Keeping the MIS Capstone Relevant: Three Cases

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Abstract

This paper reports on three cases where traditional capstone courses have been changed to maintain relevance in the face of changing technologies and business practices. The goal of capstone courses is to give students knowledge and experience in the field, improve self-efficacy, and help develop their communications and interaction skills in a real-world environment. The literature suggests that there is a continuing need for capstone courses. However, it may be time to move beyond the traditional applied systems analysis capstone project. This paper discusses three cases where instructors have changed their capstone projects to facilitate improved outcomes. These include a programming capstone where an entrepreneurial and business aspect has been added, an information systems capstone where the instructor has introduced cloud competencies and analysis of alternatives, and a management capstone with business competencies. The courses are described, innovations noted and outcomes reported. It is submitted that experiential capstone courses continue to be beneficial for students about to enter the workforce, and that innovative courses such as the three discussed are indicative of the direction of future efforts.

Keywords: Capstone, Applied Student Project, Systems Analysis, Experiential Learning, Emerging Technologies.

1. INTRODUCTION

This paper examines three cases where the instructor has changed the course to improve or recapture relevance. Changing technologies and business practices have altered organizational business models where students will perform their IT or business tasks. To ensure that experiential capstone projects add value and remain relevant, instructors must continuously modify courses to include current technologies, processes and paradigms.

The high level goals of a capstone experience are to enhance and reinforce student learning, give students an opportunity to encounter and acquire practical knowledge, improve their task and personal self-efficacy, provide practice with basic consulting activities; and learn to assess, select, acquire, and incorporate emerging technologies.

New and emerging technologies and changed business paradigms have altered the landscape of systems development and the practical demands of the IT work environment. Although the literature suggests that experiential capstone courses remain necessary and relevant, it is

argued that the traditional capstone paradigm of an applied systems analysis project and prototype or partial development effort of a functional system is no longer an adequate model for training IT professionals.

This work examines three specific courses where the instructor has examined the legacy course, and made a dedicated effort to change the course to meet the demands of current practices and business needs. It is submitted that the changes to traditional capstones made in these three courses represent the wave of the future in experiential capstone courses.

2. LITERATURE REVIEW

Capstone Value

It is widely accepted that legacy capstone projects have added value to MIS programs. We have summarized a number of the primary experiences, and predicted value contributions below. Dunlap (2005) suggests that introducing students to problem-based learning in a capstone course improves their ability to solve real world problems. Increasing self-efficacy helps students solve problems they may otherwise not have attempted. Others (Gupta & Wachter, 1998; Lesko, 2009; Brandon, Pruitt & Wade, 2002) suggest that capstone courses help students integrate competencies and tasks and acquire practical knowledge.

Cameron (2008) finds that the integrative nature and enterprise focus of the capstone prepares students to be immediately productive in industry. Novitzki (1998) discusses developing a capstone course to foster integration, and discusses the problems encountered upon its initial presentation. Solutions are suggested for the problems encountered, with Novizki (1998) finding that the capstone experience improves real-world experience and adds value to student programs.

Gupta & Wachter (1998) make the case that a capstone course could be used to integrate emerging technologies. They additionally propose delivery methods that may be useful in that context. These include targeted assignments and Situation Analysis Reports (SAR). The targeted assignments are designed to lead students to consider the targeted scenarios, with outcomes defined in advance. Case studies help students understand the impact of technology on the enterprise. The SARs help students identify specific business problems and define how technology may be leveraged to solve the problems.

Capstone courses improve student confidence. A 2005 study (Dunlap) suggests that capstone projects introduce students to problem-based learning, and increase their problem solving self-efficacy in realistic environments. This increased self-efficacy facilitates participant attempts to solve problems they would not have otherwise attempted. The table below summarizes the value proposition offered in the literature.

Experience	***Value***
Problem-based learning	Improves ability to solve real world problems.
Hands-on experience	Increases self-efficacy
Acquire practical knowledge.	integrate competencies and tasks
Integrative, enterprise focus	Students immediately productive
Gains experience	Real-world based
Targeted assignments and Situation Analysis Reports (SAR).	Ability to integrate emerging technologies.

Table 1. Experience and Value

Why Capstones?

The impetus for the capstone appears to be based in AACSB standards and accreditation requirements for business schools. Capstones are not in themselves a *discipline*, or study area. However, they are supported by Standard 9 and the general change to the curriculum committee charges. These task programs to develop a curriculum that ensures content appropriate for the expectations of students within degree program type and school learning goals. (AACSB, 2017). The definition included by the AACSB addresses curricula management processes, and requires that learning experiences prepare students for business and management careers.

The knowledge content areas are general and expected to be treated as competencies consistent with learning goals. However, none of this calls about the capstone experience or defines what a capstone is to accomplish. However, the AACSB does call for student experiences to integrate real-world business strategies and to address many topics such as privacy and security, ethical issues, data management, data analytics, technology driven changes, and decision making complexity. Similarly, specialized business master's degree programs are charged with addressing the

problem of integrating knowledge across the general study fields.

This series of charges and standards appears to be both formally and informally the support behind the introduction of capstones in programs in business schools. The goals and outcomes indirectly include capstones whether they be major research efforts, projects, simulations, or some other experience. Thus, it is entirely appropriate to seek ways to upgrade and address the experience of students today, and to bring them into line with the work that is encountered in the jobs that graduates will take.

Introducing Emerging Technologies
The literature and AACSB standards support the importance of incorporating emerging technologies into the capstone. Kumar (2006) addresses strategies to include emerging technologies in the capstone to keep it relevant. Kumar suggests that a failure to incorporate emerging technologies makes students less competitive on the job market. While most institutions do not have the agility required to quickly change curricula, rapid content and exercise changes may be made to specific courses to add or improve learning outcomes. This increases the ability of a program to improve its offering, and provides an educational strategy to achieve this result.

One of the most significant emerging technologies currently changing the information systems field is cloud computing. Roggio (2011) successfully developed a capstone course which required students to use cloud competencies.

Innovative Examples
Pike, Spangler, Williams and Kollar (2016) develop a capstone project whereby a cross-functional team of accounting and information systems students collaborate to design a solution to an accounting business project. The students receive credit for completing a capstone in their respective fields. In another 2016 paper, Wong, Pepe and Englander discuss the creation and implementation of a parallel development mobile web app and android phone app. They find that the complexity of the project yields valuable experience to student portfolios.

McGann and Cahill (2006) developed a capstone incorporating, in addition to experiential and conceptual objectives, a focus on soft skills such as interpersonal communication, teamwork, and project management. This was also found to be successful. Indeed, soft skills are a recurring theme in current discussions of experiential courses.

3. THREE CASES

Reinvigorating a Programming Capstone
Touted as a programming capstone, the course goals include providing students with hands-on experience designing and building web based applications. In the legacy course, the instructor had the students attempt to build a complete application, individually or in groups, during the one semester course. It was found that students often failed to complete their projects, due to the complexity of doing planning, designing, building, and testing - all during a single semester (of approximately 14 weeks). Completions of *working* capstones of this type are almost impossible during abbreviated summer sessions.

After reviewing the course, the instructor decided to change the course to improve student soft skills, particularly lacking in a programming course, and to change the format to make the course more realistic. He focused on not only the development aspects of the application, but also the championing of the project and marketing of the concept to investors. He envisioned the students working on prototypes for a Kickstarter (Marom, Robb, & Sade, 2016; Etter, Grossglauser, & Thiran, 2013) type of scenario where they would then sell the prototypes with the idea of having someone fund their projects. Kickstarter is a well-known global crowdfunding platform dedicated to facilitating creativity.

In keeping with the goal of having the students develop the competency of selling their ideas to potential investors, the professor invites guests from industry and academia to play the role of potential investors. Uniquely, the instructor bases some 10 percent of the course grade on feedback from these participants.

The result is that students gain value beyond that of a large coding project. The instructor's goal of developing student soft skills is accomplished, and student feedback is uniformly positive.

Improving Business Competencies:
This upper level course uses a traditional simulation exercise to stress the integration of key business functional areas. The course seeks to enable students to student practice integrating the functional theory courses through student problem-solving and decision-making skills by making strategic management decisions regarding production, investment, financial allocations, market selection, etc.

The innovation introduced into the class seeks to improve student understanding of industries, competitive firms, and the reasons some firms within industries are more innovative and develop competitive advantages of others in the industry. Additionally, the course helps students understand and consider the effects business changes or improvements can have on innovation and business performance, and to explain how innovation and business performance is related to the overall business environment. The class broadly seeks to contribute to student understanding of entrepreneurial activities, innovations, market dynamics and turbulence, as well as business performance.

The course introduces industry level competitive analysis, and individual company business understanding. Key questions posed to students, as they select industries and companies to study, include what does this company do? How do companies in this industry make money (what is the business model)? Who are its major competitors? How are they doing? What are annual revenues, stock price, earning, and market valuation? Is the company growing? Is it facing competition from overseas? Does it have an exchange rate concern? Is it regulated? Who is the regulator? Is it facing any environmental or legislative pressures? If you had $ 10,000 to invest, how much would you put in this company?

The capstone project paper requires that students demonstrate their ability to critically analyze the issues that confront the target organization, discuss the strategic responses of the organization, and recommend a future stringy for the focus organization. For deliverables, students complete three industry analyses, with the third including a paper and capstone presentation.

The development process of the final project requires that a target company be selected and discussed. The project introduction section requires students to address industry, background, history, products, services, financial position and current business strategy. Addressed within the context and terminology of the fundamental strategies covered in the course and text are industry background, finances and average or expected financial ratios of companies in this industry, and information technology used. Further consideration must be given to the impact of industry size to include dollar volume, number of sales, number of competitors, number of clients/customers, industry segmentation, size, industry challenges, and concerns for regulation.

In the next section, the course addresses functionality, how the industry works, the competitive landscape, and primary business model(s). These include factors that are hurting and/or helping businesses stay open, and trends that might be exploited (with empirical data and analysis supporting these ideas).

In the third section, market analysis is required to define the major characteristics of the specific industry and to explain what gives *any* businesses a competitive advantage in this industry. This analysis includes the process of obtaining and storing products and delivering them to customers by identifying major suppliers and distributors in the industry, and assessing how effective and accessible the existing suppliers and distribution systems are functioning.

Finally, the capstone incorporates a competitor discussion ranking the competitors, identifies their strategies, and provides a likely success assessment. As an innovation, the capstone creates and argues for a new or modified business strategy recommendation (with analysis and reasoning). Metrics are developed and used for the competitor evaluation.

Each capstone team must also make a presentation, as if to an owner/investor or managerial board. The presentation addresses three primary interrelated topics: (1) overview of industry including customers, competitors, product, production/service delivery methods, and current business strategy, (2) history and implementation of the dominant business processes used in the industry, (3) business enablers or drivers in the industry, (4) proposal for the *new* business, and (5) an example of how the business would meet the needs of a typical customer.

The revised course demonstrates to students how business improvements can be made in industry, and that the metrics and measures for comparing businesses have wide applicability. The strategic industry groups are important in an age when investments, analytics and technology are obviously driving many business successes and causing others to fail.

Student target organization and industry selection with data showing the influences on short-term and long-term measures of performance is interesting to students and beneficial because of its comparative value. Students acquire an understanding of firm (management and, investment, innovation, etc.), strategic group, and industry effects and

performance. Research has shown that firm effects are the strongest, and that strategic group effects and rivalry may outweigh the industry performance effects. (Short, Ketchen, Palmer, Hult, 2007).

The end result is that students become well-versed in metrics, analytics, and factors both solid and intangible, which stand students in good stead as they become managers in business enterprises.

Consulting and the Cloud

In a continuing education bachelor's degree program, an instructor changed a traditional systems analysis capstone into one giving students consulting, cloud, and solution selection competencies.

The legacy course focused on a traditional applied systems analysis with a requirements document as the final deliverable. The course was designed to integrate competencies learned throughout student programs. Although the course was successful, it was felt that improvements could be made in several areas.

Discussions with former students indicated that few were doing the type of large scale systems analysis that the legacy capstone focused on. Many were working as consultants. Cloud computing continued it emergence as a new and powerful paradigm.

It was decided to include all of the above factors in the design of a new capstone course. The course was divided into three sections. First, students would be introduced to individual consulting topics. Second, students would learn the basics of cloud computing. Finally, students would complete an analysis of alternatives on a real world project.

At the start of the course, Consulting topics are discussed, with handouts provided on consulting topics. Students are exposed to all aspects of working as an individual consultant. Examples include services profit models, bidding, statements of work, contracting, business development, benefits and healthcare, retirement, workplace conduct, human resources, etc. These topics are discussed in class, and students are assessed by completing homework on the handouts and discussions, by a quantitative examination, and by applying the consulting knowledge while working on group projects.

Students are next introduced to cloud computing through lectures, combined with library research. Following in-class discussions and lectures, the assignment is for students to individually find five relevant articles on improved cloud capabilities, to submit their findings in an annotated bibliography. They are assessed by grading of their annotated bibliographies, by turning their bibliographies into short 1250 word papers, and by their findings being combined with their teammate's findings as they prepare for their analysis project.

In their course projects, students are required to examine customer requirements, then devise a plan to analyze solutions and report on their analysis. They examine the capabilities of cloud providers, and develop findings and recommendations for the provider best meeting customer requirements.

When all relevant information is collected and analyzed, students prepare and present a final report with findings and recommendations in a format provided by the instructor. The report is the culmination of their semester project, and includes all information captured during the course, from background and requirements to findings and recommendations.

In summary, this course was changed from a traditional applied systems analysis to one where students acquired consulting, cloud, and alternatives analysis competencies while working on a real-world project.

4. CONCLUSIONS

This paper examines three diverse modifications to existing capstone courses. The first involves adding soft skills to a programming capstone, with students championing and marketing their projects to investors, instead of completing a large coding project. The second focuses on students using a business simulation exercise to analyze and derive insight into business processes in a real-world environment. The third course changes a traditional systems analysis capstone into a course helping students acquire consulting, cloud and alternatives analysis competencies.

Although these courses are diverse and vary tremendously in their content and goals, what they have in common is an intent to provide students with relevant, useful and needed competencies as they enter today's job market. It is submitted that these types of courses add value by including a hands-on real-world project,

with content relevant to projects they will be working on as they enter industry.

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