

# PULLING IT ALL TOGETHER: AN IS CAPSTONE COURSE FOR THE 21<sup>ST</sup> CENTURY EMPHASIZING EXPERIENTIAL & CONCEPTUAL ASPECTS, SOFT SKILLS AND CAREER READINESS

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## ABSTRACT

*Past pedagogical research strongly indicates that the IS capstone course should include experiential [7] and conceptual elements [3]. A strong emphasis on soft skills (e.g., interpersonal communication, teamwork, project management) is also noted [6]. However, a review of IS capstone course designs such as IS 2002.10 in the AIS model, shows that capstone courses do not emphasize soft skills and are either experiential OR conceptual in nature, not both. We offer a comprehensive design for the IS capstone course, currently in use in the Ohio University MIS Department curriculum, which integrates all the above elements. This unique course also adds a fourth dimension, career readiness, to help ensure the success of our graduates. We present the key components of this course and then discuss preliminary findings of our study which validates this approach to delivering the IS capstone.*

**Keywords:** IS curricula, system development lifecycle, project management teaching, capstone

## INTRODUCTION

Past research on IS curriculum development strongly suggests the need for an experiential element (i.e., “real life” projects) [4, 7] and a conceptual element (e.g., business systems analysis, case studies and targeted activities) [3] in the IS capstone course. The literature also places strong emphasis on the importance of “soft skills” (i.e., interpersonal communications, high performance teaming and project management) [6, 7]. The need for these three areas is said to be driven by industry requirements for an integrated understanding of IS fundamentals, as well as the ability to apply IS skills in project settings [2]. A comprehensive set of “representative capabilities and knowledge expected of IS program graduates” is reflected in the IS 2002 curriculum model [1]. However, a review of IS capstone course designs such as IS 2002.10 in the AIS model, shows that capstone courses do not emphasize soft skills and are either experiential OR conceptual in nature, not both.

This paper documents a unique approach to delivering the MIS capstone course, which resolves the above pedagogical dilemma. Our course, which is currently being taught in the Ohio University (OU) MIS curriculum, incorporates both conceptual and experiential content and related activities. It also has a strong soft skill foundation, with daily activities focused on interviewing, presentation, project management and high performance teaming. Further, we add a fourth dimension not present in other capstone course designs: MIS career readiness activities. Our capstone model and the lessons learned in delivering it are our contributions. We are convinced that using this comprehensive model is an extremely effective approach for producing top IS professionals. Along with the details of the course design, we present preliminary results of our study of the effectiveness of these techniques, and discuss opportunities for future research.

## **THE OU MIS CAPSTONE**

The OU MIS Capstone Series is an 8-hour course which has two primary segments: 1) The applied skills segment, which is delivered in the context of an actual client engagement, spanning the entire quarter and taking the student through the entire system development lifecycle (SDLC) and 2) The conceptual/activity-based segment which covers the full spectrum of system types, associated business issues and “Hot Topics” (e.g., pervasive computing, telematics and biometrics). Each segment has a separate grading scheme; therefore, students receive two letter grades. Soft skills are taught and evaluated throughout both segments. The conceptual segment also incorporates many career readiness activities such as panel discussions, resumé critiquing, mock interviews, interviewing IS professionals to learn about their careers, networking events and placement assistance. As a final step towards ensuring career readiness, students develop and present an electronic student portfolio of their MIS achievements to the faculty before they are cleared for graduation. The details of this capstone series are as follows:

### **Applied Skills Segment**

The goal of this segment is to challenge students to apply all concepts and skills learned in the context of a real-world client project, which spans the entire quarter. The focus is on the use of the system development lifecycle (SDLC) methodology to develop and implement a complex web application. This development process is supported by related readings, case studies and activities designed to build solid systems development, project management, client relationship and teamwork fundamentals. Particular emphasis is placed on professionalism and deliverable quality. The specific components of this segment are as follows:

**Real-world client project.** Students assume the role of IS consultants to complete a complex systems development project for an actual, “real-world” client in the span of 10 weeks. Throughout the project, students adhere to the phases and steps of the systems development lifecycle (SDLC) to deliver an application that meets the client’s business needs. Students first work with the client to gain an understanding of their current business processes and determine the requirements for the application. They then utilize ASP.NET and Microsoft Access to design and develop a web application tailored to the client’s specifications. Throughout the project, students are in constant contact with the client to ensure satisfaction, manage the relationship and respond to client issues. Evaluation is based largely on the creation and presentation of deliverables associated with each SDLC phase (e.g., project plans, use cases, process flows, prototypes). These deliverables constitute 60% of the final grade in the applied skills segment.

**Systems development readings, case studies and activities.** For each session, students are responsible for readings related to their current SDLC phase. Readings are mostly taken from McConnell’s RAD book [5], which we have found to be a fantastic repository of fundamentals (students also regularly comment that they actually enjoy the readings!). After assigned readings concerning the people, process, product, and technology-related issues associated with systems development projects, students analyze related case studies and identify “classic mistakes,” risks and best practices for estimation and project management. A key to this process is the fact that upon completion of each activity, they are required to immediately apply what they have learned to their own client projects during an open session in class. At the end of each session, the team’s current project manager reports its findings and lessons learned to the entire class. Quizzes are

given at the beginning of each class to assure students are prepared. The quizzes and activities count for 20% of their grade in the applied skills segment.

**Project management workshop.** The project management workshop consists of four class periods devoted specifically to the topic of IS project management. During this time, a series of project management lectures intended to introduce important concepts (such as project management's relationship to the SDLC and the nuances of IT projects that separate them from other projects) is presented. After each lecture, an open discussion about project management is held. Throughout this discussion students are encouraged to share their past project management experiences from this class, other classes or prior internships. By sharing these experiences, the students create an environment in which they can learn from one another's past successes and failures. The project plan (created in MS Project) is the focal point of these workshops. Activities follow each of these discussions, in which students are expected to apply what they have learned by creating and revising their project plans for their client project. In these activities, they discuss how the plan has evolved and other related issues. These workshops are designed to be informal, and therefore do not have a graded component.

**Individual development assignment.** In order to ensure that baseline programming skills are attained, there is one individual system development assignment. Each student is given a set of specifications for the development of a restaurant seating and ordering application. They are then required to apply the SDLC methodology to design and develop this system. Student applications are evaluated on the basis of creativity, usability and how well it meets the specifications. Ample help sessions are offered outside class. This project counts for the remaining 20% of the grade in the applied skills segment.

### **Conceptual Segment**

The goal of this segment is to remove students from the computer lab and their client projects, and to encourage them to engage in intense dialogue about the full spectrum of systems and related business issues, emerging technologies, and IS careers. Obviously, this is a tall order for one class, so this segment is very intense. In order to facilitate this process, a wide variety of activities are designed into the class. The focus is on expanding what they are learning in their client projects by forcing them to look at SDLC concepts in the broader IS business environment. The specific components of this segment include the following:

**IS readings and related activities/discussions.** There is no text for this class. Instead, current articles are chosen (and constantly updated) which deal with fundamental IS issues such as "Does IT Matter?" IS strategy, ERP/CRM/SCM systems, wireless and pervasive computing, IS security and ethics. Students are assigned a set of readings for most classes and must take a quiz each day to ensure preparedness for discussions. Breakout sessions are held first, with a set of discussion questions assigned to randomly selected groups of three. The class then regroups and an open discussion ensues. In these discussions, students are forced to step up and participate. Most importantly, we require them to move beyond perfunctory regurgitation of readings making them more comfortable offering their perspectives and taking positions on key issues. The quizzes/discussions each count for 20% towards the final grade in this segment.

**Hot topic open forums.** This is by far the most popular component of the course. It is designed to offer a break from the intensity of assigned readings, allowing students to select something of interest to them. The requirement is that they find an IS article that is a “hot topic” (i.e., published in the last 60 days and covering an important IS issue). They must write a 2-page summary indicating what the article was about, what their position is on it, and why they think it is important. During class we move about freely, allowing students to give an overview of their article. The rest of the class is encouraged to respond. Lively discussions/debates always evolve, as these are typically areas that students are excited about. This is also a nice break for the instructor, as there is no prep required. These forums take place four times during the quarter and count for 10% towards the final grade.

**IS topic paper and facilitation.** Each student is required to choose from a list of IS topics (e.g., Sarbanes Oxley, Data Warehousing, Outsourcing), and write a 5-page position paper. They must then facilitate a 30-minute discussion/activity. This gives students practice leading a discussion on a key IS topic. Students are evaluated on their ability to move beyond presenting, to engaging the class. If they can get the class involved, it is considered successful. Student activities often include breakout sessions, debates and games/contests. Creativity is encouraged. This component counts for 20% of the final grade (10% paper, 10% facilitation) in this segment.

**Emerging technology day.** Each student is assigned an emerging information technology (e.g., biometrics, nanotechnology, telematics) and is expected to write a 2-page brief on their view of this technology and its potential impact on the business environment. Findings are discussed in an informal 2-hour class workshop on “Emerging Technology Day.” Students are evaluated on their ability to articulate an understanding of the technology and its issues, as well their participation in the overall discussion. This activity counts for 5% of their final grade.

**IS career days.** The key component of the career readiness portion of the capstone is “IS Career Days.” This takes place over three separate class sessions. The first day consists of mock interviews for some common entry-level IS positions (e.g., analyst, DBA, developer). These interviews are conducted by guest interviewers who are actual IS professionals. To prepare, students are required to submit a current resumé, which has been tailored to a job description provided by the instructor. The class observes and participates in a debrief after each interview. The interviewer then offers advice about their interviews and resumes. For the second day, students must select an executive or managerial level position from a list provided (e.g., CIO, Director of IT), interview someone in this position, and give a 15-minute report providing an overview of “A Day in the Life” of that individual. The third day is the marquis event of the capstone, called “OU MIS Day.” This day consists of a series of activities built around a panel of 10-12 IS professionals who travel to OU to spend the day with our students. In order to offer students a broad view of IS careers, the panel consists of representatives from industry and consulting who work in technical and non-technical roles in positions ranging from entry level to executive. First, a 2-hour panel discussion/Q&A session takes place, in which students are required to take turns asking questions and interacting with the panel. Second, a formal luncheon is held to provide a more intimate interaction opportunity. Finally, the event culminates in an informal networking session at a local establishment, where students can practice their networking skills and explore potential career opportunities. Many students are hired as a result

of MIS Day activities. Students are evaluated on their overall level of engagement and professionalism exhibited. This component counts for 5% of their final grade.

**Concept integration day.** Concept integration day is designed to require students to take all key concepts learned throughout the course and apply them in the context of a case study. Students are divided into teams and presented with a business systems analysis case study. They are given two days to design a complex system model, which resolves the issues in the case and integrates all concepts from the course. Each team presents their solution on “Concept Integration Day.” Students are evaluated on effectiveness in addressing the issues in the case and application of course concepts in an integrated fashion. This component counts for 10% of the final grade. Prizes are also awarded for the top team.

**Jeopardy tournament.** In lieu of a final exam, teams from the client project face off for the last two class sessions in a Jeopardy tournament for extra credit. Material covered in this tournament is comprehensive, spanning the entire capstone series. The winning team receives three percentage points on their final grade. The remaining teams receive prizes. This has proven to be an extremely effective way for us to engage students in a comprehensive review of course material. The enthusiasm generated by the competition gets the entire class involved while helping to reinforce key concepts.

**Electronic student portfolio and career readiness presentations.** In order to package all skills and accomplishments for potential employers, students are required to develop an electronic student portfolio (ESP). To accomplish this, they use web development tools of their choice to creatively construct a website that houses descriptions of all courses taken, key deliverables created, a description of skill areas and their resumé. In order to be cleared for graduation, students are then required to present the contents of this portfolio to a panel of IS professors and discuss their readiness for graduation and a career in IS. The portfolio process counts for the remaining 10% of their grade in the conceptual segment.

Having outlined our unique capstone model, we now present empirical data to validate its effectiveness.

## **ILLUSTRATIVE DATA**

### **Methodology**

We conducted a year-long study of the OU Capstone Series to validate our pedagogical techniques. Due to page constraints, we present a small segment of this data to illustrate the spirit of our findings, which were largely positive (negative viewpoints were expressed, but are not presented in this brief format, as they represented less than 5% of our data). In this study we used a number of data sources to help triangulate our findings, including 1) a year of anonymous capstone course evaluations, 2) surveys of 30 present and past Capstone students, 3) 30-minute phone interviews with 15 past students working in various IS positions, and 4) an hour-long focus group with five present Capstone students.

### **Initial Findings**

Our empirical research suggests that our approach to teaching the IS capstone is highly effective. Throughout our interviews, both present and past students acknowledged that because of the IS

capstone series, they feel they are strongly positioned for success in IS careers. Our survey data shows that the vast majority of past and present students surveyed (5-point scale - strongly disagree, disagree, neutral, agree, strongly agree) agree or strongly agree that 1) the capstone series provided them with a great learning experience, which prepared them well for a career in IS (96% - past, 92% - present); 2) the MIS capstone series has better prepared them for a career in IS than a peer who has not taken the course (97% - past, 91% - present).

Other key findings that validate our approach include: 1) Students felt that the client experience was extremely effective at solidifying SDLC concepts, as a past student notes: *"For the last two months I have been working as a contractor on a software rewrite project for a major bank, during which time my knowledge of the SDLC has been invaluable. My prior knowledge of the SDLC obtained through the capstone allowed me to immediately work towards understanding the business and its software. This gives me a distinct advantage over my peers who must first spend time to learn the SDLC."* (past Student 3). 2) The effectiveness of the course at promoting soft skill development, especially applied in the context of client communications was another key theme in interviews. The following is a typical sentiment: *"Communicating and presenting to a client about their expectations is something really important that you need to know when you have an IS career because you need to be able to communicate to others what the project is going to be...and I think that is something we will all take away and something that no other class touched upon."* (present Student 3); and similarly from a past student: *"I believe that my 'soft skills' give me a huge advantage in my field over other colleagues and co-workers. I am able to communicate with highly-technical individuals, as well as executives who do not speak 'geek'."* (past Student 6). 3) Our data also suggests that career readiness activities made students feel as though they were much more prepared for IS careers as a result of the capstone class. Frequent comments such as this were made: *"I feel 100% more ready [for a career in IS] than I did prior to the course."* (present Student 4). 4) Students also felt they had much clearer idea of what the future might hold for them as an IS professional. This quote shows a common course outcome for a student: *"I thought a lot of the profession was coding and creating programs and/or applications, but there is so much more to IS than I realized. I definitely feel the instructor has helped all of us see the many paths we can choose."* (past Student 4). 5) Finally, one of the most pervasive themes was that students felt more prepared for IS careers than their peers who had not taken the capstone. This quote was typical: *"I have worked with many other entry-level professionals with very different and similar degrees to mine. Without a doubt, the MIS Capstone courses gave me a huge head start on my peers in my career in consulting."* (past Student 5).

## DISCUSSION AND CONCLUSION

As the above findings indicate, we have experienced tremendous success with the delivery of our IS capstone course. These successes include a high level of satisfaction by students, clarity on key IS concepts, ability to apply the SDLC methodology in practical settings and development of a strong soft skills set. Perhaps most importantly, our students feel as though they are ready for the real world. We attribute these successes to the following factors: **In the applied skills segment**, 1) the use of the real-world project to foster practical application of the SDLC, 2) the immediate application of course readings and activities to the client project, 3) emphasizing the non-technical side of IS by spending most of the course (6.5 of 10 weeks) on analysis, design and testing, 4) constant critiquing and revision of project plans to show how projects evolve and

5) requiring relentless presentation and explanation of projects to foster the ability to not just develop systems, but also articulate what these systems do. **In the conceptual segment,** 1) forcing participation. Even those who usually sit idly must contribute. Although more difficult for the instructor to enforce, this is where the real learning takes place. 2) Reinforcement of course concepts by actual IS professionals. When students hear it from the instructor, it only penetrates so deeply. When hearing it from a potential employer, students take notice. 3) Concept integration modeling activities to force a systemic understanding of IS concepts (e.g., ERP, CRM and SCM and how they can be integrated through XML) and how they can be applied to resolve business problems. Understanding these concepts individually is important, but the real win takes place when students begin to see how they can all fit together to form complex systems and solve business problems.

To further validate the effectiveness of our capstone model, we plan to conduct deeper analysis of the current data set, and to expand the scope of our research to include feedback from project clients as well as the employers of our students. In addition, we plan to pursue a longitudinal case study to track the career progress of our students compared to non-capstone peers. We invite faculty from other IS programs to utilize our pedagogical techniques for teaching the IS capstone and we welcome your feedback. We would be pleased to provide you with more detail on syllabi, course schedules, content, our teaching approach, and the methods/results of our study.

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