A, B, C) is not an exhaustive or all-inclusive list of evidence a faculty member may provide. The order of items in a list does not reflect importance or weight in the promotion, tenure, or post-professorial merit process. Justification of the items should include the significance of the activity. The candidate is not expected to present evidence for all items in categories A, B, or C.

Performance Evaluation of Teaching

Outstanding: To achieve a performance rating of OUTSTANDING, the candidate must present evidence, over the review period, of effective instruction and evidence of three examples from category A and two examples of involvement in each of the other two areas (categories B and C, "currency in the instructional field" and "accessibility to students").

Superior: To achieve a rating of SUPERIOR, the candidate must present evidence, over the review period, of effective instruction, and evidence of two examples from category A and involvement in the other two areas (categories B and C, "currency in the instructional field" and "accessibility to students").

Good: To achieve a rating of GOOD, the candidate must present evidence, over the review period, of effective instruction and evidence of one example from category A and involvement in at least one of the other two areas (categories B or C, "currency in the instructional field" and "accessibility to students").

Unacceptable: Insufficient evidence of effective instruction and lack of involvement in one of the other two areas (categories B or C, "currency in the instructional field" and "accessibility to students").

Professional Growth:

Evidence of professional growth shall include intellectual activities and contributions that strengthen the teaching function (instructional development) and/or lead to the expansion (basic research) or application (applied research) of knowledge. Output from intellectual contributions shall be subjected to public scrutiny by academic and professional peers. Candidates are responsible for making the case for the scope of their scholarly work (international, national, regional), and the review status (refereed or non-referred). They should also provide the acceptance rate and/or citation rate, when available. Candidates should indicate their specific role in multiple author publications.

On page 49, the 2020 AACSB standards define *Intellectual Contributions* as "original works intended to advance the theory, practice, and/or teaching of business. Further, intellectual contributions may have the potential to address issues of importance to broader society. The contributions are scholarly in the sense that they are based on generally accepted academic research principles and are disseminated to appropriate audiences."

As with HCBC research reassignment guidelines, scholarship activities are assigned point values that, when totaled, result in an overall rating for professional growth. Justification for point values must be provided for all activities. The candidate is required to submit within the record of service a table showing the activities included and the points earned for each activity with total points earned included.

	Activity	Points awarded
1	"A" level (from externally verifiable list, such as Australian Business Deans Council Journal Quality List (ABDC) "A," Scimago Journal and Country Rank (SJR) "Q1", etc.) refereed journal publication (e.g. research, case study, teaching note).	10
2	Publication of first edition scholarly book or textbook by a reputable publisher; revised editions would be valued at 50 percent.	10
3	Authorship/co-authorship of external grant proposal awarded with a value of $100,000 or more.	10
4	"B" level (from externally verifiable list, such as ABDC "B," SJR "Q2," etc.) refereed journal publication (e.g. research, case study, teaching note).	7
5	Editor of peer-reviewed journal.	6
6	Publication of first edition practitioner book by a reputable publisher; revised editions would be valued at 50 percent.	5
7	Publication of an edited volume (book or journal)	5
8	Authorship/co-authorship of external grant proposal awarded with a value between $50,000 - $100,000.	5

	Activity	Points awarded
9	"C" level (from externally verifiable list, such as ABDC "C," SJR "Q3," etc.) refereed journal publication (e.g. research, case study, teaching note).	4
10	Chapter in scholarly compendium, book, or monograph.	4
11	Authorship/co-authorship of external grant proposal awarded with a value between $10,000 - $50,000.	4
12	Associate editor of peer-reviewed journal.	4
13	Refereed journal publication in outlet not otherwise listed.	3
14	Publication of article in professional publication.	3
15	Editorial board member.	3
16	Participation in faculty internship.	3
17	Authorship/co-authorship of grant proposal (internal or external) awarded with a value less than $10,000.	2
18	Award received for published paper/presentation.	2
19	Published book review.	2
20	Publication in peer-reviewed conference proceedings (also eligible for journal publication points).	2
21	Attendance in credit-earning courses to maintain currency in the field.	2
22	h-index >= 10 or i10-index >=10 over the last 5 years (obtained from Google	1.5

	Scholar).	
23	Academic presentation to business/industry.	1
24	First time presentation of paper/panel participant in academic or industry conference.	1
25	h-index of 5 – 9 or i10-index of 5 – 9 over the last 5 years (obtained from Google Scholar).	1
26	Reviewer for journal, conference, book, grant agencies, etc. Points awarded for each individual manuscript reviewed.	0.5
27	h-index of 1 – 4 or i10-index of 1 – 4 over the last 5 years (obtained from Google Scholar).	0.5
28	Attendance at seminars and workshops related to professional growth/research.	0.5
29	Other evidence of research. Justification for point value must be provided. Multiple research artifacts may be reported (max of 3 points per item).	0.5-3

Other factors for consideration (optional)

If there is additional information the candidate feels should be considered that does not fit in a category provided above or unique circumstances the candidate would like to explain, the candidate may include that content in this section of the document.

Performance Evaluation of Professional Growth

Outstanding: To achieve a performance level of OUTSTANDING, the candidate must present evidence of effective achievement in scholarly activities, including two refereed journal articles or equivalent and scholarly activity. Faculty must earn at least 15 points (without rounding) using the defined scale.

Superior: To achieve a performance level of SUPERIOR, the candidate must present evidence of effective achievement in scholarly activities, including two refereed journal articles or equivalent and scholarly activity. Faculty must earn at least 12 points (without rounding) using the defined scale.

Good: To achieve a performance level of GOOD, the candidate must present evidence of effective achievement in scholarly activities, including one refereed journal article or evidence of scholarly activity. Faculty must earn at least 6 points (without rounding) using the defined scale.

Unacceptable: Insufficient evidence of achievement in the area of intellectual contributions. Fewer than 6 points earned over the review period.

Service:

Service refers to support given to the university, students, the academic discipline, and to professional organizations or to the community/region. Evidence of service to the university should include active service that promotes the mission and goals of the university, the college, the department, and program. Justification for point values must be provided for all activities. The candidate is required to

submit within the record of service a table showing the activities included and the points earned for each activity with total points earned included.

A. Service to the university, college, department, and program

	Activity	Points awarded
A1	Chair of university committee or task force, per year (cannot also claim membership).	3
A2	Chair of college committee or task force, per year (cannot also claim membership).	2.5
A3	Chair/coordinator for programs and activities sponsored by the Douglas C. Greene Center for Innovation and Entrepreneurship or Catapult Creative House, per year (cannot also claim membership).	2.5
A4	Chair of department committee or task force, per year (cannot also claim membership).	2
A5	Membership on university committee or task force, per year.	2
A6	Membership on college committee or task force, per year.	1.5
A7	Involvement in planning/coordinating university, college, or department activities, per year.	1.5
A8	Membership on department committee or task force per year.	1
A9	Development and presentation of professional workshops and/or training seminars for internal university constituencies.	1
A10	Service to other units of the university.	1
A11	Attendance at university, college, or department programs/events. Points available for each event, with a maximum of 3 points available.	0.5
A12	Alternate for university or college committee, per year.	0.5
A13	Other evidence of service to the university, college, department, and program. Justification for point value must be provided. Multiple service commitments may be reported (max of 3 points per commitment).	0.5-3

B. Service to students*

	Activity	Points awarded
B1	Faculty advisor to active student organization or HCBC learning community, per year.	3
B2	Supervision and coach/mentor of students for state or national competition.	3
B3	Sponsor/plan student field experience (domestic or international)	2
B4	Involvement in student programs, such as the Jane Stephens Honors Program, First Step, and/or the Mentor Program. Multiple service commitments may be reported.	2
B5	Out of load supervision of internships, and/or involvement in arrangements of internships, placements, etc.	2
B6	Involvement in planning/coordinating student-focused activities, e.g., HCBC learning community activities or Welcome Back event.	1.5
B7	Involvement in student recruitment activities, such as admission meetings, athlete recruitment events, and high-school visits.	1
B8	Participation (not planning or sponsoring) in student field experience.	1
B9	Advisor for a substantial number of students and/or graduate students and/or complex advising situations. Justification must be provided for how advising exceeds standard load.	1
B10	Attendance at university, college, or department student recruitment events. Points available for each event, with a maximum of 3 points available.	0.5
B11	Attendance at university, college, or department student-focused programs/events. Points available for each event, with a maximum of 3 points available.	0.5
B12	Supervision of student projects, such as graduate papers, theses, independent studies, honors contracts, internships, applied research projects and/or serving on a student's graduate committee. Multiple service commitments may be reported.	0.5
B13	Other evidence of service to students. Justification for point value must be provided. Multiple service commitments may be reported (max of 3 points per commitment).	0.5-3

*Activities may not also be counted in teaching effectiveness

C. Service to the community (local, regional, national, and/or international)

	Activity	Points awarded
C1	Service on city or county advisory board, per year.	3
C2	Elected officer of board of directors of a community service organization, per year.	3
C3	Member of board of directors of a community service organization, per year.	2
C4	Involvement in university, college, or department extension activities, including continuing education, small business development, and entrepreneurial outreach.	2
C5	Professionally-related contributions to civic groups/community service organizations.	1
C6	Involvement in professional consulting, per event.	1
C7	Involvement in ongoing professional relationship consulting, per year.	1
C8	Representing university/college at community events.	1
C9	Other evidence of service to the community. Justification for point value must be provided. Multiple service commitments may be reported (max of 3 points per commitment).	0.5-3

D. Service to academic and professional organizations**

	Activity	Points awarded
D1	Officer of an academic or professional organization, per year.	4
D2	Board member of an academic or professional organization, per year.	3
D3	Conference program chair for academic or professional meeting.	3
D4	Editor of conference proceedings.	3
D5	Editorial board member, per year.	3
D6	Associate editor of conference proceedings.	2
D7	Track chair for academic or professional meeting.	2
D8	Session chair/discussant for professional or academic conference.	1
D9	Textbook and/or supplemental package reviewer.	1
D10	Membership in academic organizations, per year.	1
D11	Membership in professional organizations related to teaching discipline, per year.	1
D12	Reviewer for journal, conference, book, grant agencies, etc. Points awarded for each individual manuscript reviewed.	0.5
D13	Other evidence of service to academic and professional organizations. Justification for point value must be provided. Multiple service commitments may be reported (max of 3 points per commitment).	0.5-3

**Activities may not also be counted in professional growth.

E. Other factors for consideration (optional)

If there is additional information the candidate feels should be considered that does not fit in a category provided above or unique circumstances the candidate would like to explain, the candidate may include that content in this section of the document.

Performance Evaluation of Service

Outstanding: To achieve a performance level of OUTSTANDING, the candidate must present evidence, over the review period, of high level effective service (e.g., leadership positions and/or high involvement) to the university, college, department, and program and evidence of effective service across the other three areas ("service to students," "service to the community," or "service to academic and professional organizations"). Faculty must earn at least 20 points using the defined scales with a total of at least 8 points for category A, and a total of at least 12 points between the other three categories (B, C, D).

Superior: To achieve a performance level of SUPERIOR, the candidate must present evidence, over the review period, of effective service to the university, college, department, and program and evidence of effective service across the other three categories ("service to students," "service to the community," or "service to academic and professional organizations"). Faculty must earn at least 15 points using the defined scales with a total of 5 points for category A, and a total of at least 10 points between the other three categories (B, C, D).

Good: To achieve a performance level of GOOD, the candidate must present evidence, over the review period, of effective service to the university, college, department, and program (category A) and to students (category B). Faculty must earn at least 10

points from the defined scales for categories A and B.

Unacceptable: Insufficient evidence of acceptable service in the four categories (A, B, C, and D). This is determined by the lack of ability to meet the requirement for good in service in this document.

Preparing the Dossier

Dossiers should be prepared in accordance with the *Faculty Handbook*. Dossiers that are not in compliance may be rejected from the review process.

The record of service should include an executive summary, indicating the candidate's self-evaluation level (e.g., outstanding, superior, or good) in each category and the total points earned in the professional growth and service categories. Candidates may also include a self-evaluation summary in each section of the record of service (i.e., teaching effectiveness, professional growth, and service).

Requirements for Probationary Faculty Members

Each probationary faculty member, regardless of rank, will provide evidence in each of the three dimensions listed above during the probationary period using the criteria outlined in this document and adhering to the polices of the *Faculty Handbook.*

Documentation for tenure is to be prepared in accordance with the guidelines stipulated in the section on the dossier in the *Faculty Handbook.* The candidate for tenure is required to have the appropriate terminal degree.

Probationary faculty are evaluated in accordance with university policies and procedures. Evaluations should be consistent with performance required for promotion to an academic rank and shall require positive evidence to support continued contributions and accomplishments in teaching effectiveness, professional growth, and service. For individuals hired at the assistant professor rank, it is necessary to demonstrate an expected continuing record of performance consistent with the criteria for promotion to associate professor to be considered for tenure.

Appendix 5 - Previous Tenure and promotion Document

CRITERIA FOR PROMOTION, TENURE, AND ANNUAL EVALUATION
DEPARTMENT OF MANAGEMENT AND MARKETING
SOUTHEAST MISSOURI STATE UNIVERSITY

Underlying Philosophy

This document is intended to achieve the following three objectives:

A. Set forth a promotion, tenure, and post-professorial merit program that is consistent with AACSB guidelines.

B. Provide guidance for candidates for promotion, tenure, and post-professorial merit.

C. Provide guidelines that reflect the true state of nature, that is, the way the promotion, tenure, and post-professorial merit systems function in the Donald L. Harrison College of Business and Southeast Missouri State University. While the three major areas of expectation (teaching, professional growth, and service) have not changed, not all the activities that candidates have historically used to validate their accomplishments in these three major areas are viewed as being as important as they once were. In highlighting those activities that are viewed as more important to attaining promotion, tenure, and post-professorial merit, this document provides insight into the way the system works, which will be useful to candidates as they plan and organize their promotion/tenure/post-professorial merit documents.

It should be pointed out that the following are guidelines only, and, in exceptional circumstances, a candidate's credentials may be such as to warrant a recommendation from the committee although all standards may not have been met. Furthermore, if a candidate's qualifications satisfy the criteria for two or more categories of performance (Outstanding or Superior, Superior or Good, etc.) within any area (Teaching, Professional Development, or Service), the presumption is that the candidate will be judged to have attained the higher of those two performance categories.

Requirements for Promotion

Consistent with AACSB standards, consideration for promotion will be based primarily upon the candidate's demonstration of a "sustained" and "significant" record of achievements relating to scholarly work, teaching effectiveness, and service over the mandated review period based on university guidelines. In this context, sustained means time in rank with an emphasis on the most recent five year period. In this context, a "significant record of achievement" means that the candidate is able to indicate how his or her accomplishments relate to and/or contribute to achievement of the mission of the Department, College, and/or University. As indicated above, sustained performance is important to evaluation for promotion; significant multiyear gaps in recent performance will significantly disadvantage the candidate seeking promotion.

> **Professor:** To achieve promotion to professor, the candidate must obtain a minimum rating of outstanding in one area and ratings of a superior in the remaining two areas.

Associate Professor: To achieve promotion to associate professor, the candidate must

obtain a minimum rating of superior in the two areas of Teaching Effectiveness and Professional Growth, and a rating of good in Service.

Assistant Professor: To achieve promotion to assistant professor, the candidate must obtain a minimum rating of good in each of the three areas.

I. **Teaching Effectiveness:** Effective teaching, the most important of the three major responsibilities of the faculty member, may be demonstrated by the faculty member through the use of a variety of sources which indicate (A) delivery of effective instruction, (B) currency in his/her instructional field, and (C) accessibility to students. For promotion and/or tenure, candidates shall submit a portfolio of output measures providing evidence of teaching effectiveness. According to the *Faculty Handbook,* "Because standardized rating forms and departmental assessments may not adequately capture the nuances and variations across disciplines or between types of courses within a discipline, the use of the results of student evaluations may not be compelled in any kind of personnel decision (such as promotion, tenure, merit pay, termination, etc.) and may only be used if the individual faculty member wishes them to be so used." It is further stated that "Demonstrating one's teaching effectiveness, however, is the responsibility of the individual faculty member and may be done in a variety of ways, such as other types of student evaluations, peer evaluations, portfolios, pre- test/post-test or other "value-added" outcomes measures." It is recommended that some consistent form of feedback from students be provided. It should be remembered that student evaluations are affected by a variety of factors including: course difficulty, time of day, GPA, length of course, class size, method of delivery (face-to-face or online), to name a few.

A.i.). Delivery of Effective Instruction

Delivery of effective instruction is typically demonstrated by the faculty member through a combination of input and output measures such as, but not limited to, the following:

1. Student evaluations of instruction (a summary of the results of neutrally administered student evaluations of instruction conducted during the relevant time period. While student evaluations of instruction are not required, when submitted, nationally-normed student evaluations are generally preferred). Data submitted should include key criteria as identified by administrators of that normed instrument.

2. Chairperson, peer and/or Dean evaluations (including classroom observation reports).

3. Participant evaluations of teaching effectiveness during workshops and/or seminars conducted.

4. Student and/or alumni responses to assessment instruments (alumni surveys, etc.) used by various University entities.

5. Other evidence of the delivery of effective instruction.

ii). Efforts to Support the Delivery of Effective Instruction

1. Effective course-planning activities and materials (class syllabi, course outlines,

bibliographies, assignments, exams, graded student work, course materials, etc.)

2. Integration of activities and information focusing upon the various issue areas required for inclusion in the BSBA core courses.

3. Other evidence to support the delivery of effective instruction.

B. Currency in the Instructional Field

Currency in the instructional field is typically demonstrated by a variety of input measures, such as, but not limited to, the following:

1. Development of new courses (including on-line courses not previously offered as on-line courses) and /or proposals for new courses.

2. Major revisions to existing courses.

3. Development of new academic programs.

4. Teaching in one of the University's study abroad programs, or in a departmentally approved study abroad program, or as a visiting professor at an institution outside of the United States.

5. Incorporation of library assignments and computer usage in classes.

6. Attendance at conferences, seminars, and workshops related to maintaining currency in the instructional field.

7. Development of innovative instructional techniques and/or course materials.

8. Application of new instructional technologies in the classroom.

9. Development and maintenance of web courses and web-enhanced courses.

10. Integration of "real-world" examples or practical applications in classes.

11. Completion of published textbook reviews.

12. Achievement of professional certification.

13. Continuing Professional Education (CPE) required to maintain professional certification.

14. Other evidence of currency in the instructional field.

C. Accessibility to Students

Accessibility to students may be demonstrated by the faculty member through a combination of input and output measures, such as, but not limited to, the following:

1. Quality academic/career advisement of students (up-to-date advising of students regarding course selection, program changes, career opportunities, and information on graduate programs).

2. Assistance in helping students secure internships and/or employment.

3. Other evidence of accessibility to students.

D. Self-assessment (optional)

1. Self-assessment of the candidate's strengths in teaching and continuous improvement efforts made toward teaching effectiveness.

The information presented in the three categories above (A,B,C) is not meant to be an exhaustive or all-inclusive list of the types of evidence a faculty member may provide but rather to serve as examples of the types of information that a faculty member may present to support his/her candidacy. The order of items in a list does not necessarily reflect their importance in the promotion/tenure/post- professorial merit process.

Performance Evaluation of Teaching

Outstanding: To achieve a performance rating of OUTSTANDING, the candidate must present evidence, over the review period, of sustained highly effective instruction and evidence of involvement in the other two areas (Categories B and C, "Currency in the Instructional Field" and "Accessibility to Students"). Highly effective instruction is most directly evidenced by Category A output measures where the candidate's aggregate portfolio of student and/or other quantitative evaluation measures are consistently in the middle range and above. Qualitative output measures indicate highly effective instruction.

Superior: To achieve a rating of SUPERIOR, the candidate must present evidence, over the review period, of sustained very effective instruction, and evidence of involvement in the other two areas (Categories B and C, "Currency in the Instructional Field" and "Accessibility to Students"). Very effective instruction is most directly evidenced by Category A output measures where most of the candidate's student and/or other quantitative evaluation measures indicate very effective instruction.

Good: To achieve a rating of GOOD, the candidate must present evidence, over the review period, of effective instruction and evidence of involvement in at least one of the other two areas (Categories B or C, "Currency in the Instructional Field" and "Accessibility to Students").

Unacceptable: Insufficient evidence of effective instruction (see pg. 10 Performance Rating for Teaching Effectiveness – Satisfactory) and lack of involvement in one of the other two areas (Categories B or C, "Currency in the Instructional Field" and "Accessibility to Students").

II. **Professional Growth:** Evidence of professional growth shall include intellectual activities and contributions that strengthen the teaching function (instructional development) and/or lead to the expansion (basic research) or application of knowledge (applied research). Output from intellectual contributions shall be subjected to public scrutiny by academic and professional peers. Candidates are responsible for making the case (using Cabell's

and/or other sources such as the college's list/inclusions/guidelines) for the scope of their scholarly work (international, national, regional), and the review status (refereed or non-referred). They should also provide the acceptance rate and/or citation rate, when available. Candidates should indicate their specific role in multiple author publications. While intellectual contributions in international or national outlets are usually given greater significance than those in regional outlets, the geographic scope of the outlet is not the only important criteria; the quality of the publication is of equal importance. Refereed publications are accorded greater significance than non- refereed publications. Refereed proceedings are accorded less significance than refereed publications in national/international journals. Publication and presentation are not limited to traditional meanings, but also include other outlets; for example, online publications.

A. **"Faculty members should make intellectual contributions on a continuing basis appropriate to the school's mission. The outputs from intellectual contributions should be available for public scrutiny by academic peers or practitioners." (AACSB IC.I) Successful progress in this area necessitates evidence of publication in national refereed journals.**

Outputs from all forms of scholarship activities may include, but are not limited to, publications in the following two categories:

Category I

1.1   Publications in national and/or international peer-reviewed journals (academic, professional, pedagogical)
1.2.   Research monographs
1.3   Scholarly books
1.4   Chapters in scholarly books
1.5   Textbooks

Category 2

2.1.   Publications in regional peer-reviewed journals (academic, professional, pedagogical).
2.2.   Proceedings from scholarly meetings
2.3   Papers presented at academic or professional meetings
2.4   Publicly available research working papers and applied research reports
2.5   Papers presented at faculty research seminars
2.6   Publications in trade journals
2.7   In-house journals
2.8   Book reviews
2.9   Written cases with instructional materials, non-refereed
2.10   Instructional software
2.11   Publicly available materials describing the design and implementation of new curricula or courses
2.12   Grants
2.13   Other significant scholarship activities

B. Self-assessment (optional)

1. Self-assessment of the candidate's strengths in professional growth and continuous improvement efforts made toward professional growth. Intellectual

contributions are demonstrated by documented achievements in applied scholarship, instructional development, and/or basic scholarship consistent with the above criteria. Applied scholarship is the application, transfer, and interpretation of knowledge. Instructional development is the enhancement of the educational value of instructional efforts in the discipline. Basic scholarship is the creation of new knowledge.

Performance Evaluation of Professional Growth

Outstanding: To achieve a performance level of OUTSTANDING, the candidate must present evidence of significant and sustained achievement. Significance is reflected in a body of scholarly work published in respected national/international outlets. Indicators of respect include stature and distribution of the outlet, its listing in bibliographic databases, citations of the scholarly work, and/or other indicators described by the faculty member and judged as indicators of respect. For example, this requirement may be met by: 1) Three national/international refereed journal publications (Category 1, item 1.1) over a five-year period and evidence of an ongoing research agenda; or 2) Two national/international refereed journal publications over a five-year period and one additional Category I (above) accomplishment and evidence of an ongoing research agenda; or 3) Two national/international refereed journal publications over a five year period plus five Category 2 (above) accomplishments and evidence of an ongoing research agenda.

Superior: To achieve a performance level of SUPERIOR, the candidate must present evidence of significant and sustained achievement. Significance is reflected in a body of scholarly work published in respected national/international outlets. Indicators of respect include stature and distribution of the outlet, its listing in bibliographic databases, citations of the scholarly work, and/or other indicators described by the faculty member and judged as indicators of respect. For example, this requirement may be met by: 1) Two national/international refereed journal publications (Category 1, item 1.1) over a five-year period and evidence of an ongoing research agenda; or 2) Two publications which include: one national/international refereed journal publication (Category 1, item 1.1) over a five-year period and one additional Category 1 (above) publication which must be judged equivalent in rigor and scope to Category 1, item 1.1 and evidence of an ongoing research agenda.

Good: To achieve a performance level of GOOD, the candidate must present evidence of achievement. For example, this requirement may be met by one national/international refereed journal publication (Category 1, item 1.1) over a five-five-year period and evidence of an ongoing research agenda.

Unacceptable: Insufficient evidence of achievement in the area of intellectual contributions; no publications in the last five-year period and/or no evidence of an ongoing research agenda.

III.   **Service:** Service refers to support given to the university, the academic discipline, professional organizations or to the community/region. Evidence of service to the university should include active service that promotes the mission and goals of the University, the College, and the Department.

   A. **Service to the University may be demonstrated by providing such examples as:**

1. Membership on department, college and university committees.

2. Chairperson of a departmental, college, or university committee or task force.

3. Involvement in student recruitment activities.

4. Development and presentation of professional workshops and/or training seminars for internal university constituencies.

5. Service to other units of the University.

6. Supervision of internships, and/or involvement in arrangements of internships, placements, etc.

7. Advisor (sponsorship) or other involvement in student organizations.

8. Supervision of students in state and national competition.

9. Supervision of student projects, such as graduate papers, theses, independent studies, and applied research projects and/or serving on a student's graduate committee.

10. Involvement in student programs, such as the University Honors Program, First Step, and/or the Mentor Program.

11. Involvement in programs and activities sponsored by the Douglas C. Greene Center for Innovation and Entrepreneurship, Catapult Creative House or other College of Business related programming.

12. Other evidence of service to the campus.

B. Service to the community (local, regional, national, and/or international) may be demonstrated by providing such examples as:

1. Involvement in professional consulting.

2. Development and presentation of professional programs.

3. Involvement in extension activities, such as continuing education courses and entrepreneurial outreach activities.

4. Professionally related contributions to civic groups.

5. Other evidence of service to the community.

C. Service to academic and professional organizations may be demonstrated by providing such examples as:

1. Officer or board member of an academic or professional organization.

2. Referee/reviewer of papers for a professional organization.

3. Discussant or chairperson of a session during a professional organizational meeting.

4. Track chair and/or program chair of a professional organizational meeting.

5. Editorship/Editorial Review Board/Reviewer of a professional journal/proceedings.

6. Other evidence of service to academic and professional organizations.

D. Self-assessment (optional)

1. Self-assessment of the candidate's strengths in service and continuous improvement efforts made toward service.

Performance Evaluation of Service

Outstanding: To achieve a performance level of OUTSTANDING, the candidate must present evidence, over the review period, of sustained service to the university and evidence of high- level sustained service (i.e., leadership positions and/or high involvement) in at least one of the other two areas ("Service to the Community," or "Service to Academic and Professional Organizations").

Superior: To achieve a performance level of SUPERIOR, the candidate must present evidence, over the review period, of sustained service to the university and evidence of sustained involvement in one of the other two areas ("Service to the Community," or "Service to Academic and Professional Organizations").

Good: To achieve a performance level of GOOD, the candidate must present evidence, over the review period, of sustained service to the University.

Unacceptable: Insufficient evidence of acceptable service in any of the three areas (Categories A, B, and C).

Requirements for Tenure

Each probationary faculty member, regardless of rank, will provide evidence in each of the three dimensions listed above for each year during the probationary period using the criteria outlined above and adhering to the polices of the *Faculty Handbook.* Documentation for tenure is to be prepared in accordance with the guidelines stipulated in the **Record of Service** of the *Faculty Handbook.* The candidate for tenure is required to have the appropriate terminal degree in his or her chosen field of specialization.

Probationary faculty will be evaluated in accordance with university policies and procedures. Evaluations should be consistent with performance required for merit pay and promotion to an academic rank and shall require positive evidence to support continued contributions and accomplishments in teaching effectiveness, professional growth, and service. For individuals hired at the assistant professor rank, it is necessary to demonstrate an expected continuing record of performance consistent with the criteria for promotion to associate professor to be considered for tenure. For individuals hired at the associate professor rank, it is necessary to demonstrate a continuing record of

performance consistent with the criteria for promotion to full professor to be considered for tenure. For individuals hired at the full professor rank, it is necessary to demonstrate a continuing record of performance that would lead to an evaluation of outstanding in at least one dimension and superior in the remaining two dimensions of teaching effectiveness, professional growth and service to be considered for tenure.

Promotion and tenure qualifications of AACSB universities similar to Southeast Missouri State University were examined. The qualifications and standards given above are within the parameters of those examined.