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COMPARING LEARNING EFFECTIVENESS IN QUANTITATIVE COURSES TAUGHT TRADITIONALLY AND ONLINE

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Abstract: Learning effectiveness, online vs. traditional courses, quantitative courses
In the study of effectiveness of online learning, many researchers have concentrated on investigating only the performance of online courses. There are very few studies comparing learning effectiveness of the traditional and online formats and none of them do it for quantitative courses. The goal of this project is to determine if there is a significant difference in learning effectiveness between traditional and online quantitative courses. The purpose of this project is to create the necessary teaching materials and evaluation instruments to perform a comparative analysis of a quantitative course taught in-person and online. Once the actual study is performed, the findings will be published.

Project Description - Universities around the world have experienced extreme growth in participation in online education programs. However, methods and tools for assessing online learning effectiveness have not kept pace. In the past, many researchers have used survey data to assess the effectiveness of online courses (Hanney. and Newvine, 2005; Utts et al, 2003). There are significant limitations to this approach, because the overwhelming number of such surveys decreases the students' motivation to participate appropriately. Proliferation of learning management systems (LMS) provided an abundance of automatic logs of student activities. Recently, these logs became the major source for researchers to examine the effectiveness of online courses (Black, Dawson, Priem, 2008). While student activities are an important part of a student learning processes, they do not necessarily directly correspond to learning effectiveness. A limited range of assessments is available for use in online education programs and the few of these have proven valid and reliable (Black, Ferdig, DiPietro, 2008). Therefore, there are very few direct comparisons of learning effectiveness between traditional and online courses. Those that exist (Tallent-Runnels et al, 2003) are about ten years old and according to my knowledge, there is no research that is based on teaching quantitative courses.

At the same time, there is mounting pressure at Colleges of Business to institute online undergraduate as well as graduate programs with ongoing controversy over teaching quantitative courses online.
What makes teaching quantitative courses online different from many other courses? The most difficult component of quantitative courses is problem solving, followed by the stepwise procedures/algorithms required to solve the problem. In addition, such courses use specific software tools (Excel with various add-ins, JMP, SPSS, SAS and many more) which require specific training. In addition, many quantitative courses are lab and project based which poses considerable difficulties in online evaluations of such student activities.

The overall goal of this project is to perform a comprehensive comparative study of learning effectiveness in quantitative courses taught traditionally and online. For this purpose, I'm proposing the following general research question:

- Is there a significant difference in learning effectiveness between traditional and online quantitative courses?

The objective of this project is to create the necessary teaching materials and the evaluation instrument to perform a comparative study of learning effectiveness in quantitative courses taught traditionally and online. The findings from this research will be subsequently presented in a manuscript for a refereed journal article.

Proposed Methodology - My intention is to develop six representative teaching modules for quantitative courses based on best industry practice used in teaching online courses including massive open online courses (Kop, Fournier, Fai Mak, 2011). I will also develop an evaluation instrument that is equally applicable for in-person as well as online evaluation and that will reflect the various components of learning effectiveness. A mixed-methods

approach and a variety of research techniques and analysis tools will be used to capture the diverse activities and the learning experiences of participants. The first module will be performed in-person for all students in a given class. The second module will be performed online for all students as well. Those two modules will serve as control samples. For the remaining four modules, I will split the students into two groups and alternate teaching methods for those groups so that each group will do two in-person and two online modules. My intention is to perform this study on both undergraduate and graduate level quantitative courses that I teach. Using the collected evaluation data, I will perform various statistical analyses in order to answer the proposed research question.

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ROLE-PLAYING AND PROBLEM-BASED LEARNING: THE USE OF CROSS-FUNCTIONAL STUDENT TEAMS IN BUSINESS APPLICATION DEVELOPMENT

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Keywords: Problem-based learning, business application development, cross-functional teams

Description of the Study

We describe a student team project and interactive learning experience which replicated the process by which consultants, systems developers and business end users collaborate to design and implement a business application. The overall learning experience was distinguished by specific components and characteristics of the project, including: 1) a problem-based learning (PBL) approach requiring students to design and develop a computer-based application from scratch to solve an accounting auditing problem; 2) the formation of cross-functional teams comprised of students across multiple sections of two different courses (the capstone courses for both Accounting and Information Systems Management); and 3) the contributions of individual students based on their respective backgrounds and roles in the project. The roles included domain/content experts (accounting students), as well as consultants, business analysts and developers (information systems students). The intentional use of cross-functional/cross-discipline teams and assigned roles distinguishes this approach from other problem-based approaches. Preliminary assessment data indicate that students learned, through iteration and trial-and-error, new interpersonal, analytical and technical skills in client-consultant interaction, problem definition and formulation, requirements analysis, business process and data modeling, and application development.

Basis of the Study

The analysis, design and development of a business application is an inherently collaborative, complex and unstructured task requiring the interaction of many different types of skills and knowledge that no one person is likely to possess. It requires progressive understanding of business requirements through iterative communication with content experts, the design of data and process models that align with and address the requirements, and the development of a technical solution that implements the models and solves the business problem. As such, this task is particularly conducive to a problem-based learning approach that immerses students in the general process of exploration, information gathering and analysis (Barrows, 1986).

The motivation for this type of project came somewhat opportunistically from a student contest sponsored by the Pennsylvania Institute of Certified Public Accountants (PICPA). The PICPA invited college students in the Commonwealth of Pennsylvania to develop a web application (or 'web app') that could provide automated decision support in the area of accounting, financial reporting and/or auditing. Our goal in response was to place students in a problem-directed context that would reflect what they might expect when they enter their profession. As such, the accounting students would be the end users; i.e., the professional accountants in need of a decision support system. In this role they would have to communicate to the development team their needs as well as the nuances and

complexities of the decision task. The ISM students, in turn, would be the development team; i.e., the business analysts and application developers who would have to glean the system requirements from the accountants, and iteratively develop and deliver an application to the accountants' satisfaction.

Implications and Conclusions

Preliminary results from this project suggest, consistent with prior research (Kay et al., 2000; Mills & Treagust, 2003; O'Grady, 2012), that problem-based learning methods can be effective within this domain in instilling many of the self-learning skills required of business graduates. These results should be of interest to IS and management researchers who are exploring the application of problem-based learning methods, as well as to educators who are considering experiential methods for teaching complex problem-solving and design approaches.

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COMPARATIVE PRODUCTIVITY ANALYSIS OF HOSPITALS BASED ON THE LOCATIONS, SIZE, AND TYPES

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ABSTRACT

As the healthcare spending is growing rapidly, the way of reducing healthcare spending and improving productivity of healthcare system has been a major topic among various stakeholders including researchers, legislators, and hospital administrators. This paper analyzed the productivity of 626 hospitals in the United States and compared the efficiency by geographical locations (urban and rural), size (small and large), and hospital types (profit and not-for-profit, teaching school and not-teaching school). Information provided by the department of state health services was used to categorize the hospital locations, size, and types. Data for this research were obtained from the health sources provided by the US News and World Report. Data consist of three inputs and two outputs. The first input variable was the number of beds, which was used as a proxy for material resources. The second and the third input variable were the number of registered nurses and the number of doctors respectively. These two variables represent the labor input. The number of inpatient surgeries and the number of outpatient visits were used as outputs of hospital services.

To identify the waste of resources without worsening any other inputs and outputs, technical efficiency of hospitals was measured using a variable-return-to-scale (VRS) with an input-oriented data envelopment analysis (DEA) model. DEA method came out due to the issues of traditional way of measuring efficiency, which focuses on averages of parameters, utilizing optimized regression equation assumed to be appropriate for every unit. However, DEA focuses on the individual unit's optimization. DEA has several advantages including 1) it uses a non-parametric approach and measures the inputs and outputs in their natural unit, 2) it can accommodate multiple inputs and outputs, and 3) it can produce reasonable estimate of efficiency without using a large data set. Due to the merits of DEA, it has been used in many fields including the financial sectors, the education sectors, and the public services.

The analysis will give various stakeholders the information on whether the urban (large, profit, or teaching school) hospitals are more efficient than rural (small, not-for-profit, or not-teaching school) hospitals or the opposite is true. If so, what are the factors influencing the outcomes? The research outcomes will also give a way to eliminate the inefficiencies of hospitals.

Keywords: Hospital Productivity, Hospital Locations, Hospital Size, Hospital Types, Variable-Return-To-Scale, Data Envelopment Analysis

USING REAL-WORLD CLIENT PROJECTS IN A BUSINESS INTELLIGENCE COURSE

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Keywords: business intelligence, Qlikview, real world, client projects, experiential learning

Description of Completed Study

A common issue in information systems (I.S.) education is how to better incorporate active learning methodologies into the classroom that mimic the "real world" as defined by Schuldt (1991). However, little has been discussed with regard to integrating real world projects into business intelligence (BI) courses. This study reports on the use of real world projects in a BI course within an undergraduate I.S. program. Over the past four years, students in this course had the opportunity to work with real data from the university in addition to retail data from the institution's student-run art gallery. Through these projects, students are pushed beyond their comfort zone to communicate with a client, work in teams, manage and model raw data, and build BI solutions to answer key questions that address the clients' needs. Through these experiences, students are better prepared to enter the workforce to meet employer demands.

Literature Review

Instructors who teach business intelligence courses often lack data sets and meaningful cases and professors cite the need for real world business problems, not just rote tutorials (Wixom et al., 2014). While simulated projects provide students with experience, these can often be sanitized and constrained to achieve specific results. Real projects involving real clients forces students to manage uncertainty and synthesize their knowledge and skills in an unconstrained environment. According to Abbassi and King, students gain experience in actual I.T. work before graduation and are able to gain a more realistic understanding of information systems and solve real I.T. issues (2007). In today's economy, employers are seeking talent with a broader set of skills that go beyond technical acumen. The National Association of Colleges and Employers (NACE) reported that the skills most sought after are teamwork and the ability to make decisions and solve problems (Adams, 2014). Therefore, a compelling case can be made that the need for real world projects is necessary for I.S. graduates and is even further supported within the context of business intelligence.

Implications

Building a business intelligence course that involves a real client project can provide immense value for the organization and the students. Students are motivated knowing that their work serves are a larger purpose and adds value rather than an answer that exists in a lab manual. When working with another organization's data, particular attention to sensitive information is essential. Selecting a software tool is an important consideration in developing a client project. Popular software titles that include complimentary academic licensing include Tableau and QlikView that allows the user to develop BI applications for dashboarding, visualizations, and analysis. Software tools, such as these, have academic resources and training materials that allow for easy training and onboarding. Identifying and developing projects involving real clients, even across campus, takes considerable time and effort from the faculty perspective. Careful attention is needed with regard to how students are evaluated as solutions will vary and teamwork evaluation leaves the opportunity for some students to slip through with minimal contributions. Through proper design and execution, students will leave the course with improved communication and teamwork skills to complement their technical abilities while clients benefit from having a BI tool built for their use.

Conclusions

After integrating real world projects into a BI course for four years, students and clients assert that the projects presents benefits along with challenges. One student commented in a course evaluation that "Working in teams doing real-life projects, and being able to present my work to a client are key tools for future success in the

workplace." Another student said that "it helped [him] understand that it was I.T.'s job to build and model data so that others in the company can make better decisions." There is compelling evidence to conclude that these project add value to both the client and the student. Further research is needed to gauge student outcomes after graduation and to understand how the project is being used by past clients.

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AN ANALYSIS OF DIFFERENT APPROACHES TO MINIMIZING USER-RELATED FAULTS IN INFORMATION SYSTEMS SECURITY: IMPLICATIONS FOR RESEARCH AND PRACTICE

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Basis for Research
Understanding the factors that drive employee information security awareness and behavior is important. It isn't immediately clear in reviewing subsequent research how the theory has translated to changes in organizations that reduce or eliminate information security breaches. Human-related faults in the area of information security are just as daunting today as they were a decade ago. The approaches that are recommended to minimize user related information security breaches should be derived from our understanding of the factors that drive user behavior. The last article that attempted to analyze the different approaches to minimizing user-related faults in information security through a review of the relevant research was published 15 years ago (Siponen, 2000).

Importance
What seems to be clear is that information security breaches due to the behavior of authorized users have been on the rise. One recent study funded by IBM in 2015 found that hackers and criminal insiders continue to compromise authorized users to gain access to systems. The behavior of the official users led to breaches. The research found that 25% of the data breaches were simply a direct result of human error (negligent approved users). Overall, 72% of the data breaches could be directly or indirectly attributed to sanctioned users of the information systems. (Ponemon Institute, 2015)

Research Insights
These organizational failures could be the result of disconnects between research and practice. Or, these failures could represent both a theoretical and practical misunderstanding of user behavior. We believe that academics and practitioners need to better understand the root causes of these failures. It is possible that organizations are simply failing to implement effective policies, practices, education and training. Or, as some of the literature suggests, the research methodologies employed might not be correctly identifying the factors which drive user behavior. Perhaps the theory is on point but the practices that emerge from the theory aren't effectively addressing the root causes of failure.

Implications for Research and Practice
For this research, the authors have identified 100+ research articles published in the last decade related to understanding, reducing or eliminating user-related faults in information security. The goal of the paper is to update the Siponen research that was published in 2000 to reveal how processes, policies, education and training used to minimize IS breaches have evolved over time. As a result, a taxonomy, a comparison and critical analysis of the strengths and weaknesses of approaches shall be presented. This can then be directly compared to the results of the Siponen (2000) study.

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AN INTELLIGENT E-BOOK ITEM ANALYSIS PLATFORM USING COLLECTIVE INTELLIGENCE IRT

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ABSTRACT
This research discusses some fundamental and theoretical aspects of IRT and illustrates these with applied e-book platform. In this paper, authors focus on an intelligent e-book item analysis platform using collective intelligence item response theory (CIIRT). Therefore, the importance of this study is to provide the testing of item properties such as the question difficulty and discrimination of intelligent questions to the appropriate subject, which automatically analyze and adjust in real time to analyze the questions with collective intelligence.

Keywords: Item Response Theory (IRT), E-book Item Analysis, Collective Intelligence

INTRODUCTION

The bulk of the theoretical work in IRT comes from the fields of psychometrics and educational measurement with early key contributions from Rasch (1960), Birnbaum (1968), Wright and Stone (1979), and Lord (1980). Some introductory IRT reading includes Hambleton, Swaminathan, and Rogers (1991), McDonald (1999), Embretson and Reise (2000), Bond and Fox (2007), and de Ayala (2009). More advanced treatments are presented, for example, in Fischer and Molenaar (1995), van der Linden and Hambleton (1997), Baker and Kim (2004), and De Boeck and Wilson (2004) [1, 2]. The main concept in IRT is the item characteristic curve (ICC) and fuzzy probabilistic models [3, 4]. The ICC describes the probability that a person "succeeds" on a given item (individual test question). In the Figure 1(a), we can see an ICC for one item intended to measure ability. Notice that the probability of this broadly defined success increases as ability increases. ICCs, however, will be different for different items. The probability of success on an item is a function of both the level of the latent trait and the properties of the item. The latent trait is commonly denoted by θ. The value of θ for a given person is called the person location. The item properties are parameters, commonly known as difficulty and discrimination that are estimated in the IRT model [5]. The difficulty parameter, or item location, commonly denoted by b, represents the location of an item on the ability scale. For example, the following Figure 1(b) graph plots the ICC for items q1, q2, and q3, with difficulty parameters -1, 0, and 1, respectively.

(a) Item Characteristic Curve (b) ICC for Items with varying difficulty

Figure 1. IRT Models

RESEARCH METHODOLOGY

For example, when users testing by e-book, imagine three tests each with then questions. The questions in each of the tests have facility values as Table 1. The aim of any test is to separate out the candidates as much as possible so that decisions can be made on as reliable evidence as possible. Test-1 would not be a very good test. Test-2 would also not be an effective test. Only 2/100 students would be expected to answer Q4 correctly, while 98/100 would correctly answer Q5 and all would correctly answer Q10. Cleary this is not providing very much information. Test-3

would work well. Although some of the questions are a bit hard (e.g. Q1) or easy (e.g. Q4), most of them are close to 0.5, which allow students at the ends of the ability range to distinguish themselves. In general, however, it may be better to have easier questions at the beginning with more difficult ones toward the end.

Table 1. An Example of Item Discrimination

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Test-1	.50	.50	.50	.50	.50	.50	.50	.50	.50	.50
Test-2	.89	.75	.10	.02	.98	.15	.88	.22	.23	1.00
Test-3	.20	.45	.51	.72	.39	.44	.56	.61	.55	.48

Item Difficulty

Item difficulty is the percentage of people who answer an item correctly. It is the relative frequency with which examinees choose the correct response. It has an index ranging from a low of 0 to a high of +1.00. Higher difficulty indexes indicate easier items. An item answered correctly by 75% of the examinees has an item difficult level of .75. An item answered correctly by 35% of the examinees has an item difficulty level of .35. Item difficulty is calculated by using the following formula [6].

$$\text{Difficulty} = \frac{\textit{\# who answered an item correctly}}{\textit{Total \# tested}} \text{ X } 100$$

Item Discrimination

Item discrimination compares the number of high scorers and low scorers who answer an item correctly. It is the extent to which items discriminate among trainees in the high and low groups. The total test and each item should measure the same thing. High performers should be more likely to answer a good item correctly, and low performers more likely to answer incorrectly. Scores range from –1.00 to +1.00 with an ideal score of +1.00. Positive coefficients indicate that high-scoring examinees tended to have higher scores on the item, while a negative coefficient indicates that low-scoring students tended to have lower scores. On items that discriminate well, more high scorers than low scorers will answer those items correctly [7].

CONCLUSIONS

This research described major concepts related to item analysis including, item difficulty, and item discrimination, particularly in relation to criterion tests in e-book platform. The paper discussed how these concepts can be used to apply and improve items and listed suggestions regarding testing in e-book guidelines for test development. Most of the test items have acceptable levels of difficulty index and excellent discrimination index. Future developments in assessment, particularly the importance of the standards debate and the development of e-book adaptive testing (EAT) may well lead to further innovations in item analysis.

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BUSINESS PROCESS MANAGEMENT IN THE CLASSROOM

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ABSTRACT

Organizations are increasingly adopting Business Process Management (BPM) approaches growing the need for BPM expertise in the industry (Bandara, et, al., 2010). This has resulted in growing demand for college graduates who have a thorough knowledge of business processes (Lee, 2008). Hadidi (2014) pointed out that development of courses and programs in BPM area has received huge consideration in academia during recent times. This paper presents a classroom activities for teaching Business Process Management using a paper-based simulation game conducted as part of an undergraduate IS course. The paper discusses various class activities involved such as execution of the simulation game, creation of graphical representations of processes followed in the game, and creation of Business Process models using Microsoft Visio software. A post-test survey was conducted to evaluate the understanding of BPM concepts learned and analyze the effectiveness of the simulation game. The paper concludes with recommendations for future research.

Keywords: business processes, business process models, enterprise resource planning

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DECISION SUPPORT SYSTEMS: HELPING EDUCATORS GATHER & ANALYZE DATA

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ABSTRACT

Nearly every industry uses data to guide decisions. In education however, data is difficult to obtain and the lack of technology and resources makes data analysis even more of a challenge. CTESurveys.com was developed as a Decision Support System to improve the flow of data in education and allow educators the ability to analyze their data without having to be skilled statisticians.

Keywords: Information Technology (IT), Decision Support Systems (DSS), Educational Management Information Systems (EMIS), Information Systems (IS), Data Analysis

INTRODUCTION

According to the Data Quality Campaign, educational data is inaccurate, expensive to obtain, difficult to transport, and flows in only one direction, up. Educational programs need data that is in context, reliable, timely, affordable, and flows in all directions (Data Quality Campaign, 2016). Furthermore, data in general can be difficult for educators to understand. EdTech Reviews explains that Data that is difficult and complex to understand can often lead to wrong interpretations and can be perceived incorrectly (Gupta, 2016). With the growing importance of data- driven decisions in program improvement and education, there is a need for new instruments to help educators in the process of gathering, disaggregating, and interpreting data in an easy, timely, and affordable way.

Decision Support Systems

According to Ralph M. Stair and George Reynolds, authors of Fundamentals of Information Systems, a Decision Support System is a collection of software, databases, and devices that support problem-specific decision making.

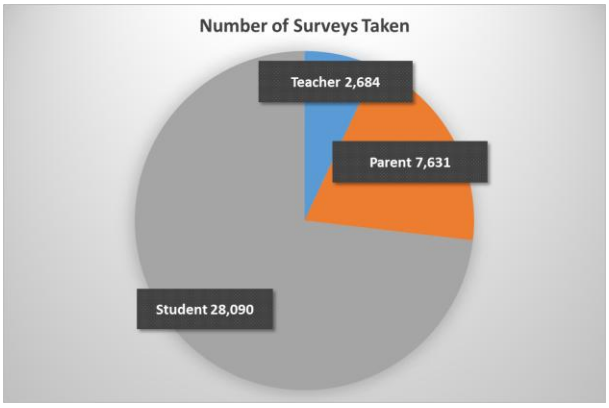
RESEARCH METHODOLOGY

In order to develop an effective data analysis tool for educators to use, we first had to understand their needs. School counselors in Utah were looking for a tool that would help them gather data from different stakeholders, and then assist them in analyzing the results to improve or develop programs. In addition, counselors were looking for an instrument to help them identify disparities among sub-populations. Because school counseling programs rely so heavily on data gathered to determine the needs of stakeholders, counselors were looking for a better way to facilitate the process.

RESULTS

CTESurveys.com was designed to help all secondary schools in Utah. The website allows counselors to add custom questions, send surveys, apply custom filters and see demographic disparities without the need of

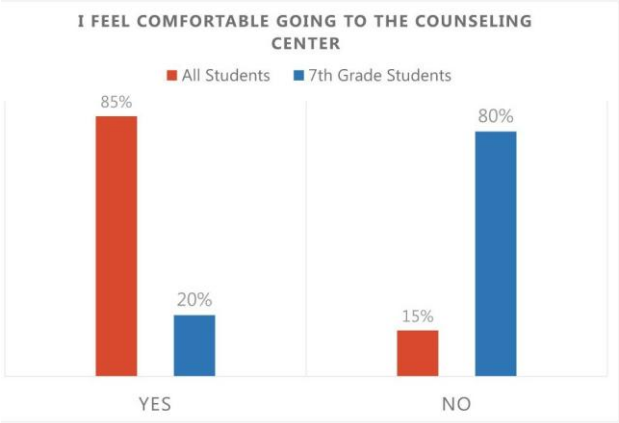
Figure 1



subject matter expert. Features on this website give school counselors the tools they need to make data-driven decisions in their programs and improve the education atmosphere for all students. Simple charts can easily be created, summary reports can be downloaded, survey results can be downloaded and used in a spreadsheet application, and data flows in all directions. Once a survey has been taken, each counselor, district supervisor, state advisor, etc. can view the results and disaggregate the data with demographic filters. Data There have currently been over 38,000 surveys completed by students, parents, and teachers (see Figure 1).

With the growing complexity of modern-day chart options, charts are becoming more and more difficult to interpret. The key feature of CTESurveys.com is to help counselors disaggregate the results by applying standard demographic filters and viewing the changes in the height of bar lines. A larger difference in height of each bar might suggest to counselors a disparity in the data (see Figure 2). Charts such as these provide a simple way to analyze data to those unfamiliar with data analysis.

Figure 2



SUMMARY

With the rising demand for data analysis to drive decisions in education, new, easy, and affordable technology plays a critical role. Decision Support Systems such as CTESurveys.com can offer educators the information they need to make data-driven decisions without having to be trained extensively in statistics, or rely on software that would be too difficult to learn.

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STUDENT PERCEPTIONS ABOUT INFORMATION TECHNOLOGY AND CYBERSECURITY INDUSTRY CERTIFICATIONS

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Keywords: Cybersecurity, Information Technology, Industry Certifications, Industry Certified, Curricula

This research study seeks to analyze how students perceive industry recognized certifications in the field of Cybersecurity and Information Technology (IT). It is generally acknowledged that in order for students to fully realize their career and earning potential they need to have a proper academic grounding as well as pass several Information Technology certifications (Hunsinger & Smith, 2005). There seems to be a strong preference for balanced (education, experience and certification) candidates in the minds of most Human Resource (HR) professionals (Anderson, Barrett, & Schwager, 2005). By gaining an understanding of how students view certifications and how they feel about the process of studying for certification testing (Hunsinger & Smith, 2008), we hope to formulate specific strategies to assist students.

Students from all Information Technology / Cybersecurity degree programs were asked to participate in the study. These include Associate, Bachelors and Masters students from a regionally accredited university. The data collection instrument used in this research study is a 30 question electronic survey. As of May 12, 2016, 124 students have taken the survey. Of the 124 students, 23 are in the Associates program, 80 are in the Bachelors program and 21 are in the Masters program.

Prior to engaging in this study, many academicians at the University considered students to be reluctant to take certification tests while enrolled. This study tackles this perception head on. The data will reveal if it is, in fact, the case that students are reticent to sit for certifications. In addition, the researchers hope to gain a better understanding of what hurdles students feel exist for them with regard to this very important facet of their future careers.

Do students perceive value in becoming industry certified?

For students with no IT Experience, 75.2% indicated, "Possessing certification(s) is highly likely to influence the decision in favor of the certified candidate". The same question for people with experience resulted in 66.6%. When asked directly about value, only 11.8% indicated that they were unsure of the value.

In both groups of students, with and without direct IT experience, the survey results indicate that students see strong value in obtaining a certification. This finding applies to both entry-level certifications as well as advanced certification for career advancement. Of the participants, 66% of students felt that completing a certification would be Likely or Very Likely to strengthen their ability to complete tasks on the job.

Despite this strong positive attitude, most students, 55%, indicated that they had not seriously made plans towards achieving certification. Alternatively, 39.3 % indicated that they were either actively planning or actively involved in preparing for a certification.

What were the factors that had the most impact on student failure to start or achieve a certification while completing their degree programs?

Students indicated that the lack of available time was one of the dominant factors affecting their choice of not preparing for certification - 52.9%. Financial considerations were also deemed to be important, with 66.9% indicating a Strong or Major Influence. Respondents also indicated a strong preference for a companion course –

46.1% vs. preparing during a main associated course – 16.7%. The main difference between these two selections is judged to be available time. Other important factors were related to a lack of information ("Not sure how to start" – 31.4% and "I need to know more" – 27.5%). Answers related to lack of motivation and fear of failure were strongly weighted to the low end of the scale and did not appear to be important factors. 88% of students felt that the solution they selected would be Likely or Very Likely to assist them in obtaining certification, additionally, 80.4% indicated that the results of the survey would be Likely or Very Likely to be effective in helping the researchers answer the stated research questions.

Conclusions

The study is ongoing; however, at this time, the data confirms the researchers' hypothesis. Students, by and large, fully understand the value of certification relative to hiring and promotion opportunities. Students are reluctant to begin preparation for certification achievement while undertaking their degree; although, it should be noted that the researchers initially believed this reluctance to be stronger than indicated by the results. Reasons for the reluctance skewed most strongly to lack of available time and limited financial resources. This certainly makes sense given that most of the students are part time students and full time workers. Students, by and large, were likely to favor inclusion of a certification solution within their degree program and were strongly positive about the choices presented as possible (selected) solutions.

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A COMPLETELY DIFFERENT CONCEPT: NON-MATHEMATICAL ENCRYPTION?

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Keywords: Lingual Transformation, Encryption, Decryption, Stream Cipher, Seed Generation, Security, Internet

BASIS OF THE STUDY

From Julius Caesar's simple substitution cipher (Reinke, 1992) through polyalphabetic ciphers produced by the likes of WWII Germany's famous Enigma machine (Winkel, 2005) to today's secret-key-based stream and block ciphers such as RC4 variants and AES (Wang et al., 2011), math-based cryptography algorithms have been the go-to tool for encrypting messages for much if not all of human history. However, the advent of computer technology has given rise to an encryption "arms race" in which adversaries compete to build the fastest computer and hence possess the most powerful encryption/decryption capability (Arquilla, 1996). Is there a way off this hamster wheel?

STUDY DESCRIPTION

There may be: a novel approach to encryption we call lingual transformation (LT). Just as humans use slang arising from their current social environment to communicate covertly without resorting to mathematical transformations (Locke & Bogin, 2006), so it may also be possible to program computers to generate ciphertext by representing transmissions in "slang" arising from the current transmission environment.

One way to characterize LT is as a modified stream cipher (Hell, Johansson, & Meier, 2007). Traditional stream ciphers suffer from a potentially debilitating weakness: the seed from which their keystream originates, supposed to be entirely random, in practice is often generated from internal computer states that are pseudorandom, i.e., potentially predictable. If a seed can be identified by an adversary, the adversary can decrypt any encrypted messages resulting from that seed (Ekdahl & Johansson, 2002). An example of this problem is the untimely obsolescence of WEP encryption in early Wi-Fi implementations (Lashkari, Mansoor, & Danesh, 2009).

LT proposes to address this weakness by generating the seed not from an internal computer state but rather from transient, nonrepeating states of the sender's and receiver's shared network (e.g., the Internet). We view these transient, nonrepeating network states as the "slang" of the network; thus the LT name. With the Internet as source, the number of states available to sample could increase virtually immeasurably, particularly when allowing the seed to be generated from combinations of multiple network states as well as from individual network states. We believe this huge multiplicity of seed sources makes the seed effectively random and thus effectively unpredictable.

INDUSTRY IMPLICATIONS

We currently see two uses for LT-based seed generation: key transmission and stream synchronization.

Key Transmission
Since stream ciphers are symmetric (the same keystream used to encrypt is used to decrypt), sender and receiver must share the same seed (Bellare et al., 1997). Sharing the seed between sender and receiver has historically been the Achilles heel of symmetric cryptography (Bellare et al., 1997). However, if sender and receiver could independently generate the same seed from their shared network, there would be no need to arrange a mechanism for sharing the seed. We believe an LT approach to seed generation allows for this.

Stream Synchronization

An ongoing difficulty of stream ciphers is the need to exactly match, bit for bit, the encryption and decryption keystreams with the message. If the receiver gets the decryption keystream out of sync with the encrypted message, decryption fails. On even moderately noisy networks where message transmission is interrupted and packet retransmission is necessary, this can significantly slow message receipt because of the need to repeatedly restart the decryption (Watanabe et al., 2002). So-called self-synchronizing stream (SSS) algorithms have been developed that calculate succeeding bits in the keystream from preceding bits, essentially packetizing the decryption and reducing the need to retransmit large portions of the message. However, this also makes the already not-really-random keystream even less random and thus even more susceptible to prediction/compromise (Daneshgar & Khadem, 2015).

We believe an LT approach to seed generation could alleviate the stream synchronization problem without compromising the randomness of the keystream. LT would do this by having sender and receiver simultaneously sample an agreed-upon network state, thus achieving the same result as SSS algorithms without increasing keystream predictability.

CONCLUSIONS

It is probably clear by now that our assertion of a non-mathematical basis for encryption is a bit of hyperbole. That is, everything in a computer is ultimately binary-mathematical. However, we also hope it is clear that LT-based seed generation is significantly different from current methods, which difference we hope we have appropriately highlighted by characterizing it as arising from network "slang." We readily admit that this idea is still quite rough and needs much development, but we also see it as potentially ending the current cryptography arms race by making the entirety of the Internet an encryption/decryption seedbed.

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Open Source and the Validity of Intellectual Rights

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ABSTRACT

Discovering the factors that allow the open source architecture to thrive in this consumer driven market is the starting place to uncover how valid laws protecting intellectual property and the rights of the creators of emerging technologies. Intellectual rights, granted and protected by patents and copyrights, give assurance to creators and developers. Several companies utilized trade secrets to assure the protection of their creations. Companies that guard themselves and their creations will adopt a profit-driven model of business whereas other companies will use intellectual property laws to ensure that its source code remains open to those who use or seek to improve it. Looking into how open source impacts security and commercial markets cellular companies and their motives will be examined. Is there an obsoletism of intellectual property rights in this digital, open sourced, cellular world?

Keywords: Intellectual rights, cellular, intellectual property rights, open source, security

INTRODUCTION

The biggest obstacle for cellular companies today is the concept of intellectual rights and the laws that support that ideology. The movement to open source coding and software driven devices encroaches on the validity of companies claim to sole proprietorship of devices and the elements behind them. The design of an object digital, physical, or virtual still falls under the jurisdiction of the intellectual rights laws, requiring significant interpretation to determine the validity of many of the legal claims that encroach upon our courts. Will the open source movement meet with resistance by the cellular companies that originally embraced the endeavor?

Open source and cellular companies

Numerous cellular providers and manufacturers rely on different models of coding to fit their particular sales and security model. Apple IPhone is based on open source allow users to adapt apps for the device but the password programs are very secure and the encryption coding guarded because of the security Apple wants to instill on their customer both financially and in matters of privacy. Open source phones like Google's Android allow the Linux based OS to be accessible to many phone manufacturers that can adopt many different apps and devices from other companies. Greater acceptance of open source models will increase given a market that is ever evolving and expanding as Raymond (2001) states:

> Simply because the closed-source world cannot win an evolutionary arms race with open-source communities that can put orders of magnitude more skilled time into a problem. Traditionally-minded software-development managers often object 210 that the casualness with which project groups form and change and dissolve in the open-source world negates a significant part of the apparent advantage of numbers that the open-source community has over any single closed-source developer. (p.40, 41)

Companies are moving away from the monopolizing conglomerations of the past and with Linux opening the door for open source acceptance in the early 1990s. Hippel and Krogh (2003) expound on the realization that open source will allow developer and communities the ability to work and grow together and create logs that will be of value to everyone investing and advancing a project.

When looking at a patent-driven society compared to an open source model and the incentives offered Maurer and Scotchmer (2006) determine:

> While generalizations are difficult, most open source incentives reduce agency problems and deadweight loss compared to patents, and accelerate discovery through automatic disclosure. Against these virtues, open source incentives often lead to an under-supply of goods relative to the patent system. Open source may also be less responsive to certain users, especially when those users are non-programmers. Because of undersupply, open source can only be a partial solution: It is not viable, and cannot operate in every environment where patent incentives do. Where it works, however, it is often superior. (p. 30-31)

Samsung and exFAT

Samsung recently adopted the open source OS based on Linux in the hope of greater diversity and market placement. In 2013 Samsung was reprimanded for violating the proprietary law when they use old stripped down Microsoft code on a new OS program and to avoid legal implications the company switched to open source and republished their drivers and coding using Linux instead of the questionable exFAT application (Byfield, 2013). The coding "oversight" was caught, once exposed and Samsung adopted the Linux code to avoid legal issues (Libby, 2013).

Apple and the FBI

In light of the recent Apple/FBI conflict over creating a backdoor to the IOS the FBI wanted to enact the All Writs Act of 1789, Tim Cook (2016) remarks "the implications of the government's demands are chilling". Because the security programming is not open source, the laws that protect Apple give the company assurance that the focus of their secure devices will allow customers to rely on the security measures established by the dictates and laws that protect Apple. The FBI wanted access to the IPhone and Apple refused looking at the future of their security code being compromised, which is one aspect they do not want open sourced, and for good reasons. Apple had every right under the Intellectual Property Rights Act not to reveal their code. The FBI went ahead and cracked the IPhone in question using an outside, unnamed company and what the ramifications and legal actions will be are yet to be determined. The case against Apple will be dropped after the phone was successfully hacked.

SUMMARY

Intellectual property rights are designed to protect the creators from having their ideas stolen and to also ensure that when shared openly anyone using the intellectual property must, in turn, distribute the forwarded property openly as well. Apple, Google, and Samsung have learned the rights arena can be manipulated and either advance of hinder their progress, creations and furthering development. Open source code sharing bridges the gap between tightly held commercialized products and free to use products. It becomes more about getting the creation to the people and getting help improving the product so that others can utilize and build upon to greater future development and advancement. Safeguarding the right to distribute and promote products is adherently the focus of having rights drafted to ensure the owners and creator's future protection of how they want their property distributed either openly or privately. Cellular companies have tried to work around the laws that protect property to ensure their proliferation and market shares. Other companies will shout unjust when their rights are infringed or tampered with. When it comes to data and intellectual rights how is a price placed upon a tiny increase or decrease of those rights regardless of antiquated laws? In the realm of intellectual rights, the cost of knowledge becomes the ultimate deciding factor.

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COPYRIGHT PROTECTION IS DISAPPEARING

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KEYWORDS: copyright law, infringement, youtube, videos

ABSTRACT

Before the widespread use of the Internet were an everyday phenomenon, books, VHSs, and other copyrighted works were protected by many copyright laws; however, these laws generally were followed with a much lower amount of infringement than what is seen today. As the Internet has risen to a prominent position in most people's everyday lives there has been a large decrease in how copyright laws are followed due to the easiness of infringement. Internet piracy has become more or less a commonplace activity for a substantial amount of Internet users, Youtube videos among others are constantly using copyrighted content as means to rack up on viewers, and many other events occur daily that threaten the livelihood of copyright protections. In the age of Youtube, it is becoming increasingly harder to enjoy the protections of copyright law in the online world. As it stands currently, copyright protections are still in place and new lawsuits are formed constantly, but how much longer remains before copyright laws are a thing of the past? This topic is especially pertinent to IACIS conference participants as the Internet and copyright protections are constantly crashing in this day and age. A comprehensive solution for copyright infringement on Youtube and other Internet based media websites has not been developed. Furthermore, court cases that have dealt with topics of this kind only have inadequate, outdated copyright laws to use as a basis. This is an incredibly threatening situation to intellectual property owners who unfortunately are fighting an uphill war and losing battles as a daily routine.

Copyright owners are allowed protections of their copyrighted works under copyright laws, but in certain situations these works can be used without fear of repercussions. For example, the most well-known exception to copyright law lies under the fair use doctrine that allows individuals limited use of copyrighted works for events such as parodies or other "harmless" instances (Seidenberg 2009). However, in the age of Youtube as it is called, fair use has seemed to pave the way to a substantial amount of copyrighted use. For instance, *Lenz v. Universal Music Corp.* (2015) became a case after a mother posted a video on Youtube, which showed her sun dancing around with a Prince song faintly playing in the background (*Lenz v. Universal Music Corp*., 2015). Universal Music Corp., the owners of the song issued a takedown notice to Youtube and the video was subsequently removed from the website (*Lenz v. Universal Music Corp*., 2015). However, Stephanie Lenz decided to pursue the matter and hired an attorney and eventually sued Universal Music Corp, declaring that her use fell under the fair use doctrine (*Lenz v. Universal Music Corp*., 2015). After many years and appeal hearings, Stephanie Lenz was awarded the win as Universal Music Corp. lost the lawsuit as it was determined the music group decided to issue their takedown notice without first considering whether or not the video fell under the fair use doctrine (*Lenz v. Universal Music Corp*., 2015). Similar occurrences to Lenz's actions have been happening for many years, but finally the case *Lenz v. Universal Music Corp.* (2015) has further strengthened the idea of fair use in the online world.

In 2007 Viacom sued Youtube by claiming that the video hosting website held around 150,000 unauthorized clips of Viacom programs and that Youtube was not trying to curb this type of infringement (Seidenberg 2009). The case *Viacom v. Youtube* (2010) resulted from a company unable to keep up with the massive amounts of video located on Youtube, choosing to target the host of the videos instead of attempting to find all of these 150,000 unauthorized clips (Seidenberg 2009). Ultimately, Viacom failed miserably with the lawsuit as Google, the parent company of Youtube, successfully defended itself in court by arguing for protections under the ideas of "safe harbor." The finding was based on the Digital Millennium Copyright Act under the idea that a service provider must be aware of specific incidences of copyright infringement in order to act (Katz 2011). Honestly, looking at the court case in Youtube's point of view it is easy to determine that if they were to lose a case such as this the company could eventually fail as a business. Copyright infringement runs rampant across Youtube; however, it would be almost

impossible for the company to monitor and find every instance of infringement with the sheer amount of videos the website actually hosts.

The world of copyright protections on the Internet is slowly collapsing upon itself as copyright owners are seemingly finding themselves almost helpless when it comes to protecting their works. Cases such as *Lenz v. Universal Music Corp.* (2015) are broadening the scope of fair use on the Internet, while the case of *Viacom v. Youtube* (2010) more or less allows Youtube to host copyright infringed content as long as they are not informed by the owners of the content that infringing content exists on the website. Arguably, it would be near impossible for copyright owners to search every single video on a website such as Youtube to ensure that no infringing content of theirs exists. Perhaps a new direction may need to be taken for copyright owners in regards to protecting their works from the dangers of the online world. Ultimately, the battle of copyright protections is a never-ending struggle that has no end in sight. The Internet has seemingly created a massive environment abundant with copyright infringement. Perhaps action in the legislative branch to attempt to curb the vast amounts of copyright infringement that currently exists on the Internet is one solution. However, there is no guarantee that the legislative branch would draft accurate legislation to combat this epidemic. Perhaps an alternate route exists that can be accomplished without the help of any government intervention?

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A CURRENT EXAMINATION OF THE SKILLS REQUIRED FOR CYBERSECURITY PROFESSIONALS

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Keywords: cybersecurity professional, skill requirements, professional development, security jobs

Proposed Study

Cybersecurity permeates all functional areas of an organization. Almost everyday, there are news stories detailing the impact from of a new cybersecurity incident. As such, cybersecurity is a necessity that all organizations must address in order to protect their digital assets. With the threat landscape continually increasing, it is expected that many organizations will hire cybersecurity professionals in the next year. As a means of understanding the security field and the needs of organizations in this environment as well as determining if current higher education programs are meeting the needs identified, this study will analyze job advertisements to ascertain and compile the knowledge, skills, and abilities in highest demand for entry-level cybersecurity positions. From an academic perspective, cybersecurity is a part of the information technology profession that pulls from several different areas across a university curriculum. Over 3,000 job advertisements will be queried from an online career website under the category "information security". The results of this study will help academic departments to examine their curriculum as it pertains to cybersecurity and to provide necessary enhancements and improvements to meet the demands of the market. The results will allow a university to map their curriculum with the current cybersecurity needs of industry. Students will also benefit in being able to identify the skills they need in order to become gainfully employed in the cybersecurity field.

Basis for Study

A recent survey of security professionals found that over half expected their organization to be successfully hacked this year (Higgins, 2015). As more organizational assets become digitized, the need for cybersecurity professionals continues to increase at unprecedented rates. Cybersecurity is one of the largest areas in which information technology (IT) departments are expected to hire in the upcoming year. In addition to an increase in the number of personnel, cybersecurity compensation is expected to have the greatest increase in the IT department (Bennett, 2016; Richards, 2015). While there is an increase in the demand for cybersecurity professionals, there also exists a gap in required skills among cybersecurity professionals. This gap is seemingly due to the presence of advanced threats and more sophisticated malware confronting cybersecurity personnel trained in a traditional security curriculum. Security curriculum has historically focused on perimeter security and regulatory compliance. Programs that provide advanced degrees and courses in cybersecurity need to address the current needs of organizations pertaining to cybersecurity and work to fill this gap.

The data for this study consists of 3,000 job ads obtained from careerbuilder.com. In addition to outlining skills specific to cybersecurity, the data is expected to reveal that experience and communication are highly desirable characteristics in new graduates. These are sought after skills for any new information technology graduate regardless of area. Additionally, it is expected that internship opportunities will be seen in the security area as a way for organizations to begin working with students. Internships can also lead to a sustained partnership between a university department and local organization. The study will attempt to identify those ads seeking internships (Woodward, Imboden, and Martin, 2013). The results of this study are expected to reveal that demand is strong for graduates with a technical background and problem solving skills (Sauls and Gudigantala, 2013). Additionally, the study expects to show that new cybersecurity threats require new skills and tools.

Implications of the Study

An expected and intended benefit of this research is to provide an overall picture of the needs of the cybersecurity field and to provide recommendations regarding how the workforce needs to be prepared for the demands presented by the increasingly complicated environment. The implications of this research project will also extend to universities with programs and course offerings in cybersecurity as they will assist in guiding curriculum development and enhancement. With the continued growth in certification options in the areas of information systems and security, it is expected that certification requirements will be present in a large number of job advertisements. Certifications provide a level playing field on which to judge an individual's knowledge base and skill set; therefore, they help in providing organizations with a more consistent way to define their job requirements and expectations. An expanded benefit of this study will be to provide students and academic institutions with a proper ranking of these certifications as deemed important by the market, which can help guide new graduates in their progression from student to security professional.

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INTEGRATING CERTIFICATION PREPARATION INTO UNIVERSITY CURRICULUM

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Keywords: Cybersecurity, Information Technology, Industry Certifications, Industry Certified, Curricula

This research study intends to identify students perceptions related to a set of proposed solutions for integrating Information Technology (IT) / Cybersecurity certifications into their University degree programs. Preliminary discussions were held with associated faculty and a set of possible solutions were devised. Students were directed to choose from these likely workable solutions. The researchers, using a solution choice approach, were interested in how students felt about the integration of certification preparation activities within the curriculum.

Students from all Information Technology / Cybersecurity degree programs were asked to participate in the study. The data collection instrument used in this research study is a 30 question electronic survey. As of May 12, 2016, 124 students have taken the survey. Of the 124 students, 23 are in the Associates program, 80 are in the Bachelors program and 21 are in the Masters program of a regional accredited university. Respondents are largely non-traditional, they largely face the stresses and possess the coping mechanisms as highlighted by (Forbus, Newbold, & Mahta, 2011). The courses offered and taken are all online courses.

At the present time, data indicates that students have strongly positive attitudes towards the value of certifications in relation to landing entry-level positions or increasing opportunities for increased job responsibilities. Finding enough time to prepare and having access to materials and support were identified as major constraints, along with financial considerations.

Do students feel that certification should be integrated into the curriculum as part of their career preparation while attending the University?

The data showed that 95% of the students choose some form of integration. When invited to select possible solutions for integrating certification preparation within some classes, 45.0% indicated a preference for deep integration via a "Companion Course" that compliments an existing course, while 17.8% indicated a preference for deep integration into the existing course itself, even when the workload for that existing course would be significantly increased. Lighter integration into current courses using a variety of methodology was scattered over five possible options and was preferred – 35%.

It is interesting to note that only 2% indicated that there should be no certification prep as part of their degree program, but from comments received, it was apparent they felt strongly about that view. Some students indicate objections based on the fact that certifications expire, and that the certs might not be relevant for the job that they obtain. There was some concern that there was a major difference between emphasis on training (with certification preparation) and the kind of learning undertaken in University level courses. These results coincide with results found in a similar study and literature review (Mohammad, 2014).

What support facilities do students prefer?

When asked to choose four of a possible seven options for support, students responded as below (only the top five preferences are shown):

- Freely available study materials organized by topic area – 77.5%
- One certification exam cost included in tuition – 72.1%

- Online labs – certification preparation focus – 82.9%
- Faculty facilitated structured study groups – 41.9%
- Discussion boards centered on difficult certification questions – 41.9%

Course value to degree for a companion course

The companion course option was strongly preferred, and as a result, only that option is presented in this section. It is difficult to make a judgement in this area as the results were not conclusive, but given the relative weighting as seen below, the researchers feel that 50% of regular course value (3 credits) would likely be the best candidate.

Data also suggests the following: No additional value as it supports the certification process – 17.8 %, 25% of a regular course – 18.6%, 50 % of a regular course – 24.8%, 75% of a regular course – 3.9%, full regular course value – 27.9%

Conclusions

The study is ongoing; however, students by and large, were likely to favor inclusion of a certification solution within their degree program and were strongly positive about the choices presented as possible solutions. Students overwhelmingly preferred the companion course option and had strong preferences for the likely support options available. The researchers feel that the results indicate the best way forward would be to offer certification preparation via a companion course to be taken immediately after the main course related to the certification subject area and that such a course, if designed with the survey results in mind, would be highly effective. The researchers believe the certification course should be optional and be allowed a maximum of two times per student / degree.

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INVESTIGATING THE EDUSCRUM FRAMEWORK

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Keywords: Scrum, Agile, Flipped Classroom, Adaptive Learning

Brief Description

Scrum is a technology development framework containing simple roles, events, artifacts and rules founded on empirical process control theory. Many organizations including the government are now using the Scrum framework to develop technology solutions (Version One, 2014). As a result, Information Systems (IS) recruiters and executives have recently been placing a focus on students with Scrum knowledge. For example, Erica McDowell, a Booz Allen Hamilton executive states, "In the last three years of my career I have yet to see one government RFP that did not include some form of a Scrum reference. These days, the Scrum framework and agile thinking have become the norm. Therefore we place a strong emphasis on students who have been exposed to agile thinking in general and the Scrum framework in particular."

Because of its success in industry, professionals and scholars alike (Pope-Ruark, 2012) have begun exploring alternative techniques for using Scrum in the classroom. One such approach is known as eduScrum, a framework based on Scrum that provides the foundation for teamwork throughout an entire class or semester (Delhij et al., 2015). This pedagogical framework promises enhanced collaboration and learning where content ownership is given to the students rather than commanded by the instructor. The purpose of this research is to thoroughly examine the eduScrum framework by using it in a classroom setting and comparing its effectiveness to other pedagogical models, namely the flipped classroom.

Brief Methodological Description

During the spring 2016 semester, two sections of an introductory level IT course were taught at Georgia College and State University. One course was taught using the eduScrum framework and the other was taught using a flipped classroom approach. The two classes were instructed by the same professor who is a Certified Scrum Master and has many years of experience using a flipped classroom approach. The results such as the experiences of the students and the professor are examined along with a comparison of output measures.

Implications

This research addresses the call of industry to bring Scrum into the classroom along with investigating a new pedagogical model for teaching. No doubt, using eduScrum advances students' knowledge of the Scrum framework. However, we our still unclear in terms of its pedagogical effectiveness in a university setting. This research is in the beginning phases and we look forward to collaborating with IASIS colleagues to better develop our research findings and Scrum research agenda.

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TEACHING MOBILE APP DEVELOPMENT

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ABSTRACT

Fueled by the surge in smartphone sales, some industry analysts (Levitas, 2016) expect the market for mobile apps to swell to $101 Billion (USD) by 2020. Such growth has spurred the need for more mobile app developers - a fact that has not been lost on today's college students. "There's an app for that," the classic catchphrase for Apple's iPhone, has become synonymous with portable, simple, innovative solutions to everyday 21st century living. With their background in solving business problems with technology, information systems majors are natural drawn to the ranks of mobile coders as a viable career path.

Early attempts to introduce mobile software development into the information technology curriculum in the heyday of PDAs were more experimental than mainstream (Johnson, Jones, & Cold, 2002; Jones, 2000; Lutes, 2004). The platforms (Apple Newton, PalmPilot, HP iPAQ) each had limited markets, never reaching critical mass. With the introduction of the iPhone in 2007, that all changed. The market for smartphone applications, both consumer and commercial mainstreamed. This has stirred interest by IS educators into adding mobile app development as a current topic into the curriculum. Some have gone as far as adding entire courses and series on mobile app development (Hsu & Ching, 2013; Lutes, 2012; Turbak, Sherman, Martin, Wolber, & Pokress, 2014).

Incorporating mobile application development into the information systems curriculum, however, is not without its challenges (Hsu & Ching, 2013; North, 2012; Turbak et al., 2014). As Lutes (2012, p. 115) concludes: "Choosing a mobile platform and toolset is especially difficult for educators who have little free time to become skilled on any one platform, let alone several." Alas, at this point in time, there isn't an app for teaching mobile coding.

This paper explores current approaches to teaching mobile application development and the software tools in use, from native app through web app all the way up to app builders. A meta-analytical approach is used comparing classroom experience across information technology related disciplines (computer science, software engineering, information systems). The paper concludes with primary lessons learned and suggestions for implementing a mobile app development component as part of an undergraduate IS program.

Keywords: Mobile App Development, Information Systems Education, PDA, Smartphone

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THE ROLE OF GRIT IN EXPLAINING INFORMATION SYSTEMS' STUDENT PERSISTENCE

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Keywords: grit, persistence, higher education, retention

Proposed Study

Due to the importance of the information systems (IS) function across organizations, research examining the IS workforce has focused on a wide range of issues. Everything from examining student enrollment in IS programs and how to create and maintain an adequate pipeline of IS workers to understanding why individuals leave the profession after decades of investment has been and is being explored. The purpose of this research study is to provide a more thorough understanding of the former by examining the role of grit and investigating factors that impact information systems students' persistence in the face of non-academic distractions and setbacks.

Basis of the Study

There have been numerous studies conducted that examine how students handle distractions and issues presented within the academic environment. From this research stream, we can see three related concepts emerge. Two of the key concepts include academic buoyancy and resilience. The third and most compelling is grit. The first concept, academic buoyancy, focuses on the experiences of students specifically within the academic environment. It is defined as "students' ability to successfully deal with academic setbacks and challenges that are typical of the ordinary course of school life" (Martin and Marsh, 2008 p. 53). The measures provided for academic buoyancy focus on the examination of how students perceive they deal with bad grades, study stress, etc. The second concept, resilience, is defined as "any behavioral, attributional, or emotional response to an academic or social challenge that is positive and beneficial for development" (Yeager and Dweck, 2012 p. 303). The third concept is grit. Grit has been defined as "trait-level perseverance and passion for long-term goals" (Duckworth and Quinn, 2009 p. 166). While studies focusing on buoyancy and resilience have helped in understanding factors directly related to characteristics tied to the academic environment and associated student outcomes, they have not assisted in providing those in higher education with the knowledge needed to appropriately understand and manage students when faced with non-academic issues that can impact their pursuit of an academic degree. Anecdotal evidence suggests that students are impacted by these factors and use them as excuses as to why they are not producing what is expected in a given course or program. To assist in filling this gap, the concept of grit is explored and extended to the examination of information systems students specifically. It appears to provide the best potential for understanding how students persist in the face of these setbacks as it has been shown to influence behaviors beyond other traits and measures of intelligence (Duckworth, et al., 2007).

The first study planned for this research stream would examine grit and its overall relationship to student performance in information systems. The goal of the second study would be to extend the first by examining the relationship between grit and perceptions of severity of the non-academic setbacks and distractions. A survey instrument will be used to collect data from undergraduate information systems students in various stages of their degree programs.

Implications of the Study

The implications of this study are potentially far-reaching. As noted by the Bureau of Labor Statistics, in the areas of computer and information technology, occupations will grow by 12% though 2024 (2015). This rate is faster than average when compared to other occupations. Having a better grasp as to why students succeed or don't in

information systems degree programs will assist in ensuring an adequate supply of IS professionals to meet projected workforce demands.

Additionally, by understanding the factors that foster a student's persistence, we can better create and manage programs and develop appropriate interventions to progress students towards the completion of their degree. A higher level of comprehension can also be achieved by understanding how severity of setbacks relates to the student's level of grit. Results may also assist higher education administrators to not only bolster retention but to focus students on the long term rather than short-term effects of academic persistence decisions.

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PERSONAL CLOUD COMPUTING RISKS: A DELPHI STUDY

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Keywords: cloud computing, risk, Delphi, personal use, information security

INTRODUCTION

Personal use of cloud computing has gained widespread attention as organizations such as Dropbox, Google, and Microsoft have identified ways to provide users with the ability to harness the cloud. Personal cloud computing is defined as the use of "*computing resources owned and maintained by a third party via the Internet*" (Arora & Parashar, 2013, p. 1922). While organizations have cited the concern of security as a major barrier to adoption; users have focused on the benefits associated with personal cloud computing use. The purpose of this study is to explore the potential risks associated with personal cloud computing with an emphasis on the risks associated with personal cloud computing use by college students. In doing so, this study provides educators with information to guide discussion on personal cloud computing risks and advice on mitigating these risks.

METHODOLOGY

This study utilizes the Delphi method using graduate students enrolled in an information security management course at a large, southeastern university. The Delphi method is a consensus building technique where panelists independently identify, assess, and rank order risks (Worrell, Di Gangi, & Bush, 2013). The result of the process is a collectively developed list of risks ranked in order of most concern that can guide adoption decisions, identify controls to effectively mitigate the risk, and/or generate discussion within an educational setting (Rivera, Di Gangi, Worrell, Thompson, & Johnston, 2015).

To generate an initial list of risks, students researched personal cloud computing risks. The instructor synthesized the risks and complimented it with a survey of cloud computing literature (e.g., Alizadeh, Hassan, Zamani, Khodadadi, & Caeikar, 2013; Arora & Parashar, 2013; Chang, Walters, & Wills, 2016; Thirukumaran, Ram, & Vijayraj, 2012). In all, 33 risks ranging from technical, security, and human risks were identified. Risks identified as important by over 50% of the class were retained. Next, students rank ordered the risks from most to least concerning. The Delphi method generates a non-parametric statistic, Kendall's W, which assesses the degree of consensus about the rankings. A Kendall's W value of 0 indicates no consensus while a value of 1 indicates complete consensus. If a moderate degree of consensus is not achieved, students are presented with the rationales provided by the class grouped by risk and asked to re-assess the ranking. This process tests the strength of a student's opinion and ultimately results in a final list of risks that represents the collective opinion of the class.

INITIAL RESULTS AND PEDAGOGICAL IMPLICATIONS

In this study, 22 students participated with an average age of 37.1 years old with some experience with personal cloud computing (self-rated 2.9/5.0). The Delphi method required three rounds resulting in a Kendall's W value of .689 indicating moderate-strong consensus of the 10 ranked risks. Table 1 provides an overview of the 10 risks.

Table 1. Delphi Results

Rank	Risk
1	Loss of sensitive or important Personal Data stored by Cloud Provider
2	Malicious insiders (Cloud Provider employees)
3	Lack of control over security decisions related to protection of Personal Data (including physical security)
4	Unauthorized or Undisclosed sharing of personal information with 3rd party partners of the Cloud Provider
5	Unreliable access to Personal Data hosted by Cloud Provider
6	Introduction of vulnerabilities to personal devices/ equipment due to relationship with Cloud Provider
7	Long-term viability of Cloud Provider (Cloud Provider closure)
8	Lack of legal or regulatory oversight related to security precautions undertaken by Cloud Provider to protect Personal Data
9	Interoperability issues between Cloud Provider and personal devices
10	Changes to Terms of Service or Use by Cloud Provider

From a pedagogical standpoint, the results suggest numerous topics in need of discussion. For instance, several of the risks associated with the viability of the cloud provider in terms of its hiring practices (2nd ranked risk), operational decisions (3rd ranked risk), terms of service (4th and 10th ranked risk), and availability (1st, 5th and 7th ranked risk). Each of which can generate discussion for evaluating cloud providers for both personal and organizational purposes. From a risk mitigation perspective, instructors can highlight the importance of defense-in-depth and how encryption should be used as an additional layer of security not managed by the cloud provider to protect sensitive personal data.

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NEW WINESKIN FOR NEW WINE: APPLYING PROJECT BASED LEARNING TO CYBERSECURITY EDUCATION

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ABSTRACT

The Bureau of Labor Statistics (BLS) (2016) has projected cybersecurity job market to continue growing at an annual rate of 18% for the period 2014 – 2024. Cybersecurity Ventures (2016) projects that demand for cybersecurity professional is expected to rise to 6 million (globally) by 2019, with a projected shortfall of 1.5 million. According to a survey carried out by Burning Glass (2015) cybersecurity job postings grew by 91% from 2010-2014. This growth rate was faster than other Information Technology (IT) related jobs. In the same survey by Burning Glass (2015) they found a gap in the number of skilled labor available to feed the demand for cybersecurity jobs. Shortages of this nature leave the US ill prepared to protect the critical infrastructure.

The education sector has responded to this need by creating cybersecurity undergraduate and graduate programs. However in creating curricula for these new cybersecurity programs, the old learning methods have been applied to a new problem. This has led to unmotivated students and unmotivated graduates entering a job market to defend systems attacked by motivated criminals. This is a classical problem of new wine put in old wineskins. It's no surprise that millennials are not showing interest in cybersecurity. Cybersecurity is a multifaceted problem that require students to have a strong background and preparation in information science and technology in order to succeed academically and professionally (Wang, 2016). A suitable learning methodology for cybersecurity would be one that supports students to apply knowledge from different fields and use it to solve problems.

Blumenfeld et al., (1991) define Projects Based Learning (PBL) as a comprehensive approach to teaching and learning that is designed to engage students to investigation of authentic problems. PBL provides an opportunity for students to make direct linkages between classroom learning and professional skills. Students work in teams, solving non-trivial problems. with some support from the instructor as a facilitator. PBL has been found to increase motivation, enhance interpersonal skills and support learning most especially for multifaceted problems that require application of knowledge from many different fields (Blumenfeld et al., 1991).
In our endeavor to bridge the gap between college education offering and the job skills needed in the real world, we applied the PBL methodology to a cybersecurity class focusing on skills matching a role in industry. In order to put these skills to the test, students were entered into a regional cyber defense competition where they competed against teams from other colleges in the region. In these simulated real-life competitions, students are forced to work together in a team, think on their own without any support from the coach (instructor) and apply their knowledge to defend their enterprise information and information systems against cyberattacks.

In our presentation we shall report about how we actually designed the class, the projects designed, preparation and participating the cyber defense competition.

Keywords:: Cybersecurity, cybersecurity education, cyber defense competitions, project-based learning

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FAST MOBILE CONFERENCE APP DEVELOPMENT WITH THE PUBLIC CLOUD

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Keywords: *Cloud computing, Public cloud, Mobile app, AWS, and Virtual machine*

INTRODUCTION

Today's mobile business environment is scrambling to quickly mobilize hundreds of B2B, B2C, C2B, and C2C business processes or legacy applications. However, small business events, non-profit business events, and many conference meetings are still struggling from organizing their events due to the lack of human resources, information technology skills, and so on. To handle the lack of human resource, we can use the public cloud that is open for public use over a network. In the public cloud, cloud service providers provide resources and services such as virtual machines, storage, database, and so on. In this study, we have designed a general mobile app with the public cloud for conference meetings. This mobile app in the public cloud environment provides features to check the participants' attendance and their meal information so that conference organizers can manage and control the overall conference events more efficiently. For implementation and testing, we have recruited college students, implemented a mobile app for Android and iOS with a backend server running in a public cloud, and applied our mobile app into a conference, http://ukc.ksea.org/ukc2015/. This study presents how we have designed, implemented, and tested the mobile app for conference management in the public cloud environment.

CLOUD COMPUTING SERVICE MODEL AND PROVIDER

Cloud computing services can be categorized to three different types as follows (Mell and Grance, 2011).

Infrastructure as a service (IasS) – It provides the cloud computing infrastructure such as processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software.

Platform as a service (PaaS) – It provides the cloud computing platform where consumer-created or acquired applications created using programming languages, libraries, services, and tools are deployed onto the cloud infrastructure. The consumer has control over the deployed applications and possibly configuration settings for the application-hosting environment.

Software as a service (SaaS) – It provides access to the provider's applications running on a cloud infrastructure. This is referred to as "on-demand software". The consumers do not worry about the installation, configuration, and running of the application software.

There are many cloud computing service providers such as Amazon, IBM, Microsoft, Salesforce, and Google. They provide a wide range of cloud computing services including infrastructure, platform, and software (Von Laszewski et al, 2012). In this study, we have adopted the Amazon Web Services (AWS) as a platform for the mobile conference app (Yegulalp, 2013).

DESIGN

Our aim is to provide a mobile app platform for conference events in a cloud computing environment. This platform required an event or conference website to create its registration information by following a common file format (e.g., CSV file with a comma delimiter). Once the platform has a common file, it uses a virtual machine in a public cloud and create a database supported by the public cloud or a document-oriented database, then it runs with a web server in a virtual machine provided by the public cloud. For the client side, there are three main approaches to build mobile apps: responsive web apps, native app development, and "native quality" hybrid app. We designed the native app for iOS and android that calls representational state transfer (REST) web APIs to retrieve the registration information of the event or conference attendants.

IMPLEMENTATION AND DEPLOYMENT

We recruited college students for development, and delivered our REST Web API design for the client side. For the server side, we chose the AWS free tier service to run our backend server. We created an AWS account and launched a free t2.micro EC2 instance, then we installed Node.js cross-platform runtime environment and MongoDB for our web application and a database, respectively. We added the registration information into the database with a script after downloading a CSV file from a conference website and ran our web server. A QR code has been generated for each registrant, and his/her registration information along with the QR code data has been stored in our database. Finally, we have tested with our client app, which shows the registration information of each individual by reading a QR code and communicating with the web server with REST APIs.

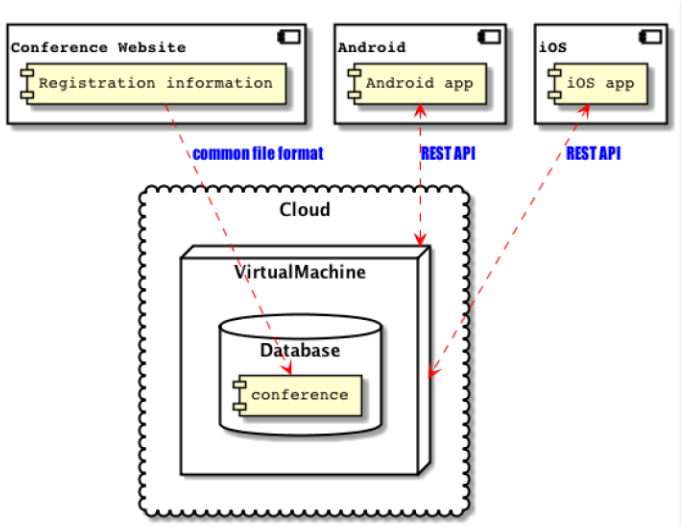

Figure 1. Architecture of the mobile app for conference events in the public cloud environment

CONCLUSION AND IMPLICATIONS

We have implemented a mobile app for Android and iOS with a backend server running in an AWS EC2 instance with a document-oriented database, applied our product into an actual conference, and run our service successfully. For our future work, we will generalize our platform and the common file format so that we can support more conference events and small business events with manual processing due to the lack of human resources and information technology skills.

This mobile app development in the public cloud environment has benefitted different stakeholders. First, the conference organizers have saved their resources by automating the conference meal check-in process. Previously they have printed all meal tickets and placed them in each individual's name tag manually based on his/her meal selection. As each name tag is printed along with one QR code including all meal selection information, there is no more manual handling for meal tickets. Second, the recruited college students had a good hands-on experience in this mobile app development project. It has been a good opportunity for those students to develop and test their product in the real world.

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SYMBOLIC CODING AND COGNITIVE REHEARSAL: EFFECT OF RETENTION ENHANCEMENT ACTIVITIES ON LEARNING PROGRAMING SKILLS

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Keywords: cognitive rehearsal, retention enhancement, learning

INTRODUCTION

This research focuses on whether cognitive retention enhancement activities could have significant effects on a student's understanding of computer programming concepts and skills. Students learning how to program for the first time could have many difficulties in understanding the concepts and learning how to code properly. This research focuses on examine the process of cognitive retention and the effect of various techniques to improve learning. This study is important topic to IACIS conference participants since this study could advance current understanding about IS research on 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

Cognitive retention enhancement activities are referring to activities such as key points summaries, mentally rehearsals on activities for a given task and hands on exercises (Yi and Davis, 2001). These activities are designed based on the social cognitive theory (Bandura and Jeffery, 1973). The social cognitive theory proposes that the mastery of new skills is through observational learning. Learners observe how a task is performed and take mental notes on the procedures and consequences. They also rehearse these procedures either in their mind and/or through hands on activities. Taking mental notes is known as symbolic coding, and mental rehearsal is known as cognitive rehearsal. Previous studies (Yi and Davis, 2001, 2003) have shown that these activities can be useful in learning new Excel techniques. Excel techniques tend to be very structural, particularly for functions and formulas. It is unclear whether these cognitive retention enhancement activities can be effective in learning much more complex skills such as C++ programming. The goal of this study is to exam whether the complexity of knowledge play any roles in the learning process.

Data would be collected from through questionnaires and experiments. 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 expands the research of cognitive learning process by examining whether cognitive retention enhancement activities are still effective when the complexity of knowledge is higher. This study is important to IT professionals since the results of this study could help them understand how to better train employees to acquire new skills. This will help educators to improve their computer programing course design.

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THE SANDWICH APPROACH: INCREASING STUDENT CONFIDENCE AND LEARNING BY CONNECTING IN-CLASS AND OUT-OF-CLASS ACTIVITIES IN A FLIPPED CLASSROOM

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ABSTRACT

The purpose of this study is to assess the effectiveness of a new instructional approach that extends the flipped-classroom pedagogy. Both quantitative and qualitative assessment data indicate that the "sandwich" approach leads to increased student performance scores and instructor-effectiveness scores.

Keywords: Student Engagement, Active-Learning Classroom, Flipped Classroom, Sandwich Approach, Course Evaluations

INTRODUCTION

The practice of "flipping" a class to increase student engagement is gaining prevalence in higher education, resulting in a stream of research and best-practice guidance. Recurring findings from the mixed-results research indicate some resistance to a flipped classroom by both faculty and students. The results of the current research study indicate that "sandwiching" learning activities between confidence-building, confirming, statements of learning results in students having a higher perceived confidence of understanding and increased performance scores. Also, course evaluation scores were higher when compared with just a flipped (non-sandwiched) course. The rest of this paper will outline some benefits and challenges associated with flipping a course, describe the sandwich approach, and discuss the results observed from applying the sandwich approach to two information systems courses. IACIS participants who utilize flipped pedagogy will benefit from this research by learning a new approach that increases student self-efficacy and tends to result in higher course evaluation scores.

LITERATURE REVIEW

Multiple factors influence the decision to flip a class (Berrett, 2012; Herreid & Schiller, 2013). Students in a flipped course complete assignments *before* coming to class so that class time can be used for engaged interaction with each other and the content. The faculty role transitions from disseminator of knowledge to facilitator of learning. Instead of lecturing for the class period, faculty circulate through the classroom to reinforce learning and correct misunderstandings as students work through problems (Berrett, 2012). Benefits to using a flipped approach include engaging students with different learning styles, thereby increasing mastery of skills and understanding (Fulton, 2012; Herreid & Schiller, 2013). However, challenges also exist to flipping a class, including students' lack of confidence when they have difficulty connecting their out-of-class and in-class activities and extending that knowledge to new problems. (Berrett, 2012; Bishop & Verleger, 2013; Herreid & Schiller, 2013). The focus of this research is to address that challenge. In many cases, student lack of confidence results in lower course evaluations for faculty. Qualitative feedback on course evaluations provides some insight into the quantitative scores. Low course evaluations associated with flipped classes could be associated with a lack of student self-efficacy with the course content and the tendency to blame the instructor.

Methodology and procedures

Two information systems courses at a regional comprehensive university in the Midwest region of the United States were used for this research: *Systems Analysis and Design* and *Database Management*. Between 30-35 students were enrolled in each course. Both courses were taught in wireless, active-learning classrooms arranged into pods with 4-5 students per pod. One of the authors is the faculty member in both courses. Both courses used the flipped approach

Spring 2015, implemented the sandwich approach (see below) Fall 2015, and then refined the use of the sandwich approach Spring 2016. The rest of the course content and rigor remained the same. Students indicated their confidence in their ability to complete the assessed skill prior to each skills-based exam.

Hoepner (Hoepner & Hemmerich, 2016) developed a "sandwich" approach to address both the problem of low student self-efficacy and to address the call for research on student performance outcomes in flipped classes (Bishop & Verleger, 2013; Butt, 2014). The basic premise of the sandwich is to integrate the out-of-class and in-class activities (Strayer, 2012) and to provide a coherent transition from increasingly complex in-class activities. The sandwich approach extends the flipped approach by providing students with confirmation of understanding (or guidance toward that understanding). The first half of the sandwich is a brief confirmation of what each student should have learned from either the pre-class assignment or the in-class activity. The comments are clear, concise and positive and focus on only 2-3 main principles (e.g., "What you should have learned from____ is that…..", or "You're on the right track if…."). Students examine their own and their group-peers' work to discuss similarities—but more importantly—differences that could be incorrect or correct but from a different perspective. Students then complete an in-class activity that applies or extends their learning to more complex applications of the knowledge or skill. The second half of the sandwich follows the lesson or in-class activity and again focuses on the primary 2-3 concepts/skills learned (e.g., "Your take-away from____ is that….."). Two subtle shifts in perspective make this seemingly simple approach work to produce significant results in student efficacy and performance. First, the instructor's focus is on what students are doing correctly—not on what errors are made. Second, the instructor works to deftly integrate both constructivism and direct-instruction in the same lesson.

RESULTS

Results from Spring and Fall 2015 and Spring 2016 (shown below) indicate an overall increase in course grades and instructor effectiveness scores. General results from confidence data (not shown here) indicated that students who earned lower exam scores tended to overestimate their abilities before the exam, whereas students who earned higher exam scores tended to underestimate their abilities. The Spring/Fall 2015 qualitative data (not shown here) aligned with the quantitative data. Student perception of the pre-class assignments and in-class group work as facilitators to learning increased from 33% to 87% and from 30% to 67%, respectively, after the sandwich approach was implemented in a flipped course. A confounding variable is that the pre-class assignments were included in the course grade starting Fall 2015. Student perception of a positive relationship with the instructor remained stable.

Course	**Assessment Instrument**	**Averaged Student Grades (%)**			**Instructor-Effectiveness Scores (4-point scale)**		
		Sp 15	**F 15**	**S 16**	**Sp 15**	**F 15**	**S 16**
Systems Analysis and Design	Applied Exam	68.7	77.9	80.9	2.65	2.98	3.37
Systems Analysis and Design	Final Grade	81.4	84.4	87.9			
Database Management	Modeling Exam	69.8	72.3	75.8	2.52	3.0	3.39
Database Management	Coding Exam	58.9	59.5	83.8			
Database Management	Final Grade	73.9	82.2	84.8			

CONCLUSION AND CONTRIBUTIONS

The sandwich approach that extends flipped pedagogy is effective in providing students with the confidence that they are indeed learning, which provides them with the motivation to continue learning, to tackle more complex problems, and to perform better. An added faculty benefit is higher instructor effectiveness scores.

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TEACHING THREATS AND COUNTERMEASURES IN THE WINDOWS NETWORK ENVIRONMENT

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ABSTRACT

In this paper/presentation, the author shares her experience re-charting a Windows system administration course by integrating information security content. The integration effort threads together (1) a well-known information security framework known as the McCumber Cube, (2) a Microsoft technical guidance on threats and countermeasures, and (3) common Windows systems administration practices. The author will present "before" and "after" examples of these assignments during her presentation.

Keywords: Information Security, Curriculum, Threats, Countermeasures, Windows, System Administration

INTRODUCTION

As demand for increased information security skills increases by both employers and students, faculty members are challenged to determine the best approach for incorporating content into their programs. Some curricula are able to offer a designated information security course, but other programs might be forced to rely on implementing security modules across multiple courses.

In this paper/presentation, the author shares her experience re-charting a Windows system administration course by integrating information security content. The integration effort threads together (1) a well-known information security framework known as the McCumber Cube, (2) Microsoft technical guidance on threats and countermeasures, and (3) common Windows systems administration practices.

RATIONALE FOR THE PROBLEM

The CNSS security model, also known as the McCumber Cube, provides a three-dimensional approach to understanding and evaluating information security scenarios (Whitman and Mattord, 2016). The three dimensions include: information characteristics/goals (confidentiality, integrity, and availability), information states (storage, processing, or transmission), and security countermeasures (policies, education, or technologies).

Avoiding attacks on information assets should be the highest priority of an information security function. Countermeasures, the third dimension of the McCumber Cube, help detect weaknesses, prevent attacks, and respond to successful attacks (Kim and Soloman, 2016). To assist system administrators with the challenge of preventing attacks on Windows networks, Microsoft offers a guide specifically aimed at threats and countermeasures in the Windows 2008 R2 and Windows 7 environments (Microsoft, n.d.).

The Microsoft guide is divided into the following sections for understanding threats and countermeasures related to Windows operating systems:

- Account policies
- Advanced security audit policies
- User rights
- Security options
- Event logs
- System services
- Software restriction policies
- Application control policies
- External storage devices

Each subsection considers vulnerabilities (how an attacker might exploit a feature or its configuration), implementation of countermeasures, and the negative consequences of countermeasures. As noted in the Microsoft guide, information security practices can impede performance, so countermeasures come with a cost.

INTEGRATING SYSTEM ADMINISTRATION AND INFORMATION SECURITY

In Fall 2015, the author was offered an opportunity to teach an upper-level CIS course whose traditional focus had been system administration with Windows 2008 R2. Prior to planning the syllabus, consultation with several faculty members indicated an interest in bringing information security content into the course. During the first class meeting, students also expressed an interest in learning more about information security. In response to the interests of faculty and students, the author re-designed the traditional systems administration assignments as information security assignments using a threats and countermeasures approach. The author will present "before" and "after" examples of these assignments during her presentation.

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EXTRACTING MEANING FROM TEXT USING STANDFORD'S CORENLP

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Keywords: Text analytics, natural language processing, Java libraries, dependency relations, open source API

Text analytics is a BI-related discipline for working with unstructured data. It involves several types of tasks including natural language processing, information retrieval, and sentiment analysis. These different tasks are implemented by various existing open source APIs. This presentation presents one of the key elements of text analytics, namely **natural language processing**, and describes how these are implemented and can be used via an open-source Java library developed at Stanford called CoreNLP. Via this library, a variety of useful text analytic tasks can be done. Using this library, I've been performing tasks for extracting meaning from text. During my IACIS presentation, I intend to show some results of this research.

Natural Language Processing

Natural language processing (NLP) involves both grammatical/lexical and semantic processes. From a semantic perspective, natural language processing involves the capacity to recognize the meanings of words and also identify synonyms, antonyms, and other relationships for these words. Representation of these relationships forms a semantic network (Quillian 1967), such as the one implemented in Princeton's WordNet lexical database and accessible via a Java API such as MIT's Java WordNet Interface (JWI) (http://projects.csail.mit.edu/jwi/).

Grammatically and lexically, NLP libraries such as those developed by Stanford's Natural Language Processing Group (http://nlp.stanford.edu/software/) provide functionality for sentence detection, tokenizing, parts-of-speech (POS) analysis, chunking (also known as "shallow parsing"), full-fledged grammatical parsing (deep parsing), and named entity recognition. Of particular relevance for this presentation is Stanford's CoreNLP library (http://nlp.stanford.edu/pubs/StanfordCoreNlp2014.pdf) which includes a dependency parser (http://nlp.stanford.edu/software/dependencies_manual.pdf) that provides a rich sentence structure that is useful for deriving the underlying meaning for a body of text. In this presentation, I will describe and demonstrate the capabilities of this library, and explore the underlying meaning that can be derived from text using the functionality of this software.

Deriving Meaning from Text via Dependency Parsing and Semantic Structures

In a sense, you can think of NLP's task as an effort to get a computer to "understand" written text, to "capture the essence" of what the author is trying to say. What does it mean for humans to "understand" what we read? This is hard to pin down, and the notion of "human understanding" has been debated by philosophers for thousands of years. But we can enumerate some processes that seem to underlie "understanding".

For one thing, humans can identify **subject-action-object dependencies** in text. Often a narrative involves a subject/agent (for example a person or animal) performing some action that affects some other object (either an inanimate object in the world, or perhaps another person or animal).

For example, consider the following four sentences:

1. John Kasich defeated Donald Trump in the Ohio primaries.
2. Donald Trump was defeated by John Kasich in the Ohio primaries.
3. During the Ohio primaries, John Kasich soundly defeated Donald Trump.
4. Although Donald Trump was defeated handily by John Kasich during the Ohio primaries, Trump beat Marco Rubio in Florida.

Although these are worded quite differently, the first three basically say the same thing: that Kasich (the subject/agent) defeated (the action) Trump (the object of the action). The fourth sentence says the same thing, and

adds that Trump (subject/agent) beat (action) Rubio (object). We can represent this sort of semantic relationship like this: **subject ==> action ==> object**.
Using Stanford's CoreNLP library, I was able to generate and trace through these four sentences' *dependency graphs* and came up with exactly these results for each sentence:

1. Kasich ==> defeated ==> Trump
2. Kasich ==> defeated ==> Trump
3. Kasich ==> defeated ==> Trump
4. Kasich ==> defeated ==> Trump, Trump ==> beat ==> Rubio

A dependency graph shows dependency relationships between terms in a sentence. There are many types of dependencies; the ones most relevant for capturing **subject ==> action ==> object** relationships are called *nominal subject* (nsubj), *agent*, *direct object* (dobj), and *nominal passive subject* (nsubjpass). Various *predicate* (pred_in, pred_on, pred_at, etc.) dependencies can also assist for less direct associations between subjects and objects (http://nlp.stanford.edu/software/dependencies_manual.pdf).

A second process involved in "understanding what you read" is the ability to able to detect taxonomic or hierarchical relationships (e.g. category/subcategory or set/member) between terms. Sometimes this is implied by certain phrases in a sentence. These types of linguistic hierarchical relationships are often called **hypernym/hyponym** links. This is a key feature of Princeton's **WordNet** lexical database. Terms like "types of", "including", "such as", "is a", "are all", or "e.g." may indicate a hypernym/hyponym relationship. Consider the following sentence: "The remaining Republican candidates include Donald Trump, John Kasich, and Ted Cruz." Here we have implied a set (republican candidates), and members of the set (the individual people). The word "include" indicates a possible set membership. This is tricky; care must be taken to minimize "false positives" in the results. I've been experimenting with Stanford's CoreNLP, in conjunction with Princeton's WordNet database, to try extracting these kinds of relationships for text.

A third element of "understanding what you read" is to recognize when a multi-word phrase really pertains to a *distinct* concept (as if it were a single word). For example, the word "human" and the word "resource" are two different concepts, and the phrase "human resource" is a third, distinct concept. CoreNLP is useful for identifying meaningful **n-grams** like this, which are usually (but not always) **noun phrases**. Finding commonly reoccurring noun phrases in a body of text related to a particular domain of knowledge can suggest possible important concepts that make up the ontology of that domain.

The results of these NLP tasks can be augmented by displaying their results via interactive **data visualizations**. In particular, two forms of data visualization are useful with NLP. One type is a **network diagram** (http://visjs.org/docs/network/) which gives a rich display of the semantic relationships between terms and concepts (e.g. from WordNet semantic structures) or grammatical and dependency relationships (e.g. from CoreNLP dependency graphs). Another useful type of visualization is a **word cloud** (http://mistic100.github.io/jQCloud/), which I've found useful in visualizing the subject-verb-object relationships discussed above.

CONCLUSION

By making use of a variety of free NLP APIs such as the ones discussed above, a developer can create customized intelligent applications with the capability to perform NLP tasks. Applications with these capabilities provide significant value in an environment where the growth of unstructured data is growing exponentially. My work focuses on pedagogical applications. For example, I believe NLP technology can be very useful for evaluating students' written work, as well as giving a high-level visualization of important underlying meaning of written text that assists students with their reading of complicated text. There are many design challenges and opportunities with these new technologies, and tools such as those described here show much promise for future development and research. During the presentation I will discuss some projects I am undertaking with this technology.

FEDERAL APPLICANTS' PERCEPTIONS OF USAJOBS

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KEYWORDS: USAJobs, federal, hiring, employment, job search, job application

INTRODUCTION

USAJobs is the job application website used by the federal government to post their job openings and for applicants to apply for federal employment. It has been notoriously problematic, for both the applicants and employing agencies, despite several overhauls (Kauffman, 2005; Medici, 2011; Reilly, 2011; Rein, 2011; Lunney, 2014; Katz, 2015; Katz, 2016). The researcher wants to understand what the problems are for applicants, specifically. In the last few years, federal hiring was done by word of mouth and paper resumes, especially when the applicants were already federally employed. From the researcher's experience as a federal employee, mandating the use of a method that takes the human element out of the equation, especially for those who are unfamiliar with technology, is seen by many applicants as frustrating. The research question: What are the reasons that USAJobs is difficult to use? This topic is of importance to IACIS conference participants because USAJobs is an information system in use by the federal government for all of their hiring.

BASIS OF THE STUDY

The source of the data being collected are current federal employees of the federal government. The researcher will ask for participants among the current employees in and around the federal building in Pittsburgh, PA. The participants will take a survey online regarding their experiences with using USAJobs to apply for federal employment (which includes applying for promotion opportunities). Questions will be open ended to gather the most accurate and in-depth information about their experiences. Demographic information will also be asked of the participants. Once the surveys have been completed, each answer will be recorded and coded by grouping similar answers together.

A review of literature shows constant problems and relaunches with USAJobs throughout the last decade (Kauffman, 2005; Medici, 2011; Reilly, 2011; Rein, 2011; Lunney, 2014; Katz, 2015; Katz, 2016). From the data, the researcher expects to find specific reasons why USAJobs is poorly received.

IMPLICATIONS

Results from this study will be given to the Office of Personnel Management (OPM) through the Federal Executive Board (FEB) Director. The FEB is aware of the shortcomings of USAJobs and is eagerly awaiting data to share with OPM. Though OPM does update USAJobs, it does not solicit feedback and opinions from actual applicant users, and this study's data may be able to help improve the next version of USAJobs so that it is a more usable tool for everyone involved.

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WHY STUDENTS CHEAT: IS IT REALLY BEING DISCOURAGED?

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ABSTRACT

A widely popular topic of research is plagiarism and what constitutes as plagiarism; however, it is still a major problem in academia and will likely be an ongoing topic of research. Plagiarism is an important topic in education, but for the purpose of this research, a component of plagiarism – cheating – will be reviewed. Cheating needs to be understood not only from educational institutions, but also understood by individual institutions and students. With advances in technology, it is not only important to know how current students are cheating, but why. Also important is to understand how to deter students from cheating and to implement consequences.

Turnitin.com was founded by four University of California Berkeley students in 1998 as a peer review application. This application expanded to Turnitin.com, known as a plagiarism prevention and detection service, in 2000. Since 2000, Turnitin has expanded its services to include other specialized detection options. In addition, Turnitin has grown to touch 26 million students and instructors globally and its database reaches 500 million submissions. Papers submitted through Turnitin are compared against approximately, 45 billion web pages, 110 million content items, and 400 million student papers using algorisms developed by the company and compared with strings of text against its massive database. Once the papers have been submitted, most are retained in the database for further comparison of future papers [1].

Like Turnitin.com, SafeAssign is a prevention and detection service; however, this tool is used by Blackboard, an online learning management system. While SafeAssign has proven to be effective in preventing and identifying plagiarism, it has limitations compared to Turnitin's large scope of a database [2]. However, it is considered a valuable prevention and detection tool used for Blackboard assignments. SafeAssign has a comprehensive index of documents available via the Internet, ProQuest ABI/Inform database, Institutional document archives, and a global reference database.

Providing students with an opportunity to be educated about plagiarism as they develop their research skills is ideal. Both Turnitin and SafeAssign provide this opportunity by allowing students to check their research against large databases, a process also known as data mining or a concept known as utilizing big data. By allowing students to send their paper through Turnitin or SafeAssign, students are provided an opportunity to verify their work and probability of duplication [5].

But what about cheating? How students are cheating and why they are cheating should be further reviewed. An example of updated methods of cheating is an email from Christine Probett, a San Diego State University management professor who has studied the methods student use to cheat, to Valerie Strauss, with the following:

- "Kids have been cheating forever and some of the 'classic; methods are still utilized: crib notes (pieces of paper, written on hand/under bandaids, etc.), looking at another's paper, signals/whispering to others, etc.
- Notes inside brim of baseball caps
- Notes inside label of water bottles
- Fake "Coke" bottle labels with notes printed where ingredients, etc. should be printed
- Having another student take exam in their place (easier now with larger class sizes)
- "Clickers" (sometimes used in class for quizzes, attendance, etc.) - students who skip class give their clickers to others so they get credit

- There are many videos on YouTube which provide step-by-step cheating techniques, so that in itself is yet another method!
- Distracting teacher and pulling out cell phone and taking photo of exam
- Texting someone in/outside class for answers
- Google-ing for answers
- Organized groups of students working together to "memorize" a question or two and collaborating to recreate the exam
- The Internet also enables access to lots of material that can make plagiarism much easier.

So how can cheating be avoided or prevented? Are the days of objective exams and essay questions extinct? Furthermore, assigning research papers seems to have its own set of challenges for sites like Turnitin and SafeAssign. Further research will be explored to identify effective techniques to be used in the classroom.

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IMPORTANT SKILLS A SUCCESSFUL DATA SCIENTIST NEEDS IN CHINA

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Keywords: Big Data, Big Data Skills, Data Scientists, Data Analytics Skills, Data Skills in China

Abstract

Big data has emerged as a powerful tool to provide unprecedented information to help businesses make the best decisions; yet, in the infancy of the new field, it is not clear to most business professionals the skills that are needed to be a successful data scientist. This presentation presents two Delphi studies, one gathered data from data scientists and one gathered data from university faculty, to gain consensus on the skills that were important to be a successful data scientist in China. Two-hundred-thirty skills were collected from the Faculty group, and two-hundred-six skills were identified by the Data Scientists group. Interquartile range (IQR) and a secondary criterion of 75% majority were used to determine consensus; the Wilcoxon matched-pairs test was used to determine stability. These two Delphi studies provide valuable consensus from both practitioners and university faculty to assist hiring managers and to provide references for curriculum planning.

The Studies

In the past few years, big data has proven to have great impact in a wide variety of industries. From manufacturer to tourism and from product design to consumer-behavior analysis, big data provides unprecedented information to help businesses make the best decisions. To benefit from the power of big data, businesses must hire qualified data analysts or data engineers. However, many executives and hiring managers are not certain about the qualifications of these data scientists they plan to hire. From an academic perspective, many universities have either created new data scientist programs or infused big-data related curricula into existing ones to respond to the newly created high demand for data scientists. Since it is such a new field, the contents of these programs range widely. This presentation reports two Delphi studies, one gathered input from data scientists and one gathered input from university faculty, to build consensus from the practitioners' perspective versus from university faculty's perspective on the skills needed to be a successful data scientist in China. A comparison of these results presents the difference between the actual skills needed to be successful in the field and the preparation of data scientists in higher education. IACIS conference participants are interested in improving teaching in the technology fields, and the results of these studies can serve as references for curricula planning.

Data Collection and Analysis

Visits were paid to several universities, companies, and government agencies in Shanghai and Beijing in China to recruit faculty and data scientists to participate in the studies. Twenty-five faculty in five universities were recruited for the Faculty Delphi study and twenty-five data scientists were recruited for the Data Scientists Delphi study. Two online, first-round questionnaires with open-ended questions were administered to the two groups using Qualtrics. Based on literature review, the questionnaires asked participants to identify needed skills in six different areas: business, data, statistics/model building/machine learning, programming/technology, problem solving, and communication/team work (Harris, Murphy, & Vaisman, 2013). To ensure that the participants had the opportunity to identify all needed skills, they were also asked to identify important skills that were not included in the aforementioned six areas. The skills identified by participants were compiled and organized. Similar skills were combined. Two-hundred-thirty skills were collected from the Faculty group, and two-hundred-six skills were identified by the Data Scientists group. In the second round of the online Delphi studies, these skills were listed for participants to rate the importance using a four-point Likert scale from "not at all important' to 'very important.'

Interquartile range (IQR) is often used in Delphi studies and is considered an objective and rigorous means of determining consensus (Heiko, 2012). Items with IQR of less than one is considered suitable consensus indicator for 4- to 5-unit scales (Rayens & Hahn, 2000); therefore, IQR of less than one was used to measure consensus in the current studies. However, for items with IQR=1, the IQR method lacks sensitivity in distinguishing degree of agreement (Rayens & Hahn, 2000; Raskin, 1994), so a secondary criterion was used. Participants' ratings of 1 (not

at all important) and 2 (somewhat important) were categorized as 'generally negative' and ratings of 3 (important) and 4 (very important) were categorized as 'generally positive.' For items with IQR=1, a more rigorous 75% or higher of either 'generally positive' or 'generally negative' was used to determine if an item has reached consensus. Of the 230 skills identified by the Faculty, 109 items has reached consensus after the second round of study; of the 206 skills identified by the Data Scientists, 108 items has reached consensus. In the third round of study, the items that had not reached consensus were sent to each participant with the mode of the respective group's ratings and the participant's own ratings. With this information, each participant was asked to reconsider his/her ratings. Scholars recommended using stability as a measure of when to stop a Delphi survey (Dajani, Sincoff, & Talley, 1979; Scheibe, Skutsch, & Schofer, 1975), and Riley, Wood, Clark, Wilkie, and Szivas (2000) recommended using Wilcoxon matched-pairs to determine stability. For the current two Delphi studies, the non-significant Wilcoxon matched-pairs tests for both the Faculty group and the Data Scientists group indicated that the data collected were stable between the second and the third round of surveys; therefore, the Delphi studies were concluded after the third round of questionnaire for both groups. The results of these Delphi studies provided the skills that were needed to be a successful data scientist in China from both practitioners' and faculty's views.

Implications and Conclusion

The demand for qualified data scientists has been high. The results of these studies provide valuable information for several groups of professionals. First, they provide a list of important skills as a reference for managers who plan to hire data scientists, as well as a list of skills that university graduates might have. Second, the data-scientist market is fluid. The consensus reached by data scientists provides useful information for those who are currently employed outside of China but are exploring the employment opportunity in the big data field in China. Third, the consensus gathered from the Data Scientists group can provide valuable information to university faculty in China for course planning. Forth, the results from the Faculty group provide universities in other countries that are accepting Chinese students a glimpse of the big-data related skills that Chinese students might have learned in their home country. With the volume and variety of data gathered by current technologies, using big data to make better business decisions will become a norm. Yet, in the infancy of the field, important skills for a successful scientist were not clear to many business professionals. These two Delphi studies provide valuable consensus from both practitioners and university faculty to fill the knowledge gap.

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Social Media—the Good, the Bad, and the Ugly

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ABSTRACT

The use of social media within modern day business has become both important and more invasive than would have been expected even just a few years ago. Social media has transformed into a business necessity on a daily basis. In the past, a vast majority of businesses viewed social media applications as a trend considered unworthy of the cost required to enact significant returns. However, that opinion has vastly changed--the social media scene has literally exploded within business information and marketing schemes. This study involves an in-depth look at the role social media plays in modern business emanating from a study of published information and an analysis of input from a survey of 38 Central U.S. businesses. Obviously, social media results in many positive primary benefits for businesses of all sizes and operational purposes such as the following: increased awareness, better understanding of customer perceptions, and new business from increased traffic to the organization's web page(s).

However, along with the positives come some elements considered as "the bad" or the negative effects of business associated social media such as the following: not having an organizational derived social media policy, employees being held liable for misrepresentation or doing something against the rules, and failing to add personal touch that is the difference between just having a social media presence and ensuring one that truly makes a significant impact.

Finally, this study includes a third dimension of social-media in business that falls within what the authors describe as "the ugly" side of this social median within modern business. Areas representative of "the ugly" side of social media include the misuse of confidential information, the misrepresenting of employer views, inappropriate use of social power, disparaging remarks, and harassment. The benefits outweigh the negatives and those organizations that embrace the change of enhanced social-media as it continues to grow and expand into something one can scarcely imagine.

Terms: Brand development, confidential information, disparaging remarks, ethical dimensions, escalating commitment, inappropriateness, misrepresentation, primary benefits, social media, harassment.

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Knowledge, Skills, and Abilities of an Information Security and Information Management Workforce: Aligning University Curricula with Industry Needs

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Panel

The purpose is to strengthen an existing research effort focused on bridging the gap between industry needs for an IT/IS/MIS workforce and university curricula. We will discuss what is known about existing knowledge, skills, and abilities (KSA¹s) of IT workers and how those KSA¹s can drive change in existing university curricula. In addition, the DACUM approach to curriculum design is being researched as a specific mechanism to bridge the gap between IT industry needs and university curricula. This panel will also serve as a recruiting mechanism for future research to host a DACUM session with those subject matter experts in an effort to apply the results of the DACUM process to a specific university curriculum. The ultimate goal is to begin the discussion on the importance of creating an industry-ready workforce by designing an industry-relevant IT/IS/MIS curriculum and encouraging the flow of information between industry and academia.

Keywords: DACUM, information systems security