5-2012

Blending Information Systems Security and Forensics Curricula

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ABSTRACT

This paper describes the process of developing an Information Security and Forensics curriculum for a master's degree. The vision for this degree program is to offer a curriculum that differentiates Friends University in the marketplace from established security degrees by including courses in computer forensics. These are courses rarely seen in a security degree but supported by the regional marketplace that the university serves.

Keywords

Information Security, Forensics, Information Systems, Security Curriculum.

INTRODUCTION

Security for businesses of any size is of critical importance. A security incursion can shut down a company's most important operations, causing a loss in productivity, jeopardizing data integrity, negatively affecting revenue, and disrupting work communications (Ketel, 2008). Recent reports from Google on malware-infested smartphone applications and phishers using their cloud-based systems to conduct cyber-attacks underpin the reality that hackers are becoming more sophisticated (Garber, 2011). Even with a cursory review of news sources, it is difficult not to notice there is an abundance of security, privacy, and policy issues in the headlines on a daily basis. Furthermore, the continued volume of such reported security incidents has raised an important question within Friends University's Masters of Information Systems Program: How can this current program at Friends University evolve so that students can be skilled computer security professionals who are capable of reducing vulnerabilities in information systems?

About Friends University

Friends University is a 3000 student, private liberal arts university located in Wichita, Kansas, the largest metropolitan city in Kansas (Friends University, 2012). Its graduate school offers 12 Masters Degrees. Of these 12 degrees, the Masters of Management Information Systems (MMIS) is a 12 course, 36 credit hour degree program. Since 2005, the enrollment in the MMIS program has remained steady despite curricula changes. A goal of the graduate school is to enhance its ability to recruit students and expand the pool of potential students interested in an information systems related masters degree.

FOCUS GROUP INTERVIEW

Developing a curriculum for an information systems related discipline requires an analysis of the workforce needs and that sufficient faculty are available, with the proportionate academic and professional qualifications to fulfill the student needs. With no readily available market study, a decision was made to form a focus group to obtain a measure of the workforce needs that could guide the needs analysis and development of a new degree program. Personal interviews were conducted with Information Technology and Computer Forensics professionals to gather their thoughts on the needs and purpose of a security and forensics education. The demographic of the focus group included professionals from academia, criminal justice, and law enforcement (local, state, and federal), and military sectors all working in forensic, security, or cyber security roles.

Listed below in Table 1 is the theme of the questions asked during the interview session. These interviews were conducted in a group setting.

1.	Looking back at the higher education you received, what do you wish you had learned?
2.	What do you see as the future needs of your profession?
3.	What are the intrinsic rewards of your career?
4.	In your opinion, what are the characteristics of a successful person for this type of degree?
5.	What is your opinion on the best method to stay current in this dynamic industry?

Table 1. Interview Questions

The focus group agreed that the need for educational offerings in information security and forensics is well documented (Dhillon & Hentea, 2005). In addition, the focus group shared that within the industries they represented, there were strategic plans taking shape that included increases or creation of job positions that would require education in the areas of information security and/or forensics. In addition, the focus group determined that there are a number of bachelor, masters, and doctoral programs in information security, computer forensics, and computer security and information assurance, but there are no such programs offered within the regional demographic area that Friends University serves. Table 2 contains a few of the most compelling statements made by focus group members:

1.	The demand currently outweighs the supply of skilled, qualified, and possibly certified computer experts in the area of forensics and security.
2.	Employees with education in information security and/or forensics are needed in law enforcement, state and local government agencies, military, and corporate environments – essentially any facility that utilizes computers.
3.	Graduates will be in demand, especially those who have availed themselves of a technical, hands-on, well-rounded education with curriculum in computer information security, networking, psychology, accounting, business, and criminal justice.

Table 2. Interview Results

One of the goals was to ensure that the degree would be a differential in the marketplace from established security degrees by including courses in computer forensics, courses rarely seen in a security degree but supported by the market needs identified by the focus group research. In addition, with this diversification of curriculum offerings, the recruitment potential would appeal to a wider audience. A mapping of the focus group recommendations to the selection of new courses that will provide the topical concentration with added research concentration in the areas of information security and forensics for the new degree program are presented in Table 3.

FACULTY QUALIFICATIONS

The starting point for determining the needed faculty qualifications to oversee the new degree program started with examining the existing graduate school's policy on faculty qualifications. The policy on faculty qualifications states, "A faculty member in the Graduate School holds a doctoral degree or a terminal master degree for disciplines in which a terminal master degree is the highest degree awarded. Alternatively, faculty members may be employed based on equivalent professional experience." Currently, two full-time faculty members are available to teach in the new program. The experience of these existing faculty members covers a range of topics in the information systems discipline, including extensive theoretical preparation in information security and forensics, but limited industry experience in those specific areas. As a consequence of this situation, the University in the short-term will rely largely on adjunct faculty with real-world experience and professional certifications to fill this gap.

PROGRAM CURRICULUM DEVELOPMENT METHODOLOGY

Vaughn, Dampier, and Warkentin (2004) advocate that there are three models for security related curricula:

1. Incorporate topics within existing courses
2. Integrate security into software engineering program
3. Create a degree focused on computer security

In accordance with the approach adopted by Vaughn, the purpose of this paper is to extend the discussion of the latter option: creation of an Information Security and Forensics degree program. The specific focus on this research paper will be at a private liberal arts four year university within a graduate school. For a liberal arts institution such as Friends University, the primary objective is teaching and student learning. In addition, any new degree program must contribute to the overall goal of the university and the graduate school.

There is an amount of practical pre-requisite conceptual knowledge, both basic and advanced information system-related, knowledge that students need to matriculate successfully into courses of study in information security and forensics. Instead of taking a forklift approach to the existing MMIS program and shelving the entire curricula, it was decided that a review of the curriculum should be completed with the goal being to identify which courses, if any, should be adopted for inclusion in the new degree program. After a collaborative review with faculty members and the focus group, it was determined there were seven existing courses in the MMIS curriculum that are relevant and will sufficiently support the pre-requisite knowledge students will need. The following courses were identified and adopted for the new degree program proposal:

Research Methods in Information Systems (MIS 525) introduces students to applied research methodologies, analytical tools, and publication standards. *Information Security and Policy Development (MIS 640)* provides the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents, and designing a consistent, reasonable information security system, with appropriate intrusion detection and reporting features. *Data Communications and Networking (MIS 550)* covers current communications and networking technology and addresses the strategic importance of communications and networking in the current business environment. Students will gain an in-depth understanding of network technologies and the way these technologies can be integrated to support the strategic IT mission of businesses. Special attention is paid to network topology, internetworking, TCP/IP, switching, and routing.

Database Systems (MIS 580) provides experience in managing the design and development of database systems including fundamentals of database architecture and database applications. The focus of the *IT Audit and Controls (MIS 575)* is on understanding information controls, the types of controls and their impact on the organization, and how to manage and audit them. *Project Management for Information Systems (MIS 625)* assumes that project management in the modern organization is a complex team-based activity, where various types of technology are an inherent part of the project management process. The *Research Project (MIS 690)* course provides an opportunity for students to identify, research, develop, implement, and evaluate solutions for a complex problem within their chosen area of emphasis.

Since the confines of a graduate degree at Friends University is 36 credit hours, the adoption of seven courses, 21 credit hours left a balance of five new courses, consisting of a total of 15 additional credit hours, that would need to be identified. Table 3 provides a mapping of the focus group recommendations to the selection of new courses that will provide the topical concentration with added research concentration in the areas of information security and forensics for the new degree program.

Focus Group Recommendations	New Course Selection
Organizations are seeking skilled, qualified, and possibly certified computer experts in the area of forensics and security.	Computer Forensics I (MIS 585) Computer Forensics II (MIS 595)
Organizations are creating 5-10 year strategic plans to create cyber crime departments – Consequently higher education institutions should to be responsive to this need.	Cyber Security (MIS 655)
Graduates will be in demand, especially those who have availed themselves of a technical, hands-on, well-rounded education with curriculum in computer information security, networking, psychology, accounting, business, and criminal justice.	Network Security (MIS 535) Seminar in Information Security and Forensics (MIS 670)

Table 3. Mapping of Focus Group Recommendations to New Course Selection

Based on recommendations made by the focus group and faculty members, the following new courses will provide the topical concentration with added research concentration in the areas of information security and forensics for the new degree program:

Computer Forensics I (MIS 585): This course covers both the principles and practice of digital forensics. Students will examine the societal and legal impact of computer activity including computer crime, intellectual property, privacy issues, and legal codes. The methods and standards for extraction, preservation, and deposition of legal evidence in a court of law are described. Computer forensics investigation techniques for collecting computer-related evidence at the physical layer from a variety of digital media and performing analysis at the file system layer is presented.

Computer Forensics II (MIS 595): This course builds on the principles and practices presented in the Computer Forensics I course. Students will learn advanced concepts of computer forensics. Students will continue to develop competences in the forensic extraction of computer evidence at a logical level using a variety of operating systems and applications. Prerequisite: Computer Forensics I (MIS 585) with an earned grade of C or better.

Network Security (MIS 535): Network security covers a broad area, including the security of devices that comprise the network infrastructure, the security of the traffic sent over that infrastructure, applications that utilize the network, the user community, and the policies that govern usage of that network. The course explores elements of network security architecture and design patterns are used to understand how these elements can be combined into an integrated design that effectively supports the security policies of the enterprise.

Cyber Security (MIS 655): A study of cyber security that integrates knowledge gained through previous coursework and experience, and builds on that conceptual foundation through integrative analysis, practical application, and critical thinking. Students will gain a thorough understanding of the organizational roles that perform cyber security work as well as the management of those roles. Current and emerging issues in cyber security are considered. Prerequisite: Information Security and Policy Development (MIS 640) with an earned grade of C or better.

Seminar in Information Security and Forensics (MIS 670): This course provides the framework for the introduction and research of current and emerging information security and/or computer forensics topics. Topics are driven by the dynamic nature of the information technology industry.

STATUS OF DEGREE PROGRAM PROPOSAL

In January 2012, the curriculum committee reviewed the new degree proposal and recommended that the proposal be forwarded to the graduate school's Academic Council for consideration. The remaining checkpoints for this proposal are the Academic Council, University Academic Cabinet, and University President's Cabinet. The proposed timeline for obtaining approval of the proposed degree program is April 2012, with the first cohort of students starting in the spring term of 2013.

CONCLUSION

In this paper, an examination of Friends University's initial approach to creating a graduate curriculum that supports an Information Security and Forensic degree was presented. Our approach included an analysis of the workforce needs and the

faculty qualifications required to teach and oversee the program. One unique aspect of our approach is the usage of focus group interviews of professionals from academia, criminal justice and law enforcement (local, state, and federal), and military sectors all working in forensic, security, or cyber security roles. The curricular components of this degree program address both the pre-requisite conceptual knowledge and topical concentration with added research concentration in the areas of information security and forensics that will meet the workforce needs.

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