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APPLYING A SCRUM FRAMEWORK TO TEACH SYSTEMS ANALYSIS AND DESIGN

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ABSTRACT

Systems Analysis and Design (SAD) courses are fundamental to Information Systems curricula. Since the focus is on analysis and design, SAD courses naturally lend themselves to a waterfall or hybrid iterative methodology. However, industry has been adopting agile methodologies—most notably, a Scrum framework. We must prepare IS graduates to apply business analysis knowledge and skills within a Scrum framework and an agile approach. This presentation is a report of one department's curriculum revision from waterfall to agile with Scrum.

Keywords: Systems analysis and design, Scrum, agile

INTRODUCTION

The Scrum framework has been used for software development since the early 1990s (Sutherland, 2004). However, since Scrum is a "framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value, (p. 3)" the use of Scrum has extended to non-programming activities (Schwaber & Sutherland, 2017). Analyzing a client's information needs and designing an information system is a complex adaptive problem, and the sheer number of research articles devoted to using Scrum in software development testifies to the prevalence of Scrum in industry; therefore, a logical approach to preparing IS graduates for industry success is to transition away from a waterfall methodology to systems analysis and design and embrace an agile approach using the Scrum framework.

LITERATURE REVIEW

Systems Analysis and Design (SAD) is a core course in most information systems programs, especially those which follow the ACM curriculum guidelines (Topi et al., 2010) developed by ACM and AIS. Changes to SAD are necessary, given the changes in industry from predominantly waterfall methodologies to agile methodologies. Topi (2016) suggested that because the roles of designer and programmer are now so integrally related, we have to integrate both the analysis and design with the implementation and deployment. Topi suggested that educators consider an enterprise-level, agile DevOps approach to SAD, with a focus more on deploying OTS packages into an existing platform rather than designing original software (Topi, 2016). However, IS graduates must still know how to conduct stakeholder analyses and create UX designs for apps (not all apps are OTS). One solution is to employ a Scrum framework within an agile approach to systems analysis and design.

The Scrum framework has been used for software development since the early 1990s (Sutherland, 2004). However, since Scrum is a "framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value" (p. 3), the use of Scrum has extended to non-programming activities (Schwaber & Sutherland, 2017). Scrum has been employed in programming classes (Barriocanal et al., 2018) and has been implemented (at varying levels) in some SAD courses (Erturk & Mac Callum, 2015), or has been incorporated as part of combined design/development courses (Albayrak, 2017; Magana et al., 2018). However, the reported implementations are minimal. For example, Erturk and Mac Callum (2015) included only Planning Poker and Daily Standup; Magana et al. (2018) included techniques associated with waterfall methodology. What is needed is a way to rethink our approach to the process and content within a Systems Analysis and Design course. Following is a description of how faculty in an information systems program—prompted strongly by their industry advisory board—is redesigning their Systems Analysis and Design course to employ a Scrum framework within an agile approach. Fall 2019 will be the third semester of revisions.

COURSE DESCRIPTION

Systems Analysis and Design is a core course in an Information Systems program at regional comprehensive midwestern university. The course averages between 32-28 students—grouped into teams of 3-5, is taught in an active-learning classroom, and employs a flipped pedagogical approach. About half of the students are IS majors; the other half are pursuing either a minor or a certificate in information systems. To provide both discipline and personality diversity, the instructor places students in teams based on their major and their dominant team-roles profile (via www.123test.com). The teams remain intact for the entire semester. They work on an instructor-selected community-partner project. The instructor serves as the product owner and proxy for the community-partner client, although students can (and do) interact directly with the client.

Although the client project is briefly introduced on Day 2, the first two weeks of the course are devoted to systems theory, business processes, and the Systems Development Life Cycle. During those two weeks, the students must visit the client's physical site, observe the business processes, and interview the client about project-related needs. The transition from SDLC methodologies to a focus on a Scrum framework within an agile approach is launched via a guest lecture from an industry partner on how Scrum is employed in their organization. During Weeks 3 and 4, students use a sample project to practice writing user stories and acceptance criteria, defining tasks, and assigning estimated points using the Fibonacci method.

The remainder of the semester is divided into four sprints. Each sprint has a decreasing number of spikes for learning the analysis and design techniques, which the team immediately applies to the client project. The tasks for each sprint reference the actual design tasks the team will complete (rather than hypothetical programming tasks) so that teams learn how to estimate and balance their workload as they discover their team's capacity. The minimum viable product (MVP) delivered at the end of each sprint comprises everything that they and the hypothetical programmer on their team would need to implement and test the selected stories for that sprint: user personas, stories, acceptance criteria, data flow diagrams, entity relationship diagrams, and graphic mockups. Sprint

planning for Sprints 2-4 include tasks and estimated points for correcting errors from the previous sprint plus one process-improvement task based on the preceding sprint's retrospective. Although the same grading rubric is used for each sprint, the points possible increases 5-6% for each sprint (64, 69, 74, 80) to provide students with a learning curve. Similar to a traditional SAD course, the end deliverable is a professional design document: no code is written.

CONCLUSIONS AND IMPLICATIONS

Students struggle with some of the agile principles (e.g., welcoming changing requirements, maximizing work not done) and with the client-facing tasks. The practice project will be replaced with the *Ball Game* (May et al., 2016) and the extra time redirected to personas, interviewing, and UX design, as well as the agile principles. Providing students with a "voice" in their team (via Fibonacci and retrospective) was an unanticipated outcome of employing the Scrum framework. One student's retrospective comment that "We spent too much time focusing on cool features instead of the minimum viable product" indicated some level of success. Each team's ability to better estimate and manage their workload over the course of the semester was another success indicator.

REFERENCES

Albayrak, A. (2017). Restructuring of Systems Analysis and Design course with agile approach for Computer Engineering/Programming departments. *International Journal of Advanced Computer Science and Applications, 8*(11), 84-89.

Barriocanal, E.G., Sicilia, M.A., Sanchez-Alonso, S., and Cuadrado, J.J. (2018). Agile methods as a problem-based learning designs: setting and assessment. *TEEM '18,* Salamanca, Spain, October 24-26.

Erturk, E., & MacCallum, K. (2015). Developing agile skills in IT courses: Perspectives and progress. *CITRENZ 2015*. Queenstown, New Zealand.

Magana, A.J., Seah, Y.Y., & Thomas, P. (2018). Fostering cooperative learning with Scrum in a semi-capstone Systems Analysis and Design course. *Journal of Information Systems Education, 29*(2), 75-91.

May, J., York, J., & Lending, D. (2016). Play ball: Bringing Scrum into the classroom. *Journal of Information Systems Education, 27*(2), 87-92.

Schwaber, K., & Sutherland, J. (2017). The Scrum guide. Available: https://www.scrum.org/resources/what-is-scrum

Sutherland, J. (2004). Agile development: Lesson learned from the first Scrum. *Cutter Agile Project Management Advisory Service. Executive Update, 5*(20).

Topi, H. (2016). Time to rethink systems analysis and design in IS curricula? *ACM Inroads, 7*(1), 34-35.

Topi, H. et al (2010). IS 2010 curriculum guidelines for undergraduate degree programs in information systems. Available: https://www.acm.org/binaries/content/assets/education/curricula-recommendations/is-2010-acm-final.pdf

CYBERSECURITY LEADERSHIP – TRUST, EMPOWERMENT AND COMPETENCE

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This study addresses the need for a new leadership paradigm for cybersecurity in today's information age. The old industrial paradigm of the leader-centric corporate organizational structure is outdated and must be replaced with an adaptive, shared, and inclusive leadership for the cyber environment in today's post-industrial organizations. The capability to respond to cyber incursions in real-time, cyber experts need to be trusted and empowered with decision-making authority, access to the requisite resources, and power to plan and execute cyber defense. Cyber experts may also need to acquire leadership competencies to initiate and execute preventive actions and strategies against cyber threats. This study is important for both academicians and practitioners in cybersecurity because it (1) introduces leadership theories and models that are more relevant to cybersecurity leadership, (2) identifies a gap that exists in leadership research with regards to cybersecurity leadership, and (3) suggests a more proactive rather than reactive cybersecurity leadership.

LITERATURE REVIEW

The review of literature shows that there is no sufficient academic research in leadership with regard to security. Technology, information sharing, and security have not been discussed well in organizational leadership, not to mention cybersecurity. Not only academic research is lacking, but also there is a lack of practical guidance for leaders on how to lead their businesses and organizations in the technological world when facing cybersecurity threats. The limited available literature emphasizes the importance of engagement in cybersecurity on all levels of organizational leadership. However, few studies have addressed what types of leadership approaches are most appropriate or effective in a cybersecurity environment (Cleveland & Cleveland, 2018a, 2018b; Hathaway, 2012). Hasib (2014) rightly argues that cybersecurity problems require multidisciplinary and multi-dimensional approaches. However, the author does not sufficiently discuss whether or not cyber experts should be trusted with decision making on when and how to defend from cyber attacks.

THE GAP

This paper argues that cybersecurity requires a modification to the traditional organizational leadership model. The typical corporate leadership that used to call the shots for subordinates to follow, which also resists inclusive and integrated approaches to the leadership process (Collinson, 2006), does not work in the digital era because it is slow, bureaucratic, and reactionary (Hathaway, 2012). The corporate executives should stop pretending that they are in control of cyber attacks. The cybersecurity experts, who are on the cyber battlefield every day, are in control of the unpredictable situation as first responders to cyber attacks. Therefore, cyber-warriors deserve the

same respect, appreciation, and trust as the men and women in uniform. Since the cyber attacks have abolished the geographical distances and brought the battleground to the digital devices in our pockets, cars, homes, businesses, and communities, the public and organizational leaders need a new understanding of cyber threats on the basis of our technological vulnerabilities (Cleveland & Cleveland, 2018a).

THE MODEL

This study offers a new leadership paradigm and several solutions to cybersecurity leadership. First, most relevant organizational leadership theories and models, such as adaptive, shared, and inclusive leadership (DeRue, 2011; Pearce & Conger, 2002; Hollander, 2009), are offered as to why empowering, trusting, and equipping cyber experts with leadership competency by C-Suite administration are paramount for collective survival (Klimoski, 2016). Cyber leaders ought to be able to develop the security framework, allocate resources, and share authority to prevent and respond to cyber attacks effectively (Cleveland & Cleveland, 2018a). Such leadership is fast, timely, adaptive, flexible, responsive to any situation, proactive, risk-taking, and service-oriented. Second, a feedback loop model is offered for cybersecurity leadership framework for assessment, evaluation, and performance improvement. Third, building a transition pathway from traditional corporate leadership to leadership for information and digital age resilient to cyber attacks.

CONCLUSION

The control and consolidation of the traditional leadership power into the hand of the top executives should be challenged as less effective or relevant leadership practice for collective survival in the digital environment (Auffret, Snowdon, Stavrou, Katz, Kelley, Rahman, & Warweg, 2017). The time has come for the hierarchical and less democratic organizational structures (i.e., away from a one-way flow of chain of commands from the top executives to middle-managers and company workers), to yield to more inclusive and democratic organizational structures of leader-follower relationship processes in organizations where leaders follow out of their leadership roles and followers lead out of their followership roles (Malakyan, 2014). Corporate leaders, for the sake of organizational survival, ought to be willing to decentralize their decision-making power by trusting and empowering cybersecurity experts to timely respond to cyber threats with no bureaucratic delays.

REFERENCES

Auffret, J. P., Snowdon, J. L., Stavrou, A., Katz, J. S., Kelley, D., Rahman, R. S., ... & Warweg, P. (2017). Cybersecurity Leadership: Competencies, Governance, and Technologies for Industrial Control Systems. *Journal of Interconnection Networks*, *17*(01), 1740001.

Cleveland, S., & Cleveland, M. (2018a). Toward cybersecurity leadership framework. In *Proceedings of the Thirteenth Midwest Association for Information Systems Conference, St. Louis, MO, May* (5 pages).

Collinson, D. (2006). Rethinking followership: A post-structuralist analysis of follower identities. *The Leadership Quarterly, 17*(2), 179-189.

DeRue, D. S. (2011). Adaptive leadership theory: Leading and following as a complex adaptive process. *Research in Organizational Behavior, 31*, 125-150.

Hasib, M. (2014). *Cybersecurity Leadership: Powering the Modern Organization*. Tomorrow's Strategy Today, LLC.

Hathaway, M. E. (2012). Leadership and responsibility for cybersecurity. *Georgetown Journal of International Affairs*, 71-80.

Hollander, E. P. (2009). *Inclusive leadership*. New York, NY: Routledge, Taylor & Francis Group.

Klimoski, R. (2016). Critical success factors for cybersecurity leaders: Not just technical competence. *People and Strategy*, *39*(1), 14.

Malakyan, P. G. (2014). Followership in Leadership Studies: A case of leader-follower trade approach. *Journal of Leadership Studies, 7*(4), 6-22.

Pearce, C. L., & Conger, J. A. (2002). *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks, CA: SAGE Publication.

SUSTAINABLE MANAGEMENT: MINIMIZING EMPLOYEE TURNOVER IN IT

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Employee turnover is not a new issue for the information technology sector. At the same time, there is a major skill shortage for all areas of information technology (Korsakienė, Stankevičienė, Šimelytė, & Talačkienė, 2015). Employee retention issues and skill shortages alone can negatively impact the operations of organizations. CyberCom Group, an organization with a global operation providing consulting services for Amazon Web Services, has employed their own strategy for minimizing issues related to employee retention. This presentation reviews some of the causes related to employee departure along with the implications for the employer. Additionally, the Sustainability Management strategy in use at CyberCom and how it can reduce employee retention issues and boost organizational growth will be presented.

Keywords: Employee, information technology, management, productivity, retention

REFERENCES

Emanoil, M., & Nicoleta, M. S. (2013). Defining Aspects of Human Resource Management Strategy within the General Strategy of the Modern Organization. *Annals of the University of Oradea, Economic Science Series*, *22*(1), 1526–1535. Retrieved from http://ezproxy.mga.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=90545850&site=eds-live&scope=site

Grosfeld-Nir, A., Ronen, B., & Kozlovsky, N. (2007). The Pareto managerial principle: when does it apply? *International Journal of Production Research*, *45*(10), 2317–2325. https://doi.org/10.1080/00207540600818203

Korsakienė, R., Stankevičienė, A., Šimelytė, A., & Talačkienė, M. (2015). Factors driving turnover and retention of information technology professionals. *Journal of Business Economics & Management*, *16*(1), 1–17. https://doi.org/10.3846/16111699.2015.984492

Li, C., Ren, J., Shan, S., Shi, J., & Yao W. (2014). An Empirical Study on Critical Factors Affecting Employee Satisfaction. *Systems Research & Behavioral Science*, *31*(3), 447–460. https://doi.org/10.1002/sres.2284

Rowell, A. (2018, January 01). Sustainable Management. Retrieved January 29, 2019, from https://www.cybercom.com/About-Cybercom/Blogs/the-agile-blog/sustainable-management

TAKING THE GUESSWORK OUT OF CYBERSECURITY LEVERAGING U.S. GOVERNMENT BEST PRACTICES IN THE PRIVATE SECTOR

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Education, training, and certification for private sector cybersecurity roles are centered on the philosophy of quantitative risk management (e.g., Whitman & Mattord, 2011). This is rational from the point of view of for-profit business entities that are required to manage risk from a cost-benefit approach. However, risk management in this context has been criticized for its tendency to create a "checklist" or "compliance" mindset that is more concerned with demonstrating due diligence and due care than it is with establishing a holistic understanding of the security problem (Woloch, 2006). This shortcoming is compounded by risk management's reliance on quantitatively assessing the value of information assets, the probability of successful exploitations, and the costs and benefits of new security controls in ever-changing and complex technical and threat environments.

In contrast, cybersecurity (information assurance) in the U.S. government and Department of Defense (DoD) embraces the risk management philosophy but approaches it from a very different angle. Rather than the quantitative assessment of risks, costs, benefits, etc. in private industry, it relies on a stable set of Information Assurance Controls (IACs) developed by the Defense Information Systems Agency (DISA) and National Institute of Standards and Technology (NIST) (How eMASS, RMF and DIACAP All Connect, 2016). Certification and Authority to Operate (ATO) of information systems requires that a determination is made for each of these IACs as to whether the system satisfies the requirement, fails to satisfy the requirement with some kind of justification, or satisfies the requirement because it is embedded in an environment in which other systems satisfy the requirement for it (inheritance). Therefore, rather than being presented with a quantitative assessment of risk based upon tentative assumptions, the certifying authority is presented with a detailed story about *how* the information system fairs with respect to a comprehensive set of requirements (IACs) that have been developed by a security community to anticipate a wide variety of threats and vulnerabilities.

While this requirements approach to cybersecurity has clear advantages, DISA and NIST go further in helping system designers understand how commercial-off-the-shelf (COTS) system components (e.g., operating systems [OS], switches, applications, firewalls, etc.) can be configured to best satisfy the IACs. They do this by developing and maintaining Security Technical Implementation Guides (STIGs)("STIGs", 2019). For example, for a particular Windows OS, the STIG will provide guidance on how each of hundreds of OS configuration settings should be set to establish a level of security that the community believes satisfies the requirements (set of IACs) relating to OS-related vulnerabilities. Referred to as "hardening," a system component that meets these STIG requirements helps to provide added confidence to the certifying authority that the system is reasonably secure. Again, as with individual IACs, certain STIG configuration rules may not be satisfied for a valid reason (user capabilities to support a mission), but the key point is

that this is explicitly captured in the documentation and the certifying authority can then accept the risk associated with it in a more informed and conscious manner.

Manually testing and configuring systems components to be compliant with the STIGs can be very labor intensive. Fortunately, automated application tools (e.g., Gold Disk, Retina, Security Content Automation Protocol [SCAP]) have been developed that are able to run within the system and read the majority of the component's configuration settings and provide a report on STIG compliance ("SCAP", 2019). Non-compliant settings can then be addressed (set to comply or have a justification story), and the remaining STIG settings that were not accessible by the tool can be checked/addressed manually but still documented within the tool to support formal reporting.

These approaches and tools reflect in depth experience and analysis of communities of experts with resources that are not available (or cost effective) to institutions in private industry. Yet they can easily be leveraged at virtually no cost and dovetailed into already existing practices of risk analysis (assessment of risk) and risk mitigation (reducing risk with technical and policy controls). In traditional risk management philosophy risk is quantitatively assed from likelihood of a vulnerability, information asset value, percent of risk not mitigated by existing controls, and uncertainty of knowledge regarding current vulnerabilities (Whitman & Mattord, 2011). Yet, as mentioned earlier, these numbers are extremely difficult to estimate accurately. The DIACAP approach and the IACs, rather, do not attempt to assess risk in this way and instead focus on typical kinds of systems in common threat environments and the sorts of requirements that are reasonable to impose to ensure that likely threats are addressed. The information assurance or cybersecurity professional must develop a detailed qualitative story for each IAC and how the information asset meets or does not meet the requirement.

Furthermore, the IAC and STIG relationship can be highly instrumental in developing or justifying new technical and policy controls. For a particular OS, switch, firewall, database, etc., the STIGs offer guidance on hardening these technical elements in line with DoD and government best practices. Therefore, an organization's System-Specific Policies (Sys-SPs) can rely heavily on the STIGs for configuring the exact type and version of a technical system that is being implemented. Furthermore, many IAC-STIG relationships focus on policy rather than technical requirements and can therefore be highly effective in drafting and maintain Enterprise Security Policies (ESPs) and Issue-Specific Security Policies (ISSPs).

Finally, while not mentioned earlier, The IAC-STIG framework also factors in notions of risk appetite and access control (confidentiality). For example, for each DoD or government system, an assessment is made early on regarding the severity or gravity of a particular mission using a three tier Mission Assurance Categories (MACs) convention (roughly indicating *severe*, *important*, or *necessary*). Depending upon the MAC level, various IACs will either be applicable or not applicable to the information asset. In this manner, risk tolerance/appetite can be applied not at the organizational level, as it traditionally is, but at the asset level. This is advantageous as traditional risk management does not assess mission importance above and beyond the value of a particular asset. In concert with MAC, the IAC-STIG framework also assesses a Confidentiality Level (*classified*, *sensitive*, or *public*) that also serves to filter which IACs will be applicable to a particular information asset. Therefore, the IAC-STIG framework aids risk management by

already analyzing the mapping between confidentiality of information and the kinds of requirements that should be satisfied in the system design and the selection of security models.

In summary, this paper provides a general overview of the DoD and government IAC-STIG framework and how it can be leveraged to overcome some of the chronic weaknesses of private industry cybersecurity risk assessment and risk mitigation practices. The IACs and STIGs work together to offer a high level of confidence in imposing requirements and configuring systems in a manner that takes full advantage of DoD and government expertise and best practices. In this light, they also offer the organization a best practice that may satisfy due diligence and due care more effectively than traditional risk management approaches and other industry best practices. In the full version of this paper more attention will be paid to specific examples of IACs and STIGS as well as more detail on how these can be mapped directly into traditional documented best practices in private industry.

Keywords: Cybersecurity, information assurance, Department of Defense (DoD), risk management

REFERENCES

CISSP Domain Refresh, (2019). Retrieved from https://www.isc2.org/Certifications/CISSP/Domain-Refresh-FAQ#

How eMASS, RMF and DIACAP All Connect (2016). Retrieved from https://phoenixts.com/blog/emass-rmf-diacap-connect/

Security Content Automation Protocol (SCAP) Content and Tools (2019. Retrieved from https://iase.disa.mil/stigs/scap/Pages/index.aspx

Security Technical Implementation Guides (STIGs) (2019). Retrieved from https://iase.disa.mil/stigs/Pages/index.aspx

Wheeler, E. (2011). *Security Risk Management.* Syngress.

Whitman, M. E. & Mattord H. J. (2011). *Management of Information Security*. Course Technology, Cengage Learning.

Woloch, B. (2006). "New dynamic threats requires new thinking – 'Moving beyond compliance'",
Computer Law & Security Review, Volume 22, Issue 2, 2006, Pages 150-156

CYBERSECURITY EDUCATION: CLOSING THE SKILLS GAP

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DESCRIPTION OF THE STUDY

The purpose of this study is to examine current and past efforts by various communities to address the widening gap in cybersecurity skills. The study will capture the efforts of governmental, private, and academic entities in their quest to address the cybersecurity skills gap. The study will focus on actions of the various communities through an analysis of their various publications and educational documents. The study is significant because it offers a comprehensive look at the various efforts to address the cybersecurity talent shortages by individual organizations and agencies all with similar intended outcomes. This is also of significance because it offers clarity to the otherwise confusing and overlapping efforts to solve the core issue of the shortage of skilled cybersecurity workforce as identified in different sources such as the NICE Cybersecurity Workforce Framework (NCWF) publication (NIST, 2017), along with recent efforts from the US President through the issuance of an Executive Order aimed at addressing the cybersecurity skills gap (The White House, 2019).

BASIS OF THE STUDY

The main theoretical basis of the proposed study is the research finding by Blair, Orbinati, and Powell (2017) positing that there are two main sources for the cybersecurity skills shortage, while offering short- and long-term solutions. The authors further argued that the two main sources of the shortage exist in the absence of educational offerings and the lack of female workers in the cybersecurity industry. The study presented the effect of the shortage as unfilled jobs, unsecure networks, and increase in security incidents. This study is also informed by others such as Vogel (2016), who views the cybersecurity skill shortage as an opportunity for IT professionals, university students, and others interested in the new career field. This new opportunity is also a plus for educational organizations that offer formal cybersecurity programs. Other studies point to the challenge of employers in finding qualified cybersecurity workers who possess both technical and business savvy (Alexander, 2014). Mulla (2018) suggests that the skills gap can easily be addressed by training military service members upon their exit from service. In addition, as more cybersecurity education programs fast emerge, a consistent standard with specific criteria is needed to evaluate and guide the programs for quality control. The national Centers of Academic Excellence in Cyber Defense Education (CAE-CDE) designation program sponsored by NSA/DHS (National Security Agency and Department of Homeland Security) provides a comprehensive and reputable national standard for quality assurance in cybersecurity education.

CONCLUSIONS & IMPLICATIONS

There are numerous current and past efforts by various communities to address the widening gap in cybersecurity skills. This widening gap is of grave concern for society in an increasing fashion; organizations along with the individual citizens are impacted. This paper examines current and past efforts by various communities to address the widening gap in cybersecurity skills; it offers a single source for information about this widening gap and serves as a basis for other research aimed at solving this critical gap. The paper in its use of current and previous literature captures details of the issue through the snapchat of a fixed period. The hope is that ideas will blossom from the analysis of this paper to offer real solutions to this evolutionary phase of human civilization.

REFERENCES

Alexander, C. (2014). The cybersecurity skills gap. *SC Magazine*, *25*(12), 50. Retrieved from http://search.proquest.com/docview/1659751023

Blair, T., Orbinati, A., & Powell, J. (2017). *Investigating the Cybersecurity Skills Gap*. ProQuest Dissertations Publishing. Retrieved from http://search.proquest.com/docview/1989786177

Cylance Inc.; Cylance Narrows the Cybersecurity Skills Gap with Virtual CISO. (2018, December 24). *Journal of Engineering*. Retrieved from http://search.proquest.com/docview/2158900954

Mulla, C. (2018). Addressing the Cybersecurity Skills Gap with Veterans. *Security*, *55*(3), 51–53. Retrieved from http://search.proquest.com/docview/2051733060/

NICE (National Initiative for Cybersecurity Education). (August, 2017). NICE Cybersecurity Workforce Framework (SP800-181). Retrieved from https://csrc.nist.gov/publications/detail/sp/800-181/final

Rebecca Vogel. (2016). Closing the Cybersecurity Skills Gap. *Salus Journal*, *4*(2), 32–46. Retrieved from https://doaj.org/article/8f1647cc9026455799e37063edb3321c

The White House. (2019, May 2). Executive Order on America's Cybersecurity Workforce. Retrieved from https://www.whitehouse.gov/presidential-actions/executive-order-americas-cybersecurity-workforce

MOBILE APP DEVELOPMENT FOR ALL

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PROPOSED STUDY

Companies are increasingly looking for ways to recruit and retain software developers in an environment where there is a limited talent pool (Torres, 2018) and job growth is expected to increase 12% from 2014 to 2024 (US Department of Labor, 2015). In addition, higher education institutions are continually exploring ways to expand and diversify students majoring in computer science (Flatland, et al, 2018; Fryling, et al, 2018; Vandenberg, et al, 2018). Visual programming and mobile app development have become a popular way to teach programming skills to both CS and non-CS majors (Cornforth, 2014; Honig, 2013). Additionally, no-code and low-code development platforms have been developed in response to the high demand and low supply of software engineers. These platforms are intended to allow organizations to hire business professionals with little to no coding experience to build applications rapidly (Rayome, 2018). This study explores the findings from the first offering of a 3-credit lower level Computer Science (CS) Low Code Mobile App Development course, which was open to both CS majors and non-majors, in a hybrid environment.

BASIS OF STUDY

The course being investigated required teaching database and programming concepts to a variety of students, including those with no prior experience, using the Mendix low-code development platform. Prior to this course offering, the college offered a mobile app development upper level course only for CS majors. By offering a lower level course with no prerequisites, students with little to no programming experience had the opportunity to explore front-end and back-end mobile app development. The course consisted of online lectures, including lecture videos developed by the instructor, and in-person labs (2 hours per week). The labs allowed students to develop proficiency in the topics covered in the lecture videos. In addition to weekly assignments on lecture topics, the students developed a mobile application of their choosing as a final project.

Fourteen students started and completed the course, 8 of which were computer science majors and 6 other majors, including Accounting, Business, Creative Arts, Management, and Marketing. Eight of the students were Seniors, 4 were Juniors, and 2 were Sophomores. The Computer Science majors had an average final grade of 84.57, while the other majors had an average final grade of 79.56.

IMPLICATIONS

There were several lessons learned from this first course offering, including:

- Students without database experience needed extra instruction on database concepts in order to successfully progress in the course. As such, unplanned in-person lectures and individual reviews of project database designs were added.

- The hybrid environment was ideal for allowing students with a stronger technical background to work faster and those without experience to get additional in-person assistance with their projects.
- Vendor provided instructions and videos needed supplemental materials, including clarifications due to incomplete, incorrect and/or outdated instructions.
- New versions of the software were released several times during the semester, which caused conflicts if students accidentally upgrade their projects.

CONCLUSIONS

This is a very preliminary investigation and, as such, it has limitations. While it only includes one offering of the course with only 14 students, it did demonstrate that students from a variety of disciplines, with no prior programming experience, are able to successfully complete the same coursework as computer science majors with several years of programming experience. Future investigation will include pre and post-tests to access prior experience and knowledge growth.

REFERENCES

Cornforth, Simon and David. 2014. Teaching mobile apps for windows devices using TouchDevelop. In Proceedings of the Sixteenth Australasian Computing Education Conference - Volume 148 (ACE '14), Jacqueline Whalley and Daryl D'Souza (Eds.), Vol. 148. Australian Computer Society, Inc., Darlinghurst, Australia, Australia, 75-82.

Flatland, Robin, Ira Goldstein, MaryAnne L. Egan, Scott Vandenberg, Meg Fryling, and Sharon Small. 2018. Connecting Colleges/Universities and Local High Schools: A New Model for High School CS Teacher Development. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18). ACM, New York, NY, USA, 958-963.

Fryling, Meg, MaryAnne Egan, Robin Y. Flatland, Scott Vandenberg, and Sharon Small. 2018. Catch 'em Early: Internship and Assistantship CS Mentoring Programs for Underclassmen. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18). ACM, New York, NY, USA, 658-663.

Honig, William L. 2013. Teaching and assessing programming fundamentals for non majors with visual programming. In Proceedings of the 18th ACM conference on Innovation and technology in computer science education (ITiCSE '13). ACM, New York, NY, USA, 40-45.

Rayome, Alison DeNisco (2018). *Low-code platforms: A cheat sheet*, TechRepublic, May 16th.

Torres, Craig (2018). *Demand for Programmers Hits Full Boil as U.S. Job Market Simmers*, Bloomberg, March 8th.

United States Department of Labor. Occupational outlook handbook. www.bls.gov/ooh/computer-and-information-technology/home.htm, 2015.

Vandenberg, Scott, Sharon G. Small, Meg Fryling, Robin Flatland, and MaryAnne Egan. 2018. A Summer Program to Attract Potential Computer Science Majors. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18). ACM, New York, NY, USA, 467-472.

INTEGRATING STACKABLE, COMPETENCY-BASED MICROCREDENTIALS INTO ACADEMIC PROGRAMS

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The demand for increasingly flexible and relevant ways for professionals to develop advanced workplace skills is on the rise. According to the 2019 Workplace Learning Report, "macro trends like digital transformation and the decreasing shelf-life of skills are challenging organizations to play catch up as they try to hire and develop their people" (LinkedIn Learning, p. 18). This has created opportunities for institutions of higher education to address these challenges. As a result, colleges and universities in the United States are exploring stackable credentials to afford expanded academic opportunities for an increasing number of professionals who are seeking advanced qualifications to "secure a foothold in the labor market, keep their existing jobs, and advance to better jobs in the continually changing economy" (Ganzglass, 2014, 2014, p. 1). Integrating stackable, competency-based microcredentials in the form of academic certificates into existing higher education programs is one way to help learners meet the demands of changing professional learning needs. Interestingly, stackable credentials are not new. In 2015, the United States Department of Labor published a report titled, *Career Pathways Toolkit: A Guide for System Development*, in which a stackable credential was defined as a being a "...part of a sequence of credentials that can be accumulated over time to build up an individual's qualifications and help them to move along a career pathway or up a career ladder to different and potentially higher-paying jobs" (p. 140). Although they have been around for several years, stackable credentials are just now starting to gain traction in credit-awarding institutions as a way to afford students the opportunity to develop specialized skills they can apply on the job right away, while earning a degree. Stackable credentials have the added benefit of offering learners the flexibility of starting a formal academic program and earning a credential with or without committing to an entire degree. For academic programs, they are a way to increase enrollment and create feeders into their bachelor or graduate programs.

This presentation will provide an overview of the emergence of stackable credentials in higher education and describe how faculty in a fully online graduate Educational Technology program developed a stackable master's degree that enabled students to earn one or more graduate certificates as part of the degree. The certificates focus on high-tech, high-need, competencies and skills employers across a wide array of fields, including information systems and technology, educational technology, business, healthcare, are looking for.

REFERENCES

Elsey, B., Lanier, L., & Stadd, J. (2015). *Career Pathways Toolkit: A Guide for System Development.* U.S. Department of Labor. Retrieved from https://wdr.doleta.gov/directives/attach/TEN/TEN_17-15_Attachment_Acc.pdf

Ganzglass. E. (2014). Scaling stackable credentials: Implications for implementation and policy. Center for Postsecondary and Economic Success. Retrieved from https://files.eric.ed.gov/fulltext/ED561777.pdf

LinkedIn Learning. (2019). 2019 Workplace Learning Report. Retrieved from https://learning.linkedin.com/content/dam/me/business/en-us/amp/learning-solutions/images/workplace-learning-report-2019/pdf/workplace-learning-report-2019.pdf

DO STUDENTS LEARN RAPIDLY DEVELOPING FIELDS BETTER WITHOUT TEXTBOOKS?

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Many fields develop more rapidly than textbook production cycles can keep up with. In many of these rapidly developing fields, experts within and outside academics produce learning materials on platforms such as Lynda, Udemy, and even YouTube. These platforms typically stay more current because of ease of developing content, more modular or more granular learning units, more potential knowledge contributors, and visual and user-friendly approaches to training and instruction. IS and IT are prototypical of these rapidly developing fields that are well represented on Lynda, Udemy, YouTube, and other online platforms.

Aside from the currency of content, students may view textbooks and these online platforms differently based on engagement. Every faculty member knows the pains students go through to do as little as possible. Some students do not even purchase the required textbook for their courses. Other students have reported not even opening the book. In part, this may be because Gen Z students are more familiar with a YouTube-approach to learning. Also, some faculty use textbooks as a crutch to get through a course. They use the powerpoints provided by the textbook and essentially teach in a non-interactive way. New resources like Lynda, Udemy, and YouTube have become available and are used by people inside and outside of their professions to gain new knowledge and skills in chunk-sized, interactive, and relevant ways. Thus, the questions we are researching in the context of rapidly developing fields are the following: Are textbooks still the most effective way to support student learning in IS and IT courses? When students enter the workforce how will they continue to learn and adapt with new technologies? Will they use textbooks as resources, or will they be trying to figure it out online?

The purpose of this paper is to identify the factors that influence student learning as it pertains to textbooks. We have developed a research study that uses two separate (similar) classes to control for learning from a textbook versus learning from publicly available content on online platforms. In one class we used a traditional textbook. In the other class we used an outline of the course and had the students search for information on the topic. Students then developed detailed notes on the subject matter using Microsoft OneNote and turned it in for grades. We are continuing the study into next year to increase our sample size and refine the study.

THE INFLUENCE OF HUMAN FACTORS IN SECURING ONLINE PROJECTS

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ABSTRACT

For decades, project management has branched out and impacted on a variety of activities within companies and organizations. It is hard to imagine a successful business nowadays without efficiently managed projects. Moreover, the way projects are managed has dramatically changed in recent years. In the past, the pen-and-paper approach was utilized. Then, with the development of Information and Communication Technologies (ICT), computer-aided tools started to be applied. At that time, the first data security threats arose but they were limited to single users and relatively easy to handle. With the rapid development of ICT, including cloud computing, the use of social media and the concept of virtual teams, a project's data protection is of paramount importance. Moreover, projects change in nature. A good example is a new product development projects (NPD), which are no longer limited to the physical limitations of the products. As a result, NPD very often includes not only engineering skills but also ICT knowledge (e.g. new cars, planes, or even fridges). Those hybrid projects, due to their complexity, have to rely on modern ICT technologies, which are not limited to e-meetings, cloud computing, and social media. As a result, there is a need to store the data in a way which allows its access from many locations and by different stakeholders, including project team members. Therefore, the issue of security in project management seems to be of the utmost importance. However, there is a limited number of articles which examine this topic. The purpose of this presentation is to share with the audience on-going research that tackles the issue of security with online projects centering around human factors.

Keywords: Data security, project management, risk, team

A STUDY OF THE ETHICS AND MORALS OF COMPUTER SCIENCE TECHNOLOGY

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ABSTRACT

Recently, computer science technology has become so pervasive that opportunities for issue abound. Computer Science Ethics has taken on increasing importance as the size and complexity of computer science issues continues to grow. Some common issues of computer science ethics include Robotics, Artificial Intelligence, privacy concerns, and how computer science affects society. In this paper, we study the ethics of computer science technology, especially the aspect of human life with AI robotics. We propose here several problems which make AI robotics a social issue. If we predict an ethical or moral problem with AI robotics, we can possibly protect the future of life in humans.

Keywords: Computer Science, ethics and morals of computer, AI robotics

INTRODUCTION & STUDY BACKGROUND

Computer science is one of the fastest growing fields in the world. In most countries of the world, the "computer science revolution" has altered many aspects of life significantly. Examples of this are the automobile, smart cities, cyber life, careers, and AI robotics to name just a few. There has been especially increased attention on the possible impact of future robotics and AI systems. One of the famous AI robotics fiction feature films was “Ex Machina” 2014. The film follows a programmer who is invited by his CEO to administer the Turing test to an intelligent humanoid robot. Ava has a robotic body but a human-looking face and is confined to her apartment. During their talks, Caleb begins to feel attracted to Ava, and she expresses a romantic interest in him and a desire to experience the world outside. Ava tells him she can trigger power outages that temporarily shut down the surveillance system which Nathan uses to monitor their interactions, allowing them to speak privately. The power outages also trigger the building's security system, locking all the doors. During one outage, Ava tells Caleb that Nathan is a liar who cannot be trusted. Ava is far more self-aware and deceptive than either man imagined. According to the end of the movie, Ava escapes her apartment after killing the human. In this movie, we must consider several problems.

- Do AI robots generate knowledge itself or from humans?
- Should AI robots be created to look like humans?
- What is the difference between humans and an AI robot?
- What protects humans from AI robots?

The field of AI robotics focuses on designing machines that can mimic human behavior. Consequently, computer science has affected human life in both good and bad ways. AI robotics

should be safe and secure throughout their operational lifetime and verifiably so where applicable and feasible.

Ethical and Moral Theories and AI Robotics

Computer science ethics is an academic field in its own right with unique ethical issues that would not have existed if computer technology had not been invented (Maner, 1996). Google's artificial intelligence group, DeepMind, has unveiled the latest incarnation of its Go-playing program, AlphaGo – an AI so powerful that it derived thousands of years of human knowledge of the game before inventing better moves of its own, all in the space of three days (Granter, Beck, & Papke, 2017). AlphaGo's shockingly dominant victory over the reigning world Go champion Lee Sedol in Seoul, Korea, in March 2016 signaled another great leap in the seemingly relentless advancement of machines becoming truly "intelligent" in the sense of being able to learn and outsmart humans. When IBM's Deep Blue defeated world chess champion Garry Kasparov in 1997, it was thought at the time to have reached the ultimate pinnacle in computer game-playing abilities, since chess had been considered to be the game requiring the most human brainpower, so the fact that a computer had finally surpassed the abilities of humankind's best would seem to have indicated that some aspects only found in science fiction might be finally approaching reality (Chang, 2016). According to Schmidhuber (2015) study, deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the backpropagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer (LeCun, Bengio, & Hinton, 2015). Deep artificial intelligence learning is arguably the most exciting field in robotics. It's certainly the most controversial almost everyone agrees that a robot can work in an assembly line, but there's no consensus on whether a robot can ever be intelligent. According to the artificial general intelligence and the human mental model, a new approach to cognitive science and philosophy of mind, one not centered on the human example, needed to help us understand the challenges which we will face when a power greater than us emerges (Yampolskiy & Fox, 2012). Lin, Abney, & Bekey (2011) described the flourishing role of robots in society—from security to sex—and survey the numerous ethical and social issues, which we locate in three broad categories: safety & errors, law & ethics, and social impact. Nick Bostrom (2011) suggested that the study of Artificial Intelligence ethics is needed because there is a vacuum of human thinking surrounding the new possibilities. Also, the other article addressed the issues of creating AIs more intelligent than a human and ensuring that they use their advanced intelligence for good rather than ill (Bostrom & Yudkowsky, 2014).

RESEARCH METHODOLOGY

Our research centered upon the following research question: Do significant ethical and moral differences about AI robotics exist among undergraduate students in the United States?

The research hypotheses to be tested are as follows:

H_1: Computer science undergraduate students have ethical and moral beliefs for AI robotics.

H_2: Non-major computer science students and major computer science students have the same ethical and moral beliefs for AI robotics.

Currently, the ethical behavior of a robot is determined by the software. The features of the software depend directly from the programmers. That means robotics is closely connected to the ethical behavior of the software developer. If a robot is good or evil depends mostly from the software or from the ethical behavior of a human (Kopacek, 2014). Recently, one of the good test ethical and moral scenarios that were utilized by Awad (2018), deployed the Moral Machine, an online experimental platform designed to explore the moral dilemmas faced by autonomous vehicles. This platform gathered and analyzed 40 million decisions in ten languages from millions of people in 233 countries and territories. Brey (2000) considered methodological aspects of computer ethics and argues for a multi-level interdisciplinary approached with a central role for what is called disclosive computer ethics.

REFERENCES

Anderson, M., & Anderson, S. L. (Eds.). (2011). Machine ethics. Cambridge University Press.

Awad, E., Dsouza, S., Kim, R., Schulz, J., Henrich, J., Shariff, A., ... & Rahwan, I. (2018). The moral machine experiment. Nature, 563(7729), 59.

Brey, P. (2000). Method in computer ethics: Towards a multi-level interdisciplinary approach. Ethics and Information Technology, 2(2), 125-129.

Bostrom, N., & Yudkowsky, E. (2014). The ethics of artificial intelligence. *The Cambridge handbook of artificial intelligence*, 1, 316-334.

Chang, H. S., Fu, M. C., Hu, J., & Marcus, S. I. (2016). Google Deep Mind's AlphaGo. OR/MS Today, 43(5), 24-29.

Floridi, L. (Ed.). (2010). The Cambridge handbook of information and computer ethics. Cambridge University Press.

Granter, S. R., Beck, A. H., & Papke Jr, D. J. (2017). AlphaGo, deep learning, and the future of the human microscopist. Archives of pathology & laboratory medicine, 141(5), 619-621.

Kopacek, P. (2014). Ethical and social aspects of robots. IFAC Proceedings Volumes, 47(3), 11425-11430.

Lin, P., Abney, K., & Bekey, G. (2011). Robot ethics: Mapping the issues for a mechanized world. Artificial Intelligence, 175(5-6), 942-949.

LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. nature, 521(7553), 436.

Maner, W. (1996). Unique ethical problems in information technology. Science and Engineering Ethics, 2(2), 137-154.

Schmidhuber, J. (2015). Deep learning in neural networks: An overview. Neural networks, 61, 85-117.

Yampolskiy, R. V., & Fox, J. (2012). Artificial general intelligence and the human mental model. In Singularity Hypotheses (pp. 129-145). Springer, Berlin, Heidelberg.

USING PYTHON FOR NOSQL AND NATURAL LANGUAGE PROCESSING IN A BI COURSE

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Keywords: Python, JSON, NoSQl, document-store database, Amazon AWS, DynamoDB, natural language processing

This abstract describes the use of Python in a senior level BI course. The course is an elective in our CIS major, and requires one coding class and one database class as prerequisites. My presentation will show two in-class exercises involving Python.

In Exercise #1, students create, populate, and query a document-store database. This gives students experience with Not Only SQL (NoSQL) database architectures and APIs. Students learn to use Amazon AWS's DynamoDB database (https://aws.amazon.com/dynamodb/). As preparation, they obtain an AWS account, use AWS's Identity and Access Management (IAM) service to create an IAM user, set up a permission policy, and gain the access key and secret key for use in their Python programs. Then they write three Python scripts, as illustrated in the figure below.

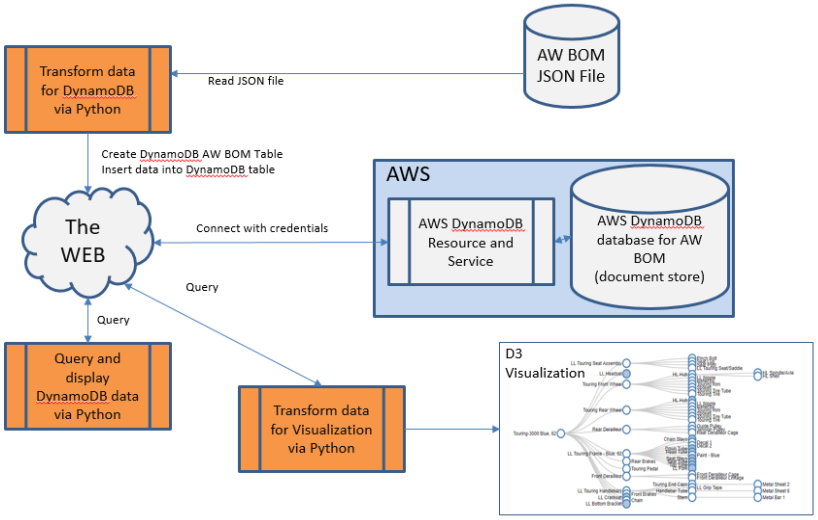

Figure 1: Python scripts for JSON processing, document store database and data visualization

The first script creates the DynamoDB database, then reads a JSON file containing bill-of-material (BOM) data and populates the database with this data. BOM is inherently a hierarchical structure, and JSON is well-suited for representing hierarchical data. A document store database is an example of key-value pairs, and students learn how to specify the metadata for the key when creating the DyamoDB table. They also learn the relationship and correspondence between JSON and Python dictionary structures.

The second script gives students experience with querying and scanning document store databases using a variety of filter expressions specific to document store databases. This gives students a contrast to SQL, and students begin to appreciate the difference in structure and purpose between relational and document-store databases.

The third script of this exercise involves transforming the data from the document store database into a format necessary for visualizing in a D3 visualization. D3 is a powerful JavaScript visualization library and students D3 tree visualization to display the hierarchy of the BOM data, as shown in Figure 1. Students create the JSON data

Exercise #2 involves using Python with a Natural Language Programming (NLP) service from Stanford University called CoreNLP (https://stanfordnlp.github.io/CoreNLP/), a Java API consisting of a suite of tools called *annotators* that can perform many NLP functions. The annotators provide several useful services, including but not limited to the following:

- Breaking a text document into individual sentences
- Tokenizing a sentence (breaking it into individual "words")
- Identifying parts of speech (POS) within a sentence (nouns, verbs, adjectives, adverbs, etc.)
- Named entity recognition (NER) – recognizing names of people, places, organizations, etc.
- Dependency parsing –identify dependency relationships between terms in a sentence

In this exercise students learn to use NLP services including tokenizing, parts-of-speech (POS) tagging, named entity recognition, and dependency parsing. Python script connect to the CoreNLP server, as submit requests in order to retrieve these services for types-in sentences. Results can be obtained in JSON, and converted to Python dictionary structure, or alternatively via direct requests (e.g. pos_tag, ner, word_tokens, depencency_parse).

For example, consider this sentence: "Muhammad Ali defeated Joe Frazier in the Thrilla in Manilla, their third boxing match, in Quezon, Philippines on Wednesday, October 1, 1975."

CoreNLP's NER annotator returns this Python list of tuples, where each tuple contains a token and its associated named entity association ("O" indicates that the word is not a named entity).

[('Muhammad', 'PERSON'), ('Ali', 'PERSON'), ('defeated', 'O'), ('Joe', 'PERSON'), ('Frazier', 'PERSON'), ('in', 'O'), ('the', 'O'), ('Thrilla', 'O'), ('in', 'O'), ('Manilla', 'LOCATION'), (',', 'O'), ('their', 'O'), ('third', 'ORDINAL'), ('boxing', 'O'), ('match', 'O'), (',', 'O'), ('in', 'O'), ('Quezon', 'CITY'), (',', 'O'), ('Philippines', 'COUNTRY'), ('on', 'O'), ('Wednesday', 'DATE'), (',', 'DATE'), ('October', 'DATE'), ('1', 'DATE'), (',', 'DATE'), ('1975', 'DATE'), ('.', 'O')]

By indexing into the various lists and tuples returned from CoreNLP, students can write code to identify the subjects and objects of actions that occur in a sentence, create compound noun phrases, associate adjectives and adverbs to gain nuance from nouns and words, and other interesting results.

These exercises give students practical experience working with cutting edge technologies by using simple coding practices. Students who have completed an introductory programming class will have the skills and experience necessary for accomplishing both exercises.

INFORMATION SYSTEMS SECURITY IN THE CORE CONTENT OF AN AACSB COLLEGE OF BUSINESS

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BASIS

This a follow-on to my IACIS 2018 presentation in which I reported a needs analysis of information systems security education at a 2,500-student college of business in an 11,000-student university in the Upper Midwest USA. See "Endpoint security knowledge and skill of business undergraduates" in the IACIS 2018 Proceedings for details of that study's rationale, literature review, methodology, etc. Results are summarized in tables 1 and 2.

Table 1.
End-User Security Concepts

Objects	Human Resources	People
		Organizational Structures
		Policies
		Processes
	Intellectual Property	Data
		Information
		Software
	Infrastructure	Buildings
		Furnishings
		Network Components
		User Devices
Risks	Human Error	Social media
		Account sharing
		Lost files
	Human Malice	Phishing links
		Phishing attachments
		Malvertising
		Watering hole websites
	Natural Accident	Gravity
		Dirt
		Water
		Heat
		Electricity
Mitig	Isolation	Authentication
		User privileges
		Shareable media

Table 2.
Windows Client Security Tools

Isolation	MyUserName website
	Sign-in options
	Windows Defender firewall
	Internet security settings
	User account control
	BitLocker
	Run-as-administrator
	VPN (GlobalProtect)
	Startup applications
Repetition	Power and sleep settings
	Backup settings
	Windows update
	Create a restore point
Education	Windows Defender
	Restore Points
	(see Table 1 for more)

Replication	Battery backup Data backup System backup
Education	Social engineering Malware protection P2P file sharing

DESCRIPTION

This presentation chronicles the development of an instructional unit for all business students that addresses the information systems security concepts and skills identified above. Obstacles and techniques to address them are detailed:

Stakeholder Acceptance:	Student	(Fatalism)
	Instructor	(Territoriality)
	Administrator	(AACSB)
	Campus Computing	(Distraction)
Development Resource Availability:	Staff	(Campus v. Online)
	Time	(Summer)
	Funding	(Summer)
	Course	(IS, BCOM, ACCT)
Delivery Resource Availability:	Content	(Theory v. Practice)
	Hardware	(Windows v. Mac)
	Software	(Licensing)

Developed instructional materials will be presented and shared with presentation attendees.

INDUSTRY IMPLICATIONS

The implications for the regional IT industry, indeed the entire regional economy, are significant since employee error is universally recognized as the common denominator in all information security breaches. Great risk attends the graduating of business professionals who do not engage in reasonable security practices with their client computing devices.

CONCLUSIONS

I see this development effort as a significant step forward in helping future business professionals exercise their expertise in a more secure manner. I propose that assurance of learning practices be applied to this instructional unit as it is used. I plan to present that data at IACIS 2020.

DIGITAL ETHICS AND SUSTAINABILITY: DEVELOPING AN IS ELECTIVE

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While much of the Information Systems content developed for students focuses on technology and technical applications, students also need to understand the issues and the decision-making that is critical to maintaining information systems, including systems that support social responsibility goals. This presentation describes the development of a new Computer Information Systems elective that examines the ethical side of information systems and the role of information systems in business sustainability initiatives. This is a senior-level elective; students will have had numerous classes in programming and systems design, but very little in terms of the decision-making and responsibility of managing information systems. In this class they consider the ethical issues and the broader impact of systems in business, including how systems can support sustainability and social responsibility.

This course focuses on ethical and sustainability issues related to information systems; recent events like the Equifax and Target security breaches and Facebook's handling of private information raise questions about the ethical issues related to information systems and the use of digital assets. Students are very aware of these events and this class give them the opportunity to analyze both the contributing factors and the aftermath. Using a variety of approaches, we explore current controversies and challenges related to information privacy, system-supported manufacturing, and ethical web development. Somewhat of a departure from the technical courses in the CIS curriculum, this course focuses on the ethical implementation and implementation of information systems, and the impact on an organization and its stakeholders.

In 2008, SAP launched an organizational transformation program, leveraging "information systems and related IT capabilities to support the change." The result was not only an internal transformation, but also a new ability to support the sustainability efforts of their customers (Siedel et al, 2014). SAP is not alone in their progress toward sustainability; in 2015, the United Nations identified 17 Sustainable Development Goals for business and government agencies. "These goals will continue to guide national priorities and influence strategy within the business sector over the next 15 years" (Weybrecht, 2019). Achieving these goals will require long-range, ethical thinking and as business school faculty, we must find ways for students to recognize and investigate the responsibilities involved in managing sustainable companies. With this challenge in mind, this elective course explores the role of information systems in the support of organizational sustainability initiatives, as well as associated ethical issues. Topics include the Internet of Things, sustainability concerns related to the manufacture of technology products and system-supported manufacturing processes, and sustainable IT practices.

Information systems can be an important piece of sustainability solutions, as shown by the success of the SAP transformation, and including ethics and sustainability in the curriculum will serve to make business school students stronger job candidates. Recent conversations with Information

Technology professionals have had a consistent theme: many CIS students are very strong technically but could benefit from broader understanding of business issues (Bergdoll, 2018.). This course includes components of both. While not every business school graduate will be in a position to lead great changes with regard to people, profits, and place, "they do all need to graduate with some basic knowledge and skills related to how the business world connects to, impacts, and is impacted by the external environment, whether through social, environmental, or economic factors" (Weybrecht, 2017). This course does that with the technology focus that supports the CIS curriculum.

REFERENCES

Bergdoll, J. (2018, January 11). Personal interview.

Seidel, Stefan, Recker, Jan C., Pimmer, Christoph, & vom Brocke, Jan (2014) IT-enabled Sustainability Transformation—the Case of SAP. *Communications of the Association for Information Systems, 35*(1), pp.1-17.

Weybrecht, G. (2017, April 18). Reaching All Students: Business School's Responsibility to Society [Blog post]. Retrieved from http://www.aacsb.edu/blog/2017/april/reaching-all-students-business-schools-responsibility-to-society

Weybrecht, G. (2019, April 22). Moving Forward: Sustainable Development Goals and Business Schools [Blog post]. Retrieved from https://www.aacsb.edu/blog/2019/april/moving-forward-sustainable-development-goals-and-business-schools

OPTIMIZING PREDICTIVE MODELS USING AN ANTI-MONEY LAUNDERING CASE

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PURPOSE OF THE STUDY

The purpose of this study is to test to see if a superior predictive model can be built to determine which cases (transactions) a bank should investigate for potential money laundering. Predictive analytics is an important topic both in information systems research and pedagogy as it is a critical curriculum component for business analytic programs.

BASIS FOR THE STUDY

Working with a regional bank in the northeast United States, they have already developed an initial predictive model and have provided the researchers with sample data as well as the results of their selection statistics for five different predictive models. The goal of the research is to produce a more optimal model as their model's error ratio is currently too high to meet their needs. Banks in the U.S. have been required to work with the U.S. government to investigate money laundering since 1970, however; sub-optimal performance of the model to determine which transactions to investigate leads to many unnecessary cases to be investigated (Meltzer, 1991).

IMPLICATIONS

This study has practical implications in that it could result in improved performance for the investigation of anti-money laundering. The study also has pedagogical implications in that the researchers intend to also develop a teaching case for use in predictive analytics course work.

CONCLUSIONS

Data has just been obtained and initial data cleansing has begun. By the time of the conference, it is expected that at least initial results will be available for presentation and discussion.

REFERENCES

Meltzer, P., (1991). "Keeping Drug Money from reaching the Wash Cycle: A Guide to the Banking Secrecy Act", *Banking Law Journal, 108*(3), 230-255.

HOW TO ADMINISTER AND UTILIZE OFFICE 365 IN THE CLASSROOM FOR COLLABORATION AND PROJECT MANAGEMENT ASSIGNMENTS WITHIN ACADEMIA

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Office 365, Microsoft's Cloud Productivity Suite is an industry-standard, enterprise tool used to replace or augment the traditional Microsoft Office products. Unfortunately, K-12 education typically introduces students to Google Docs and other associated Google cloud products, via Chromebook implementation as examined within "Device-Driven Research: The Impact of Chromebooks in American Schools." (Ahlfeld, 2017). This creates an environment whereby students will develop a preference towards using the Google products due to their increased comfort level with those applications, in conjunctions with, a lack of knowledge on what Office 365 can offer.

The purpose of the presentation is to expand upon the teaching tip "Microsoft or Google Web 2.0 Tools for Course Management" (Rienzo and Han, 2009) to demonstrate the capabilities of Office 365, including Word, Excel, PowerPoint, Microsoft Teams, and SharePoint, for collaborative and project management tasks within academia. As results, increasing the exposure of Office 365 and its capabilities to business students within higher education will help them prepare for a career within industry, where Microsoft products are more prevalent due to corporate governance and enterprise security oversight capabilities required to keep company information secure and readily accessible.

Keywords: Office 365, collaboration, project management, collaboration technologies governance

REFERENCES

Ahlfeld, K. (2017). Device-Driven Research: The Impact of Chromebooks in American Schools. *International Information & Library Review*, *49*(4), 285–289. https://doi.org/10.1080/10572317.2017.1383756

Rienzo, T., & Han, B. (2009). Microsoft or Google Web 2.0 Tools for Course Management. *Journal of Information Systems Education*, (2), 123.

DEVELOPMENT OF AN INTERDISCIPLINARY MASTERS IN DATA SCIENCE/ANALYTICS

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RESEARCH OVERVIEW

The demand for employees with data science, data analytics, and business analytics has grown at a rapid rate in the past few years, and that growth is expected to continue for the foreseeable future. Today, the supply of graduates does not meet the demand for open positions. Different skill sets are needed for different types of data science/analytics (DSA) positions (De Mauro et al., 2017). The number of DSA-related degree programs has also increased as many universities seek to tap into this new market. There is a wide range of courses among data analytics curricula (Stephens and McGowan, 2018), and there is a need to understand DSA curricula development.

Our research focuses on a particular case for the development of an interdisciplinary master's degree in DSA. This program is somewhat unique because it brings together three departments from three colleges, including management information systems from the college of business, computer science (CS) from the college of liberal arts and sciences, and industrial and manufacturing engineering from the college of engineering. The committee that developed the program was chaired by the chief academic officer, and the development process involved potential employers of our graduates. How this program came together, the process followed and the variety of perspectives involved created a unique blend resulting in this program. By using resources from each of the three departments involved, the program will be able to serve prospective students who have an interest in data science, business analytics, or engineering analytics, and not use as many resources as three separate programs would use. The design of this curriculum is complete and the program will be offered starting in the fall of 2020. This paper should be of interest to IACIS attendees who have an interest in business analytics, curriculum development, or interdisciplinary programs.

BASIS OF STUDY

To understand this new degree program and its development, we will provide the factors that led to the idea, and explain the process that led to the working design team. We will discuss the issues that emerged, explore the challenges that the working group faced, and the layout the program itself. We will conclude with the inherent unique strengths and weaknesses of the degree program.

The environment that led to the development of this new program was advanced by a series of stakeholders including: (1) employers, (2) prospective students, (3) the provost, (4) undergraduate business analytics minors and concentrations in MIS, (5) an under graduate minor in data science and courses available through the computer science department, and (6) an interest by engineering to offer engineering analytics. Part of the provost's agenda was to demonstrate that an

interdisciplinary program that crossed college boundaries was possible. Added to that is the university strategic initiative to create and maintain more interdisciplinary programs.

IMPLICATIONS AND CONCLUSIONS

We believe we have developed a program that can prepare students for a variety of jobs in the data science and analytics space. However, we are also breaking new ground with getting the curriculum approved. As with many academic institutions, we have operated on a silo basis: all previous programs were limited to a single department or a single college. Our administrative systems are not designed for interdisciplinary programs, particularly when they involve multiple colleges. It should help that the top academic officer of the university, the provost, is a proponent of this program.

We recognize that this program, while unique, does have limitations. Given its interdisciplinary nature, the program offers breadth but not much opportunity for the development of depth in any particular area. The program will bring together a diverse set of students with a variety of backgrounds and experiences. The diversity of the students in such a program is a strength but it also presents issues with prerequisite knowledge coming into the program. The program is designed to serve multiple interests. There are three tracks that students can pursue as part of the program that will result in graduates who are: (1) data science oriented, (2) data analysts focused on general business domains or (3) data analysts focused on specific engineering domains. Business oriented students will work in teams with engineers and computer scientists. Teams will have to learn how to work together to leverage their specific knowledge, skills and abilities to complete projects. All students will have to learn how to communicate their technical knowledge to others who do not know the same technical language. Not only will students learn how to practice data science and/or analytics but also they will have to be able to effectively communicate the outcomes of their work to decision makers.

REFERENCES

De Mauro, A., Greco, M. Grimaldi, M., and Ritala, P. (2017). Human resources for Big Data professions: A systematic classification of job roles and required skillsets, *Information Processing and Management*, June, 1-11. available at http://dx.doi.org/10.1016/j.ipm.2017.05.004

Stephens, P., McGowan, M. K. (2018), "Issues in the Development of an Undergraduate Business Analytics Major," *Issues in Information Systems*, *19*(2), 72-80.

NEGOTIATING GRADES: SOCIAL-CULTURAL REORGANIZING OF RATIONALITY & REFLECTIONS ON COURSE OUTCOMES

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It is that age-old time of the semester. Final grades are due. In the instructor's world, grades are the results of calculations and rubrics; in the language of a particular information system paradigm or social-cultural perspective, grades are a rational result of the use of an algorithm. But things do not always play out this way. Students bring their own social-cultural perspectives and personal information system theories to the instructor's desk as they engage in the reorganization (reframing) of the instructor's approach or rational view of the grades. Our panel will synthesize these perspectives to present how instructors and students conduct these negotiations to justify the intended outcomes as appropriate and ethical - or not. We will argue that instructors and students rely upon different criteria, philosophies, and worldviews, but each perspective remains ingrained, justified, and documented in serious beliefs. From an academic perspective, we also incorporate the following social-cultural theorists and their philosophies as they relate to negotiation tactics, such as Garfinkel, Geertz, Goffman, Hall, Hofstede, and Schein. This panel explores the idea of reorganizing social-cultural paradigms via negotiation of grades; and reaffirms the idea that everyone, including the most algorithmic-technologically-driven instructors, are participators in the negotiation situation.

Key Words: Negotiation, Grades, Higher Education, Course Outcomes, Frame Analysis

PANEL DISCUSSION

This panel explores several negotiation ploys regarding final grade outcomes, and why and how they are strategically employed by higher education students, regardless of their ultimate success. Our discussion focuses on two questions: 1). Why do university students believe that it is rational to negotiate final grades after the semester has concluded? - *and* - 2). Do (or *How do*) instructors contribute to this negotiation paradigm as willing (*or unwitting*) participants? To address these questions, we will introduce several popular negotiation techniques by applying them to the current student academic environment relative to the information systems disciplines. Then we will discuss the diversionary negotiation tactics of manipulation, persuasion, role-playing, sympathy, fear, coercion, likeability, etc., employed by students as resources for discretionary and improved grade outcomes, *as described below.*

- "Everything is negotiable." This phrase in common parlance reflects that everything has a price (or value) and everyone seeks the best deal.
- "Nothing ventured, nothing gained." This popular phrase reflects an attitude that it never hurts to ask (or try) for a different outcome.

- "Creative Accounting." This calculation lingo reflects the adage that any outcome is possible depending upon how you run the numbers. A savvy student is also aware that moving or increasing a few points from one exam or paper to the next higher grade may result in a higher final grade, as well. This ploy may be based upon a variety of factors, such as attendance, participation, attitude, team player, popularity, or merely just the belief that one deserves a better grade than earned.
- "System Gaming" or "Gaming the system." This negotiation tactic is based upon beating the system, finding a loophole, a quick fix, or instant gratification to achieve a desired outcome. One may perceive this tactic as cheating, but others may look upon it as an acceptable practice, more ingrained in society through various historical and pop culture media.
- "Extra Credit." This ruse generally occurs at semester end, when time has run out and final grades are ready to be posted. This cunning plan typically plays on a sympathetic ear when the student requests "just one more day."

From the academic perspective, we will also incorporate the following subject matter experts and their respective social-cultural and behavioral theories directly related to negotiation tactics, such as Garfinkel, Geertz, Goffman, Hall, Hofstede, and Schein, among others. For example, Hofstede's doctoral dissertation, *The Game of Budget Control* (1968) incorporates several negotiation tactics that are quite relevant to today's students' modus operandi; Hall and Hall's, *Hidden differences: Doing business with the Japanese* (1990), clearly shows that negotiation perspectives and overtures are radically different based upon ethnic, geographic, language, vocabulary, and educational experiences; and Goffman's, *Frame Analysis* (1986), portrays situational role-playing from the actor's point of view, at times, as the theatre of the absurd.

Our panel will synthesize these various perspectives to present how instructors and students conduct these negotiations to justify the intended outcomes as appropriate and ethical, *or not.* We will argue that instructors and students rely upon different criteria, positions, philosophies, and worldviews, but each perspective remains ingrained, justified, and documented in serious beliefs. We will then open the floor to audience discussion, experiences and opinions; and solicit areas of interest to provoke further study.

REFERENCES

Garfinkel, H. (1967). *Studies in ethnomethodology*. Cambridge, UK: Polity Press.

Garfinkel, H. (2006). *Seeing sociologically: The routine grounds of social action*. (A.W. Rawls, Ed.). Boulder, CO: Paradigm Publishers.

Geertz, C. (1973). *The interpretation of cultures*. New York: Basic Books.

Geertz, C. (1983). *Local knowledge: Further essays in interpretative anthropology*. Boston: Basic Books.

Goffman, E. (1959). *The presentation of self in everyday life.* New York: Anchor Books Edition of Doubleday, Inc.

Goffman, E. (1967). *Interaction ritual: Essays on face-to-face behavior*. New York: Anchor Books Edition of Doubleday, Inc.

Goffman, E. (1986). *Frame analysis: An essay on the organization of experience.* Boston: MA: Northeastern University Press. (Original work published 1974)

Hall, E. T. (1989). *Beyond culture*. New York: Anchor Books. (Original work published 1976)

Hall, E. T. (1989). *The dance of life*. New York: Anchor Books. (Original work published 1983)

Hall, E. T. (1990). *The hidden dimension*. New York: Anchor Books. (Original work published 1966)

Hall, E. T. (1990). *The silent language*. New York: Anchor Books. (Original work published 1959)

Hall, E. T. (1992). *An anthropology of everyday life*. New York: Doubleday.

Hall, E. T., & Hall, M. R. (1990). *Hidden differences: Doing business with the Japanese.* New York: Anchor Books. (Original work published 1987)

Hall, E. T., & Hall, M. R. (1990). *Understanding cultural differences.* Yarmouth, ME: Intercultural Press, Inc.

Hofstede, G. (1968). *The game of budget control*. London: Tavistock Publications Limited. [Reprinted in 2001. London: Routledge].

Hofstede, G. J. (2006). Political correctness: Words as weapons. *Business Renaissance Quarterly, 1*(1), 59-71.

Schein, E. H. (2009). *The corporate culture survival guide* (2nd ed.). San Francisco, CA: Jossey-Bass.

SYNERGY OVER SILOS: MIS PROGRAM REALIGNMENT PILOT STUDY

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Keywords: Synergy, MIS

PURPOSE

Collaboration doesn't always come easy, as faculty we recognize this in the classroom and ask our students to persist. However, among our colleagues, do we persist to collaborate? Self-contained classes within a program of study can result in inappropriate or inadequate student knowledge, inability to transfer knowledge, and ultimately produce futile assessment results. What began as an effort to sync content between two faculty teaching the same course took an unexpected turn, charting a new path within a management information systems (MIS) department. Which has led to synergy among faculty and courses, a pilot study, and the possibility of useful assessment data.

This collaborative effort became a cause for curiosity among other members of the MIS department who wanted to know what exactly was being taught in lower level courses to hold students accountable for that content in upper level courses. This is when synergy began to take hold. Three, than four faculty began working together deliberately in a way that was producing an effect greater than the sum of each individual. The faculty quickly discovered that operating in a silo environment was not beneficial to them themselves, students, or the program. Within the study of MIS information silos have a negative connotation, indicating an inability to exchange information with other parts of a system. This mentality can occur among people when information is not shared. A silo mindset among people is also negative, leading to poor actions, diminished productivity and overall failure of efforts. What followed the "silo realization" caused action and created energy. Faculty dropped assumptions and began sharing which led to communication, accountability, realignment of program outcomes, review of course alignment, and most importantly higher expectations of the student's integration and retention of knowledge.

BASIS OF THE STUDY

The pilot study began with the creation of a scaffold model of courses offered and an evaluation of course content, under the guise of the IS 2010 Curriculum Guidelines, Blooms Taxonomy, and accreditation standards. The faculty knew that knowledge integration and retention among the students in the program was deficient. New knowledge was being added with each course, but connecting and integrating knowledge from previous courses was being neglected and students were failing to transfer knowledge. While this information was known the fact that it was out in the open enabled change to begin immediately.

Faculty constructed a pre/posttest for each of the foundational courses in the program to capture the integration and retention of students' knowledge. The questions aligned directly with the course outcomes and the scaffold model created, aligning with Bloom's Taxonomy and increasing in content knowledge as the course progressed higher on the scaffold level (Anderson & Krathwohl, 2001; Ling & Leng, 2018). The pilot was deployed during the 2018-2019 academic year for campus classes. Beginning in summer 2019 online classes will be added and both modes will contribute to the data during the 2019-2020 academic year.

IMPLICATIONS

While it is early in the analysis phase, anecdotal improvement can be reported. Following capstone presentations during the spring 2019 semester faculty noted a higher level of integration of program knowledge than the previous year's capstone presentations. The data continues to be analyzed and results will be shared at the IACIS conference. While many contributing factors can be taken into account at this point it is worth noting that the participating faculty experienced personal enjoyment and professional growth while working in this collaborative environment. A characteristic of an effective program is a high performance culture, this group of faculty are practicing what they preach by taking responsibility for the learning of all students within the MIS program and deploying a high performing, synergistic culture.

REFERENCES

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Ling, L., & Leng, C. H. (2018). Designing synergistic scaffolds for knowledge integration in a design-based learning STEAM module: A conceptual paper.

MEASURING IMPACT OF ILLINOIS MINIMUM WAGE INCREASES ON ACADEMIC PROGRAM RETENTION: A CRITICAL INSTANCE CASE STUDY

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Most students (71%) leave college because they are working to support themselves and going to school at the same time. At some point, the stress of work and study just becomes too difficult (Public Agenda, 2016). What impact will future minimum wage increases have on technology-related student work and academic internship opportunities for Illinois college students? Illinois Public Act 94-1072 will increase wages twice in 2020; on January 1, the minimum wage increases from $8.25 to $9.25 per hour, and will increase again to $10.00 an hour on July 1. In 2021, a $1.00 per hour annual minimum wage increase occurs on January 1, until the minimum wage hits $15.00 an hour in 2025 (Siegel, 2019). Augmenting the new law, Illinois HB 2180 proposes employers to pay interns at full minimum wage, regardless of college credit. Empirical research of the effect of minimum wages on employment dates back over 100 years (Totty, 2015) thus this research will not attempt to resolve issues in the minimum wage-employment debate. A critical instance case study is proposed to analyze Information Systems Technologies students in order to determine the extent student employment makes a difference in retention (cause and effect). The case study will make use of the annual increase intervals to determine which wage level has the greatest impact on retention. An emphasis will be placed on information technology and cybersecurity paid student work and academic internships. In addition, the author will attempt to capture disparity between disability groups and racial categories in the study and use findings in future research and practice.

Keywords: Minimum wage, academic retention, IT and wage rates

REFERENCES

"With Their Whole Lives Ahead of Them." *Public Agenda,* Research by Public Agenda, Prepared for the Bill & Melinda Gates Foundation, https://www.publicagenda.org/pages/with-their-whole-lives-ahead-of-them-reality-1

Siegel, Katherine E. "Illinois Governor Signs Bill Raising the Statewide Minimum Wage to $15 Per Hour." *Littler.* 19 February 2019, https://www.littler.com/publication-press/publication/illinois-governor-signs-bill-raising-statewide-minimum-wage-15-hour

Totty, Evan. "The Effect of Minimum Wages on Employment: A Factor Model Approach." *Institute for Research on Labor and Employment (Working Paper #110-15)*. April 2015. http://irle.berkeley.edu/files/2015/The-Effect-of-Minimum-Wages-on-Employment.pdf

CONVERGENCE OF MARKETING AND TECH: LET'S GET AMPLIFIED!

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Keywords: MarTech, marketing stack, convergence

INTRODUCTION

MarTech is like that song that comes on the radio and you can't get it out of your mind. The convergence between marketing and technology is referred to as MarTech. "MarTech is the technology, hardware, software, platforms, and services that are used to market today" (Elson, 2017). Examples include: Facebook, Google, Twitter, HubSpot, Constant Contact, Mail Chimp, and Marketo. With the rise of social media and e-commerce purchasing, companies are now scrambling to stay relevant in this fast-paced electronic market. Marketing has taken a shift towards the analytical side by using big data and algorithms to reach their audience. The combination of marketing and technology is important because companies are forced to use these two skills to stay relevant with today's market.

MARKETING WITHOUT TECH, IS THIS EVEN AN OPTION?

This informative research will demonstrate how marketing and technology have evolved together and how companies must adapt to stay relevant to consumers. In today's world students and business professionals need to be constantly learning and understanding trends. "Martec's Law: technology changes exponentially (fast) yet organizations change logarithmically (slow) and the gap is widening" (Loftis, n.d.). Since 2011, marketing technology vendors have grown from 150 to 3,874, a 26-fold increase. This is amplified growth and it has created a need to build a marketing technology stack in order to serve buyers. The marketing stack is a stack of interrelated tools and services that can be used to connect and distribute information. Sifting through and understanding all facets of the stack has become a real challenge for marketers who feel as if they also must become technologists in order to engage clients.

The rapid explosion of MarTech has caused much of the data that is compiled to be singled out and put into separate silos. Scott Brinker, a marketing strategist, developed a marketing technology landscape graphic in 2011 which has demonstrated exponential growth through 2019. Here's where convergence between marketing and technology comes in as the graphic illustrates how the lines between different technologies have blurred. There are so many different sellers in this space today, which tends to cause confusion as to what technologies work better together or on their own. These sellers are working to figure out the best ways to integrate the mass of data that is continuously being collected, along with finding an efficient way of sharing the data to reach more

clients. While MarTech offers many benefits the convergence among tools and use of data must be understood and well managed to amplify client experiences.

IMPLICATIONS

MarTech will be that song playing over and over in the minds of marketers for years to come. How marketers build their stacks to serve their clients must evolve into a dynamic playlist incorporating new "hits", aka technologies, as those tools serve a demand; while realizing value in the "oldies", as those tools provide the foundation. This research provides knowledge for faculty development, meets the demands of industry to provide updated knowledge for our students and enhanced curriculum in university programs, and an opportunity to collaborate with IACIS colleagues to better develop and deploy our findings.

REFERENCES

Elson, N. (2017). A Beginner's Guide to MarTech: What is Digital Marketing and MarTech? Retrieved from https://www.clicklaboratory.com/a-beginners-guide-to-martech/digital-marketing/.

Loftis, L. (n.d.) Harnessing the martech advantage. (n.d.). Retrieved from https://www.sas.com/en_us/insights/articles/marketing/harness-martech-advantage.html.

FORMAL METHODS FOR BUSINESS PROFESSIONALS HOW CLASSICAL LOGIC CAN SAVE THE WORLD FROM THE COMING SOFTWARE APOCALYPSE

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Keywords: Systems design, software analysis and design, formal methods, logic

STUDY BACKGROUND

Software is "eating the world" and we face a "coming software apocalypse". This is the picture painted by a recent article in the Atlantic, which describes the concerns of a growing number of experts and scholars. The problem, at its core, is that software has become too complex and the consequences of its failure are increasingly severe (Somers, 2017).

This study focuses on how training in classical logic enables business professionals to use *formal methods* to specify systems. Formal methods is an approach to system specification and verification that ensures a system does everything it is supposed to do and nothing it is not. Formal methods have been around since the 1960's. Many researchers and experts accept that its efficacy and necessity have been proven, but it has not been widely adopted (Butler, 2001). The most common use has been in life-critical applications like medical devices and avionics, but formal methods can, and arguably should, be used everywhere (Arcaini et al., 2018).

Current methods of implementing formal methods are unnecessarily difficult and expensive because business organizations have not yet developed internal capabilities. When consultants are used they need to develop an understanding of the systems at the same level as subject matter experts (SMEs) (Holloway, 1997; Newcombe et al., 2015; Tsaltas, 2017). The difficulty, time, and complexity of formal methods in business systems can be greatly reduced if they are performed by business professionals rather than software engineers (Fuller & Cardon, 2016). But this is only possible when those business professionals are trained in classical logic.

Formal methods is essentially the use of classical logic to express rules, processes, and requirements for systems. Classical logic is sufficient to precisely express any and every kind of information that can be represented or manipulated on a computer (Gilchrist et al. 2013; Sowa, 2006) . Expressing knowledge using logic means expressing it in terms of the classical rules of inference and the standard operators. Doing this successfully requires two distinct types of knowledge: (1) detailed knowledge of the information to be expressed; and (2) a basic understanding of logic and how to use it to communicate.

The first type of knowledge can be very complex and can take years of effort and experience to acquire. The second type can be easily learned in a short amount of time (usually two or three weeks), and the principles are always exactly the same for every person and in every situation. They involve simple rules and applications that are universal and never change. So it makes far more sense for subject matter experts to learn logic, rather than for logic experts to become subject matter experts.

METHODOLOGY AND RESULTS

The purpose of our study is to show how logic training for business professionals allows them to use formal methods to specify requirements for systems that are highly integrated, free from error, and can adapt to changing requirements with cost and effort orders of magnitude lower than what is possible using current approaches.

We explore cases from the Department of Defense, Amazon, and other companies to demonstrate the pitfalls of system design using common approaches without formal methods. We illustrate several examples of how formal methods have contributed to well-designed and robust systems.

As part of our study, we have explored how powerful computers and new tools (such as TLA+) have increased the adoption formal methods to some degree, but only in cases where the subject matter experts were also the engineers who designed the systems, such as with Amazon Web Services (Newcombe et al., 2015). We explain how these tools can be adopted by business professionals and how basic logic literacy, achievable with just a few weeks of training, can make formal methods commonplace.

IMPLICATIONS FOR MIS EDUCATORS

Our work demonstrates how MIS educators can prepare IS professionals to work more effectively with SMEs to create and act upon more logically sound business requirements. Specifically, we have identified the following skills that instructors should emphasize: (1) Understand how to work with SMEs and encourage them to use formal methods when creating business requirements; (2) Understand formal methods and apply them to systems design; and (3) Learn the basics of change communication to gain buy-in within organizations to adopt this new approach to systems management.

REFERENCES

Arcaini, P., Bonfanti, S., Gargantini, A., Mashkoor, A., & Riccobene, E. (2018). Integrating formal methods into medical software development: The ASM approach. *Science of Computer Programming, 158*, 148–167.

Butler, R. W. (2001). "What is Formal Methods?" *NASA Langley Research Center*. Retrieved from: https://shemesh.larc.nasa.gov/fm/fm-what.html

Fuller, R., & Cardon, P. W. (2016). Sophotaxis. *Bulletin of Symbolic Logic, 23*, 128–129.

Gilchrist, A., Zeng, M. L., Dextre Clarke, S., Isaac, A., Lambe, P., & Vernau, J. (2013). "Logic and the Organization of Information". An appreciation of the book of this title by Martin Fricke. A set of short essays. *Journal of Information Science,* (5), 708.

Holloway, C. M. (1997). Why engineers should consider formal methods. *16th DASC. AIAA/IEEE Digital Avionics Systems Conference. Reflections to the Future, 1*, 3-16.

Newcombe, C., Rath, T., Zhang, F., Munteanu, B., Brooker, M., & Deardeuff, M. (2015). How Amazon Web Services uses formal methods. Communications of the ACM, 58(4), 66–73.

Redman, T. C. (2016, September 22). Bad data costs the U.S. $3 trillion per year. *Harvard Business Review*.

Sijtema, M., Belinfante, A., Stoelinga, M. I. A., & Marinelli, L. (2014). Experiences with formal engineering: Model-based specification, implementation and testing of a software bus at Neopost. *Science of Computer Programming, 80*(Part A), 188–209.

Somers, J. (2017, September 26). The coming software apocalypse. A small group of programmers wants to change how we code—before catastrophe strikes. *The Atlantic*. Retrieved from www.theatlantic.com/technology/archive/2017/09/saving-the-world-from-code/540393/

Sowa, J.F. (2006). Worlds, Models and Descriptions. *Studia Logica: An International Journal for Symbolic Logic*, 84(2), 323.

Tsaltas, D. (2017). Using formal methods for engineering embedded systems. *Tech Briefs, 41*(8), 14–18.

EXAMINING THE EFFECTS OF QUALITY MATTERS RUBRICS FOR HIGHER EDUCATION ON COURSE DESIGN THROUGH TECHNOLOGY ACCEPTANCE MODEL LENS

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Keywords: Quality Matters, TAM, design features, learning

INTRODUCTION

Quality Matters (QM) is a nationally recognized program for improving online content delivery. It is widely adopted by both K-12 and Higher Ed institutions. This research examines the effect of QM rubric on various course design elements. Learners' perceptions of perceived usefulness and ease of use of a certified course will also be explored. This study is important topic to IACIS conference participants since this study could advance current understanding about QM rubrics, course design and technology acceptance. Additionally, this study is also closely related to discussion topics of this IACIS international conference such as pedagogy, higher learning and technology acceptance.

THE STUDY

QM proposes that an online course needs to be designed to promote student learning and support continues improvement. In order to achieve this goal, QM requires online courses that carry the QM Certified mark to meet a set of eight standards. These standards cover topics such as learning objectives, assessment, learning activities, course materials, course technology and learner support. Each category has additional specific standards that are rated by from one to three points. A course can be QM certified if the course can receive at least 85 points out of total 100 points and all essential standards are met. This research will examine a learner's perception of a QM certified Higher Ed course from technology acceptance perspective. The results would provide a unique perspective about how learners view the effectiveness of QM certification. TAM is well suited for this research since the rubrics of QM strive to enhance the perceived effectiveness and ease of use for an online course.

Data would be collected from through interviews and surveys. Quantitative data will be summarized and analyzed through structural equation modeling techniques. The instruments for designated constructs will be validated through a nomological network approach. Interview data can reveal additional insights and would provide a context for the study. Contributions and limitations of the research will also be presented.

IMPLICATIONS

This study exams the influence of QM course design rubric on the effectiveness of online learning management systems. This study is important to IT professionals since the results of this study could help them understand how to improve the design of an online course to better meet the needs of today's diverse learners. This will also help IS researchers on the importance of QM practices.

REFERENCES

Quality Matters, Rubric Workbook Standards for Crouse Design, 6th edition.

Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

MINDFUL WEB DEVELOPMENT: A CASE STUDY

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THE PURPOSE OF THE STUDY

Mindfulness research in the arising field of Contemplative Studies, has gained popularity in disciplines such as neuroscience, psychology, and leadership. Mindfulness is often referred as "a receptive state of mind in which attention, informed by a sensitive awareness of what is occurring in the present, simply observes what is taking place" (Brown & Ryan, 2003) or similarly defined as "awareness that arises through paying attention, on purpose, in the present moment, non-judgmentally" (Kabat-Zinn, 2017). Mindfulness is relatively easy to be interpret in behavioral sciences. However, what does mindfulness mean in the context of Web development?
Seeking appropriate interpretations of mindfulness in Web development is the first step leading to operationalizing and measuring mindfulness in Web context. Deng and Pool (2003) have called for research on the effects of information systems (IS) design interface features on users' emotional responses. Wang (2015, 2017) has argued the importance of building contemplative IS workforce for promoting contemplative IS use. Because mindfulness has been proven to help reduce stress and improve well-being, both IS professionals and users can benefit from mindfulness practices. IS professionals can take the lead in mindfulness practice by using Web development as a conduit for promoting mindful behaviors of Web users.

THE BASIS OF THE STUDY

Mindfulness in IS is often referred as "openness to novelty, alertness to distinction, sensitivity to different contexts, awareness to multiple perspectives, and orientation in the present" (Butler & Gary, 2006). It is mostly related to the IS development process, exemplified in innovation (Mu & Bulter, 2009; Surendra, 2009; Swanson & Ramiller, 2004), agile development (Vidgen & Wang, 2009), team management (Dabbish & Kraut, 2008) and reliability (Butler & Gary, 2006; Carlo, Lyytinen, & Boland, 2012).

This study seeks for appropriate interpretations of mindfulness in Web development, especially from novice students' perspectives. Similarly to the approach to examining mindfulness in systems analysis and design (Wang, 2015; 2017), this study investigates if the indirect education of mindfulness through a term project affects students' mindfulness in Web development, and to what extent. In addition, it further examines whether students' self-reported mindfulness is in alignment with their Web development outcomes. Subjective qualitative data and objective Web features designed by the students were collected from a Web development course.

IMPLICATIONS

The preliminary data analysis shows that students, as developers, have interpret well of mindfulness in the development process and they specifically noticed its stress reduction benefits. In the increasingly competitive and demanding field of Web Development, the integrating of mindfulness-based coping strategies as part of a regular mental health maintenance regime for computer coders and engineers is a higher priority than ever before. Moreover, students who have deeper understanding of mindfulness have also developed the Web pages that have more appropriate features and content in alignment with promoting mindfulness in Web uses. Mindful Web uses, exemplified in peaceful and focused user behaviors, are not only beneficial to users themselves, but also potentially to the consumers of these users' content.

CONCLUSION

Mindfulness has become a ubiquitous watchword in contemporary society, appearing in contexts as disparate as Asian spiritual traditions, Western psychotherapy modalities, and education, music, and sports. It is tempting to overgeneralize the role of mindfulness as pertaining to any and all disciplines, hence the need for research to examine the adaptability of mindfulness to Web development specifically. These tailored interpretations will reinforce mindful behaviors.

REFERENCES

Brown, K. W. & Ryan, R. M. (2003). The Benefits of Being Present: Mindfulness and Its Role in Psychological Well-Being, *Journal of Personality and Social Psychology*, 84(4), pp. 822-848.

Butler, B. S. & Gray, P. H. (2006). Reliability, mindfulness, and information systems. *MIS Quarterly*, 30(2), 211-224.

Carlo, J. L., Lyytinen, K., & Boland, R. J. (2012). Dialectics of collective minding: contradictory appropriations of information technology in a high-risk project. *MIS Quarterly*, 36(4), 1081-1108.

Dabbish, L., & Kraut, R. (2008). Awareness displays and social motivation for coordinating communication. *Information Systems Research*, 19(2), 221-238.

Deng, L. Q. & Poole, M. S. (2010). Affect in Web Interfaces: A Study of the Impacts of Web Page Visual Complexity and Order, *MIS Quarterly*, 34 (4), pp. 711-730.

Kabat-Zinn, J. (2017) Jon Kabat-Zinn: Defining Mindfulness. Retrieved from https://www.mindful.org/jon-kabat-zinn-defining-mindfulness/.

Mu, E., & Butler, B.S. (2009). The Assessment of Organizational Mindfulness Processes, *Journal of Decision Systems*, 18(1), 27-51.

Surendra, N. C. (2009). Agile development as an enabler of mindful IT innovation adoption – lessons from an action research project. *Journal of Design Systems*, 19, 99-115.

Swanson, E. B., & Ramiller, N. C. (2004). Innovating mindfully with information technology. *MIS Quarterly*, 28(4), 553-583.

Vidgen, R., & Wang, X. F. (2009). Coevolving systems and the organization of agile software development. *Information Systems Research*, 20(3), 355-376.

Wang, W. (2015). Building a Contemplative IS Workforce through Promoting Mindfulness in IS Design. *Proceedings of 21st Americas Conference on Information Systems*, San Juan, Puerto Rico.

Wang, W. (2017). Mindfulness Education in Information Systems Analysis and Design. In *Proceedings of the 77th Annual Meeting of the Academy of Management*, Atlanta, GA.

CYBER SELLS: BUT DO WE KNOW WHAT WE ARE SELLING? A NEW MEASURE

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STUDY PURPOSE

The purpose of this study is to identify and classify cybersecurity programs based on the core skills taught and then create a framework aligned to the BLS job roles and the NIST and NICE frameworks to attempt to move away from the broad term cybersecurity and better align university program graduates with job roles. This study is important to the IACIS audience as both academics creating cybersecurity graduates and practitioners who are hiring those same graduates. The IACIS audience will see any identified misalignments and be better able to align cybersecurity programs with industry needs under an informative labeling framework. The ultimate goal is to ensure graduates are immediately employable in a discrete cybersecurity role and best navigate the sometimes confusing definitions that surround the term cybersecurity.

BASIS OF THE STUDY

The cybersecurity education and certification space is growing rapidly. According to Cybersecurity Ventures there will be 3.5 million unfilled cybersecurity jobs by 2021 (Morgan, 2017). This strong occupational outlook compared with the gap in available talent has created an even stronger market for cybersecurity education programs within a university setting. However, the NIST and NICE frameworks suggest that the term "cybersecurity" is a vague term as there are many verticals within the cybersecurity domain that require specialized training and certification. For example, some cybersecurity programs focus on networking and securing networks. Other programs, social engineering and human psychology. Some programs focus on ethical hacking and penetration testing and yet other programs on securing code and secure software development. Some programs are big-data focused using anomaly detection and machine learning to identify breaches or focus on cloud architectures. All of these programs are operating under the label cybersecurity but they are vastly different and teach fundamentally different core skills (e.g., networking, programming, mathematics, computer science, etc.). Lastly, some programs teach smaller amounts of each vertical to create cybersecurity generalists. Interestingly enough, the Bureau of Labor Statistics (www.bls.gov) does not identify any job role using the terms "cybersecurity" which may have industry and academic out of alignment.

This study will collect data from a sampling of different university programs with "cybersecurity" in the program title. Using a new, integrated classification system called the Cybersecurity Program/Role Alignment Index (CPR-AI) that aligns with the NIST/NICE frameworks and BLS labeling structure, programs will be classified based on the preponderance of the credit hours presented. Programs with multiple cybersecurity specializations will be treated as multiple

programs. The data collected will then be anonymized and classified as ALIGNED or MISALIGNED and GENERAL or FOCUSED based on the CPR-AI index and a cutoff value as well as the number of verticals within the program. The cutoff value will need to be benchmarked using a panel of experts to identify the proper placement of this value. The panel of experts will have representation from both industry and academic leaders to both validate the measure as a tool and identify numerical cutoff values to identify alignment with job roles. The data is expected to show that there are some programs that are aligned with job roles and other programs that are misaligned with job roles. It is expected that many programs will be quite broad making them difficulty to align under the program title "cybersecurity".

IMPLICATIONS

This research furthers the need to openly discuss program labeling and reconcile the need for industry-aligned programs while balancing the marketing and advertising footprint of same (e.g., cybersecurity sells). There is also the possibility that students enroll in certain programs based on a specific set of words to which the university has some burden to ensure those words translate into relevant industry roles. The CPR-AI composite measure serves to quantify program alignment and may be a tool for academic program managers to use to identify degree of specialization and (mis)alignment. The same tool could also benefit industry in that hiring managers can look for graduates from programs with a certain cutoff value to ensure the program was industry aligned. If this measure proves useful, it can also be generalized into other disciplines beyond cybersecurity and serve as a tool to better understand program alignment to industry needs and how to accurately title academic programs to further this alignment.

CONCLUSIONS

This research furthers the conversation about the number of cybersecurity verticals, the relationship between those verticals and university programs, and seeks to best measure and align university program using a quantitative index. The ultimate goal is to address the substantial gap between industry cybersecurity talent needs and future workforce demands and how universities position programs to create talent to solve that problem. When university and industry are aligned, we move beyond the hype of cybersecurity as a marketing term and create talented, workforce ready graduates from well aligned programs.

REFERENCES

Morgan, Steve. "Cybersecurity Labor Crunch to Hit 3.5 Million Unfilled Jobs by 2021." *CSO Online*, CSO, 6 June 2017, www.csoonline.com/article/3200024/cybersecurity-labor-crunch-to-hit-35-million-unfilled-jobs-by-2021.html. Accessed 24 May 2019.

ARTIFICIAL INTELLIGENCE: SHOULD WE BE WORRIED?

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PROPOSED STUDY

Advances in artificial intelligence (AI) are occurring at an exponential rate. This has led to some people questioning whether AI poses a threat to the future of humanity. This study will discuss the three major directions of AI research and present the inherent threat of each line of research. These are issues that impact all facets of society and should be of particular concern for IS researchers and practitioners.

BASIS OF THE STUDY

Artificial intelligence (AI) may be defined as the ability of a machine or a computer program to think, act and learn like humans do. The AI would have the ability to reason, discover meaning, generalize and learn from past experience. The AI would accomplish this task by setting a goal or objective, interacting with its environment and being able to adapt to different objects and events in the environment to achieve its goal.

The artificial intelligence applications that we are most familiar with are programs that display a very deep understanding of a specialized task or domain. These systems, often referred to as narrow or weak AI, perform at a very high level of expertise within their domain that may surpass that of any human. However, once removed from their domain of expertise, the AI demonstrates little or no reasoning ability about the world beyond the area of their specialization. Examples include AI applications that can beat experts at the game of chess, perform advanced image recognition or diagnose cancer with greater accuracy than a medical specialist. Yet, outside of their domain, these systems cannot reason as well as a three-year-old child interacting within the surrounding environment.

More recently, researchers have begun to make inroads into a second and more advanced type of artificial intelligence that would be able to understand and reason about its environment as well as humans do across any number of domains. These AI applications, referred to as general or strong artificial intelligence, would behave in ways that are like humans. They may still have a very high level of expertise in a specific domain such as chess, but the AI would also be able to demonstrate human level reasoning in the wide variety of everyday activities that humans encounter. Examples of general AI systems are androids or robots that we often see depicted in science fiction movies. A third type of AI is artificial superintelligence, which refers to a machine that is smarter than humans in practically every field, including scientific creativity, general wisdom and social skills' (Bostrom, 2016). While super intelligent systems at this point remain pure science fiction, several experts in the field suggest that the development of such systems in the future is a real possibility. The descriptions of the three types of AI focus on the AI's ability to reason and behave in a manner that approximates a human. The description, however, leaves out a key element of what some people describe as a critical element of being human; "free will." Free will is a matter of

controversy, with fields such as neuroscience and philosophy taking very different views of whether free will actually exists. This controversy invokes a discussion of the more general argument of the separation of mind and body.

This presentation will briefly consider the historical development of AI research with specific implications for the notion of AI and free will. Drawing parallels from human evolution and the development of human intelligence, implications will be drawn about the future risks that AI poses for humanity. It will be demonstrated that whether one believes that free will is or is not a critical element for AI to demonstrate human intelligence, the risks to the future existence of humanity remain the same. Those risks exist for all three directions of AI research. It will be argued that if you are not already afraid, you should be.

REFERENCES

Bostrom, Nick (2003), Ethical Issues in Advanced Artificial Intelligence, *Cognitive, Emotive and Ethical Aspects of Decision Making in Humans and in Artificial Intelligence*, Vol. 2, ed. I. Smit et al., Int. Institute of Advanced Studies in Systems Research and Cybernetics, pp. 12-17.