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MWAIS 2017 Proceedings | Midwest (MWAIS)

6-2017

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ABSTRACT

Since the signing of Presidential Decision Directive 66 (PDD-66) in 1998, Information Assurance has become an important part of US companies' governance. In the last decade, teaching computer and network security topics to both undergraduate and graduate levels students in CS and IS program has become of significant importance to support the US mission to protect its critical infrastructure. Universities and colleges around the US have taught their students how to implement security into an information system, but many have failed to prepare those future information systems professionals on how to address are Auditing-specific topics. This paper explores the possibility of creating a hands-on course in Information Technology (IT) Audit. The course will attempt to bridge the current gap between the required knowledge for future Computer and network security professionals and future IT Auditors, and the required skills by developing a course with both theoretical and practical (Lab) aspects.

Keywords (Required)

IS Audit, IT Audit, IT/IS Audit course

INTRODUCTION

While it is not a secret in the world that we live in that advancement of information technology use in business settings has exponentially grown in the last three decades. With the fast exponential growth in a short period, one should be expected abuse and the IS world is not an exception. Governments and organizations around the world have understood the risks introduced by information technology and have attempted to put in place laws and regulations to ensure a certain level of security and accountability from the people using this relatively recent technology. In 1998, President Clinton recognized the need to secure the nation's IT infrastructure. Therefore, signing a Presidential Decision Directive (PDD) making information assurance an important part of the US government and private companies (Whitehouse, 1997).

For the last two decades, teaching computer and network security topics to both undergraduate and graduate levels students in CS and IS program has become of significant importance to support the US mission to protect its critical infrastructure. Universities and colleges around the US have taught their students how to implement security into an information system, but many have failed to prepare those future computers and network security professionals on how to address IS Auditing-specific topics. IT auditing aims to help companies in ensuring that their information technologies and business systems are adequately protected and controlled (Héroux & Fortin, 2013). This paper explores the possibility of creating a hands-on course in Information Technology (IT) Auditing which bridges the current gap between the required knowledge of future Computer and network security professionals and future IT Auditors.

This paper will pave the way to help improve curriculum by providing the much-needed skills required to students while going into a career in IS Auditing. We hope to accomplish this by proposing a course plan and surveying internal audit department and auditing firms in the US to confirm the alignment of the course topics with the needs of the industry. Based on the study analysis, an adequate course in this area will be developed with both theoretical and practical (Lab) aspects. Our results will help shed light on how other institutions can enhance their current curriculum and include better IS audit classes.

THE DRIVING FORCE BEHIND THIS PAPER

The Enron scandal revealed in October 2001 was defined as being one of the biggest audit failures in the United States. The Enron Scandal pushed the US government to many rapid changes in regulations related public traded companies during the last decade due to the need for better internal controls and auditing (Ball et al., 2009). Considering those previously cited concerns, Sarbanes–Oxley Act (SOX), Gramm-Leach-Bliley Act (financial transactions), Federal Information Security Management Act (government) and Health Information Portability and Accountability Act (HIPAA), just to cite a few, were enacted to regulate the critical issues of corporate governance.

The goals of SOX as it relates to technology is to ensure that accounting systems that are considered material meets the following information processing assertions; completeness, accuracy, validity and restricted access (CAVR) which are of great importance to financial reporting. To compliant with the battery of government regulations, organizations need people with the skills to perform Information Technology (IT) Auditing. Therefore, the need for the university to fulfill their mission to educate students by giving them the fundamental knowledge with practical education to impact the society and solve the world problems.

Merhout & Buchman (2007) explained that the IT audit function is a unique one based on the required skills to be an effective IT auditor. They argue that the IT audit function requires skills which focus is to ensure that the financial statements were presented fairly, and expertise of an IS professional who is educated and qualified in the implementation, operation, and maintenance of IT systems. In 2001, the U.S. General Accounting Office (GAO) and the National State Auditors Association presented the result of their survey which put on exergue that the understanding of technology was the weakest point of the state government auditor. Coe (2011) studied audit and assurance programs in the United Stated and other countries. The result of the survey showed that 63.4 percent of the introductory auditing courses covered general IT audit concepts. Merhout & Buchman (2007) acknowledge that IS educators are beginning to respond to the trend affecting student career options in the IT auditing. To succeed in their entry level IT audit position, a new graduate needs to have the necessary skills to hit the ground running. Merhout & Buchman (2007) have investigated the requisite expertise and knowledge for entry-level IT Auditors found that network, Internet, and security experience were desired by only 19%, 8%, and 18% (respectively) of companies with job postings. The other 24% of the jobs preferred database skills, including Oracle, PeopleSoft, JD Edwards. The other 23% desired operating systems knowledge which includes UNIX, Windows NT, and other environments. The desire for graduate with experience and knowledge of ACL/CAATs and SQL abilities were noted at 15% and 4% of their ads, respectively, 34% of jobs analyzed desired experience with ERP systems. Additionally, the research determined that 53% of the jobs posted preferred general management skills, such as leadership, project management and planning, and training, and 32% of the jobs desired active general social skills including interpersonal skills, personal motivation, the ability to work independently, and teamwork skills.

Deducting from the result from Merhout & Buchman (2007), we understand that the underlying problem is that universities are producing IS/IT professional with no idea about what IS/IT Auditing is, the why of IT audit and how it is performed. Students spend years learning how to design and implement the computing infrastructures of the future, but they are not taught how to audit what they are trained to develop and implement hence to put the whole infrastructure at risk. The IS Auditing courses currently offer find their homes in accounting departments in most universities and are not part of IS students required classes for graduation. To bridge the existing gap, we are proposing an introductory class that will provide students with the required knowledge about IT auditing theories, hands-on experience through a virtual Lab and live experience with local businesses. The goal of the course is to expose students to live review of enterprise infrastructures and processes through the execution of every phase of an audit engagement and to give them the hands-on experience require for a smoother transition to their first IT Auditing employment.

LITERATURE REVIEW

Petterson (2005) argued that computerized information systems and information technology have become the backbone of most organization. Therefore, creating the need for IT audit to provide assurance that systems are adequately controlled, secured and functioning as intended. According to CNN money, Knight's $440 million glitches could be the costliest computer bug ever. Because of the computer glitch, the company nearly went bankrupt. Greenberg (2013) argued that this post the incident with Knight Capital organization around the world recognize how IT auditors can help them understand the constantly shifting risks of the information age. Questions about effective IT auditor presents itself in today's organization. Filipek (2007) argued that information technology audit and risk management are the top two areas where audit professionals need to improve their skills. The consulting firm Provide survey 450 chief audit executives about their audit capabilities and a field in which they needed improvement, and how to prioritized their needs. Survey respondents identified IT auditing as the area of audit process knowledge where internal auditors have the lowest level of competency and the greatest need to

improve their expertise. The chief audit executives (CAEs) present three subject areas for skill improvement which are general technical knowledge, audit process knowledge, and personal skills and capabilities.

Petterson (2005) argued that there is no one background appropriate for a career as an IT auditor. However, he argued that by earning the Certified Information Security Auditor designation, professionals demonstrated that they have they have experience, education, and character qualifications. Greenberg (2013) argued that to be an effective IT auditor, one must acquire the right hard and soft skills, the education, and build a sound basis of experience. Greenberg (2013) argued that hard skills IT auditors need include a strong understanding of general computer controls (GCCs), data analytics, basic system infrastructure, and risk assessment. Greenberg (2013) argued that in addition to hard skills, the IT auditor must have an active repertoire of soft skills that include translating "geek speak" to "business speak". It is also critical to IT auditor to be able to talk about highly technical topics when interviewing system administrators, system architects, and other IT personnel. It is logical to assume that the accounting graduates are not prepare for highly technical conversation. This reinforce the idea that IS audit courses should be taught to IS students.

IS/IT Auditing is the analytical and testing part of IT Governance by which the level of performance of an IS infrastructure is measured, and its maturity is assessed at a point in time. It is a relatively new niche that involves thoroughly reviewing the effectiveness of the control procedures in various part of the IS infrastructure, conducting analytical tests and collecting evidence with the understanding of auditing processes, standards, guidelines, and best practices.

THE OLD VERSUS THE NEW

The current version of the most courses provides the students the foundational knowledge in using managerial and technical skills to promote information security compliance. The course introduces the fundamentals of IT auditing and assurance services, and the principle objectives of IT auditing and assurance services.

The improved version of the course will address not only career skill and knowledge development but also IT audit's relationship to integrated and non-integrated financial audit. The student will also have to perform hands-on reviews of:

a. IT general controls
b. Database security controls
c. Operating System security controls
d. Network security controls
e. Financial and operation applications/business process controls
f. Segregation of duties controls testing
g. Develop IT Audit Work program based on industry standard and regulation

The final objective of the improved version of the course is to give students the practical knowledge and experience by participating in at least one lab project and one live project in the community and increase students' chances of passing the CISA examination. After taking the improved course, students should have not only basic knowledge and understanding of IS Auditing but also a field experience of what IS audit is and is not. The students will have the necessary skills to reduce the imbalance supply and demand of qualified IT auditing professionals.

APPROACH TO NEW

Close to none of the current IT audit classes deliver includes a project component and or cover the practical aspect of IT auditing. We believed that giving the student the first taste of an IT audit project in a learning environment will bust their confidence while on their first IT audit employment or while dealing with auditors. The improved course version will follow a hands-on approach that gives the students the skills necessary to be either an auditor or knowledgeable auditee. The rationale behind this approach can be found in the fact that researchers have proved that project-based learning is more effective in increasing student motivation, improving student problem solving, improving higher order thinking skills, addressing different learning styles and providing students with an integrated learning situation. Project-based learning is a comprehensive approach to classroom teaching and learning that is designed to engage students in an investigation of the authentic problem (Blumenfeld et al., 1991).

DESIGN CHALLENGES

The primary concern is whether the course should be a requirement for both undergraduate information system majors and all graduate level students. The argument to have all graduate level take the class come from the aspect that after graduation, they will either be an auditor or an auditee.

Topic Selection and Sequence

View the considerable time and effort needed to create material for the improvement version of the course, the correctness of the selected topics and their sequence will be confirmed by surveying local auditing firms, professional auditing organization and the BIG4 Accounting firms. Hill (2011) presents the GAIT-R methodology which covers the risk assessment and control identification process which start with starting with understanding the business objectives for which controls are to be assessed and ending with a defined scope of work. IT audit scoping will be one of the topics to be included in the course material. Students will learn to identify the business objectives for which the controls are to be assessed identify the critical it functionality relied on from among the key business checks, identify the significant applications where it general controls need to be tested, identify it general control process risks and related control objective and determine the scope of the review and build an appropriate design and effectiveness testing program. Before scoping, the student will need to understand the IT audit landscape. This will be performed by discussing laws, regulation and regulatory bodies. Some of the relevant and recent ones include Sarbanes-Oxley Act of 2002, Auditing Standard 5 (Public Companies Accounting Oversight Board – PCAOB), "risk suite" standards (American Institute of Certified Public Accountants – AICPA), and "Guide to the Assessment of IT General Controls" (Institute of Internal Auditors – IIA). Other suggested topics include Auditing Process, Governance, Ethics, Work Program Development and Documentation, Sampling methodology, Modern audit tools and techniques, and Report writing.

Student Background

Singleton et al.(2008) argued that there is a direct relationship between information security and financial audit. They present two points of interest in the relationship between information security and financial audit. They explain that the first relates to the fact that an IT auditor must understand internal controls and assess how information technology (IT) impacts the financial data. The second point refers to the need for IT auditors to determine the reliability of underlying data used to perform audit procedures, typically generated by the information systems of the entity being audited. As presented above there is a need for IT Auditor to understand information security as this one manages the availability, confidentiality, and integrity of the data use during the IT audit engagement. Therefore, we find it necessary that student taking the proposed IT Audit class have prior knowledge on IT risk management, Operating Systems, and Networking. The priory cited prerequisites will allow the class to focus on IT Audit core topics and not a revision of system, networking and other subjects cover by different classes in the curriculum.

Student Material

At the difference of several security courses for which teaching material are readily available content find on the Internet, appropriate Hands-on course content for teaching IT Auditing and compliance are not. Therefore, there is a need to create course material from different practitioner organization resource library. The student will need to register for academic membership for practitioner organization such as ISACA, IIA, ISC2 to cite a few. Those memberships will help the students retrieve the necessary materials for the class and have access to a community of practitioner. The course content will be based on the following and more:

- COSO standard
- GAIT standard
- PCAOB Standard
- AICPA Standard
- ISACA IS Auditing Standards
- COBIT Student Book
- Certify Information System Auditor Study Guide by Cannon
- IT Auditing using controls to protect information by Davis Schillers
- COBIT Standard
- COSO Standard

- ISO 27000 Standard
- NIST 800 Series

The improved course hands-on approach will be reinforced by adopting ISACA's CISA Review test bank for the weekly quizzes and the exam.

Practical Lab setup

The class would use DSU Information Assurance lab which is a virtualized infrastructure that allows to mimicking corporate networks. The IA lab which is accessible remotely by the student from anywhere in the world is based off the VMware vSphere platform and combines several other VMware products in addition to custom written software to better meet the needs at DSU. Find below a proposal for a small network that the student in the class can audit before their live project at a client in their community. The lab setup will include the following:

- The Cyclos bank application was chosen because of realistic feel in mimicking a real bank and the benefit of being a free product. Cyclos is an open source project of the Dutch nonprofit organization STRO which offers a complete on-line banking system with additional modules such as e-commerce, Mobile banking, and communication tools.
- Internal SharePoint will set up to serve up policies, procedure and standard for the dunny bank to the student auditors.
- A pfsense firewall that will be used to separate the internal network to the internet.
- A file server used to share documents within the bank by the different department.
- A domain controller to help simulate authentication on a corporate network
- A backup server to help simulate a business continuity and recovery on a corporate network
- A wireless access point to offer the internet to the bank' visitors.

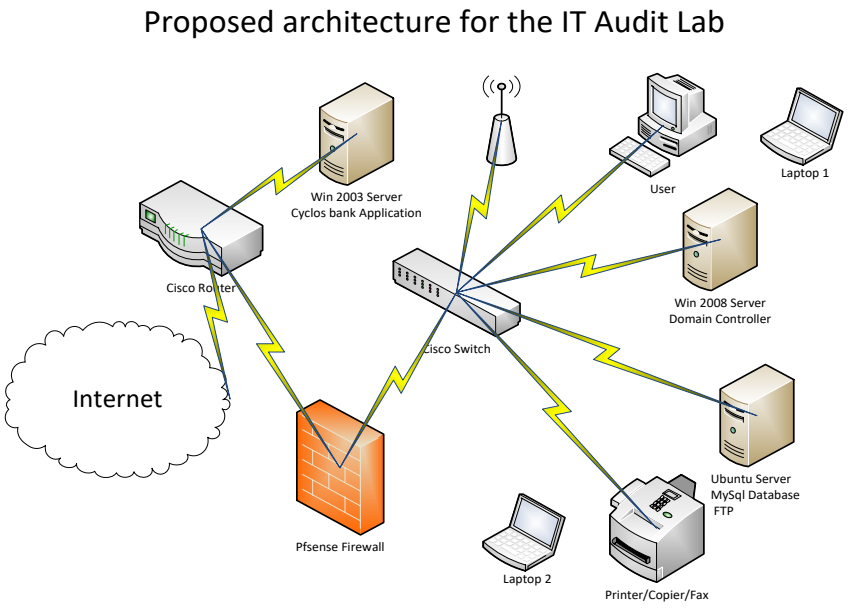

Figure 1: Proposed Infrastructure

CONCLUSION

The design of the improve courses and its formal approval by Dr. Streff, and the university will take a little while, but we expect to launch a trial version of the class in the spring semester of 2018 to receive the final school seal of approval. It is

anticipated that the course has a practical life of three semesters before revision and update are made to it. Even though the design and approval process may take time, the course changes would be a terrific addition to the student's knowledge and skills.

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