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## Innovation in Information Systems Education-II Enterprise IS Management: A Capstone Course for Undergraduate IS Majors

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## INNOVATION IN INFORMATION SYSTEMS EDUCATION-II ENTERPRISE IS MANAGEMENT: A CAPSTONE COURSE FOR UNDERGRADUATE IS MAJORS

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### ABSTRACT

As information technology becomes increasingly embedded in critical business processes, IT professionals continually seek to improve the security, reliability and performance of the systems for which they are responsible. Systems and network applications vendors are unveiling a wide array of new products designed to assist in this effort and the trade literature is devoting significant coverage to the IT operations processes required to achieve required IT service levels. Despite increasing industry attention to the importance of IS operations, the authors believe that such concerns are relatively unaddressed in the typical undergraduate business-oriented IS curriculum. This article describes a course currently offered at the authors' university that conceptualizes the enterprise management of IS as including both IS governance and IS management processes. The distinction allows for coverage of traditional content related to the strategic use of information technology while providing an increased focus on IT operational management issues.

**Keywords:** IT governance, IT operations management, IS 2002 model curriculum, ITIL, IT education

Editor's Note: The article is one of the prize winning papers in the AIS 2004 Innovations in IS Education competition chaired by AIS Vice President M. Lynne Markus. An overview of the competition is presented in CAIS Volume 15, Article 16, February, 2005.

### I. INTRODUCTION

*Did I tell you that this outage happened four shopping days before Christmas? And that our company does 80 percent of our business during December? ... Did anyone change anything? Of course, the answer was, "No." ... So while the business was losing approximately \$20k per minute because we were in our peak holiday retail season, we went from pointing our fingers at each other to eventually screaming at each other [Behr et al., 2004, pp. 19-20].*

The Gartner Group estimates that 80 percent of system outages result from operator error and that 80 percent of mean time to repair (MTTR) is wasted on non-productive activities [Behr et al., 2004, p. 15]. As the preceding vignette clearly illustrates, system outages can impact a firm's bottom line significantly. As information technology (IT) becomes increasingly embedded in

critical business processes, IT professionals must become more sophisticated in the operation of IT applications and infrastructure. While the trade literature devotes considerable attention to IT operational issues, we argue that content concerning effective IS operations is relatively absent in the typical business-school IS curriculum.

As with any generalization we acknowledge that exceptions exist; however, we base our generalization on:

- our reading of the *IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems* [Gorgone et al., 2002] (hereafter referred to as IS 2002),
- our knowledge of curricula offered at many peer institutions, and
- an extensive review of IS-management textbooks.

This article details a senior-level IT undergraduate management course designed to address this perceived shortfall. Section II presents a brief overview and discussion of the IS 2002 model curriculum as well as the typical treatment of internal IT management issues in widely used textbooks. This background information is followed, in Sections III and IV, by a description of a capstone IS management course designed for use at the authors' university. We close with a brief comparison between our proposed course and other capstone courses that are described in the literature (Section V) and a discussion of the tradeoffs implied by incorporating the suggested content into business-oriented IS curricula (Section VI).

## II. DISCUSSION OF IS 2002 MODEL CURRICULUM AND RATIONALE UNDERLYING COURSE DEVELOPMENT

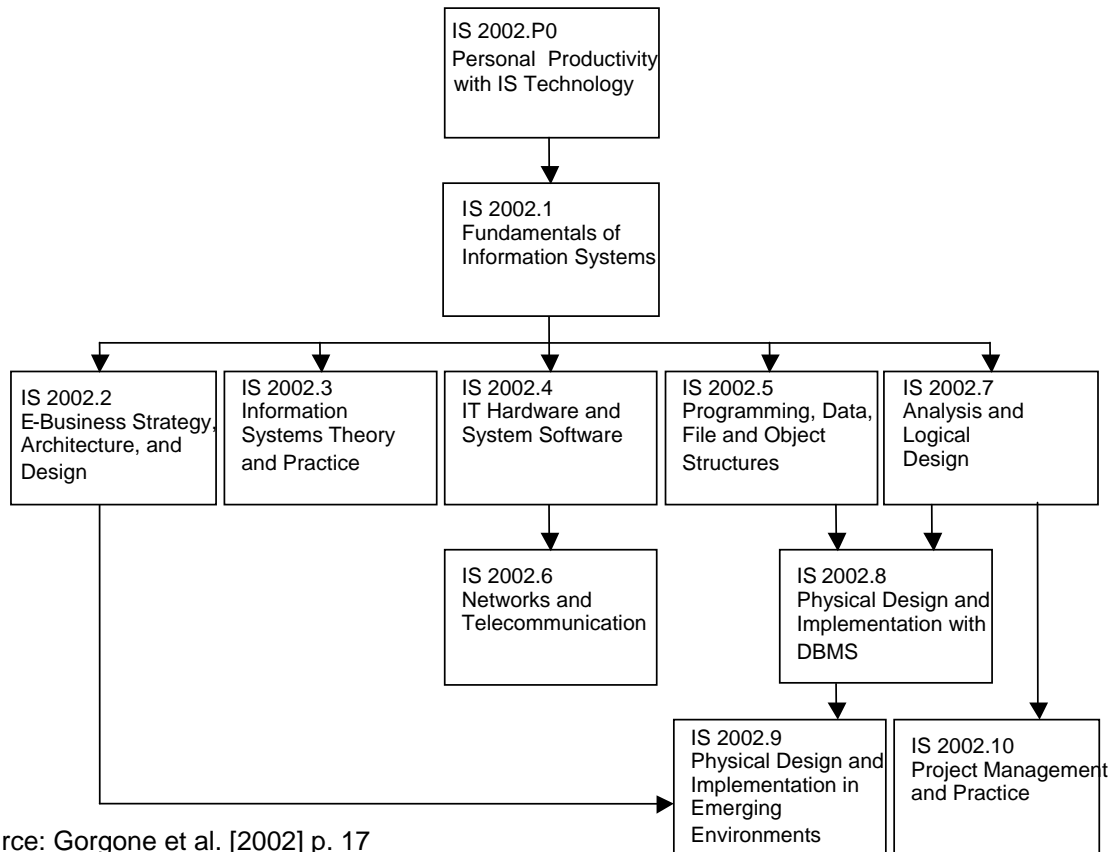
The IS 2002 is a collaborative effort by the Association for Computing Machinery (ACM), Association for Information Systems (AIS), and Association for Information Technology Professionals (AITP). The model curriculum is intended to assist universities in developing degree programs that will produce "graduates equipped to function in entry-level information systems positions with a strong basis for continued career growth [Gorgone et al., 2002, p. vi]. The IS 2002 conceptualizes information systems as "a field of academic study [that] encompasses the concepts, principles, and processes for two broad areas of activity within organizations:

1. acquisition, deployment, and management of information technology resources and services (the information systems function); and
2. development, operation, and evolution of infrastructure and systems for use in organizational processes (system development, system operation, and system maintenance)" [Gorgone et al., 2002, p. v].

The IS 2002 model curriculum reflects an in-depth analysis of the IS profession and a thorough assessment of the types of skills and knowledge that should be possessed by university graduates seeking careers in the IS professions. Although the curriculum represents an extensive effort on the part of distinguished IS academics and explicitly reflects input from the IS profession, the model curriculum, as outlined in Figure 1, underemphasizes activities and knowledge associated with IS operations<sup>1</sup>.

Succinctly stated, the IS 2002 model curriculum emphasizes IS strategy, applications development, infrastructure development and project management while paying rather less attention to the skills and knowledge required to design and manage IS infrastructure and operations effectively. This emphasis on IT strategy and applications development is reflected in many of the popular MIS management texts (Table 1) and also appears to dominate the thinking

<sup>1</sup> Rather than repeating much of the detail here, we encourage interested readers to consult the model curriculum report [Gorgone et al., 2002].



Source: Gorgone et al. [2002] p. 17

Figure 1. IS 2002 Representative Course Sequence

of those engaged in the development of capstone courses for IS undergraduates [Brandon et al., 2002; Gupta and Wachter, 1998].

As information technology becomes increasingly embedded within critical business operations, IS departments are called upon to support 24-hour-a-day, seven-day-a-week operations and to do so in a cost-effective manner. Add the ever-increasing awareness of IS security threats and the additional workload associated with intrusion prevention and incident response, and it is likely that an increasing number of students will be directly involved in IS operations and security management when they enter business. Business interest in IT operations and service management is receiving increasing attention by U.S. business as reflected by increasing adoption of practices outlined in the IT Infrastructure Library (ITIL) [Mayor, 2004; Dubie, 2004a; Dubie, 2004b; Millard 2004]. While much of this effort is directly related to increasing the quality of IT services and controlling infrastructure costs, IT auditing provisions of Sarbanes-Oxley Act place numerous IT management and operational processes under increased scrutiny [Johnston, 2004; Logan and Mogul, 2004].

The course proposal presented in this paper rests on the premise that a majority of existing business-oriented MIS/IS curricula emphasize skills and knowledge associated with IS strategy and business application development and tend to overlook the skills and knowledge required to design, support, and manage IS infrastructure and operations. We believe that this relative exclusion of infrastructure and operational concepts is problematic because:

- An increasing proportion of IS professionals will be employed in IS operations (e.g., IS service management, infrastructure management, information assurance) as IT becomes increasingly embedded in virtually all aspects of business operations.

Table 1. Popular IS Management Textbooks Coverage of IS Operations\*

Text	Emphasis on Operations
<i>Information Systems Management in Practice</i> [McNurlin and Sprague, 2004]	One out of 13 chapters covers managing IT operations (defines ops, discusses outsourcing, security and business continuity planning)
<i>Corporate Information Strategy and Management: The Challenges of Managing in a Network Economy</i> [Applegate et al., 2003]	One chapter discusses secure and reliable service. One discusses new service models for managing IT infrastructures (outsourcing and incremental outsourcing) and one chapter generally discusses organization of the IS function (primarily focusing on high-level discussion of centralized versus decentralized IT management).
<i>Information Technology for Management: Transforming Organizations in the Digital Economy</i> [Turban et al., 2004]	One section in Chapter 2 briefly discusses IRM and the role of IS department; strong chapter on evaluating IT investments. One chapter on managing information resources and security (still fairly light in terms of actual discussion of IT organization and processes).
<i>Essentials of Management Information Systems: Managing the Digital Firm</i> [Laudon and Laudon, 2003]	One section out of Chapter 1 briefly discusses management of hardware and software assets, TCO, capacity planning and technical service providers; a section in a separate chapter discusses change management and a chapter discusses information systems security and control.
* These texts are primarily designed for use in MBA core IS courses and are not necessarily intended for instruction of IS professionals. However, with the exception of the recent text, <i>Managing the Information Technology Resource: Leadership in the Information Age</i> [Luftman, 2004], we have not identified other texts specifically designed for the education of IS managers.	

- Improved knowledge of infrastructure capabilities and management is required if IS professionals are to contribute effectively to aligning IS and business strategies and communicating the business case for necessary IT infrastructure improvements [Rudd 2004].
- Many MIS/IS graduates take entry-level jobs in small or even one-person shops, where they are expected to support both IS operations and internal application development. Even those taking positions in larger organizations often start at help desk or other entry-level systems or network administration jobs where knowledge of service operations would be useful.
- Even students primarily focused on requirements analysis and applications development would benefit by developing an appreciation and understanding of the operational and organizational environment in which the applications they develop will be run.

Consequently, this article argues that IS curricula need to address internal business processes better because they comprise the day-to-day functioning of the IS activities. To that end, this article details an undergraduate senior-level “capstone” management-of-information-systems course that extends beyond the strategic IS management issues covered in commonly used IS management texts.

### III. CHALLENGES FACED IN DESIGNING AN OPERATIONALLY ORIENTED CAPSTONE IS MANAGEMENT COURSE

In teaching previous versions of this course, the authors noted several significant challenges, similar to those encountered in many upper-division business courses but particularly relevant to teaching IS students. First, the course emphasizes critical thinking over the delivery of content. Even as seniors, undergraduate students often resist being asked to reflect on rather than simply

to regurgitate information. We do introduce models and various types of management policies and prescriptions. However, we emphasize that the value of memorizing this content is minimal. The key to achieving success in the course is for the student to engage with the concepts offered and start to develop some degree of judgment with respect to how course concepts can be applied or misapplied.

In addition, many IS students are simply more interested in writing programs and configuring systems than learning about administrative processes and thinking about fuzzy organizational issues. Given that most students do not expect to assume managerial positions immediately and that many of these same students feel that they do not receive a sufficient technical (read hands-on) education, establishing course relevancy poses a serious challenge.

We attempt to circumvent possible student resistance by:

- minimizing time spent in straight lectures,
- providing “real world” examples illustrating relevant concepts,
- encouraging students to share relevant experiences,
- primarily assigning practitioner-oriented readings, and
- extensively employing group projects/assignments that require students to engage with the practitioner community.

#### **IV. COURSE OBJECTIVES, COURSE OUTLINE AND DESCRIPTION OF MAJOR ASSIGNMENTS**

Our course emphasizes enterprise IS operations management; yet it does not ignore IS strategy and governance issues. We developed a capstone IS management course intended to enable our students to:

- Identify and explain strategies for employing information systems and technology to support business/organizational strategy (this objective constitutes a review of content provided previously).
- Identify and explain commonly prescribed IS management practices and be able to evaluate potential difficulties that organizations can face in attempting to implement these practices.
- Define IS governance, identify and demonstrate an understanding of the relationship between IS governance decisions and business strategy [Weill and Ross, 2004].
- Explain the purpose of, and demonstrate an ability to perform, IS/IT investment analyses and technical product evaluations with minimal supervision and technical assistance.
- Compare and contrast IS management processes associated with IT infrastructure management and IS service management.
- Explain how an organization's culture can influence IS management effectiveness.
- Identify and explain how common organizational/group behaviors and personal idiosyncrasies (cognitive biases) can adversely impact planning, implementation, and use of information systems.
- Evaluate potential strengths and weaknesses associated with various organizational configurations of IS activities.
- Sensitize students to ethical issues that they may face as IS professionals and encourage them to consider the challenges often faced in making ethical decisions.

Course assignments are designed to provide students the opportunity to improve their critical thinking, their verbal and written communications, and the ability to work in teams.

Figure 2 serves as a course map to assist the students in conceptualizing the course material and objectives [Nicholson & Johnson, 1999]. As we proceed through the course we explicitly identify interrelationships among the subject areas – particularly to reinforce how subjects encountered in core business courses contribute to successful accomplishment of IS management tasks. The course diagram is used to highlight the focus of each day's lecture and discussion. Figure 2 also identifies other subject areas drawn from the core business and liberal arts curriculum required of

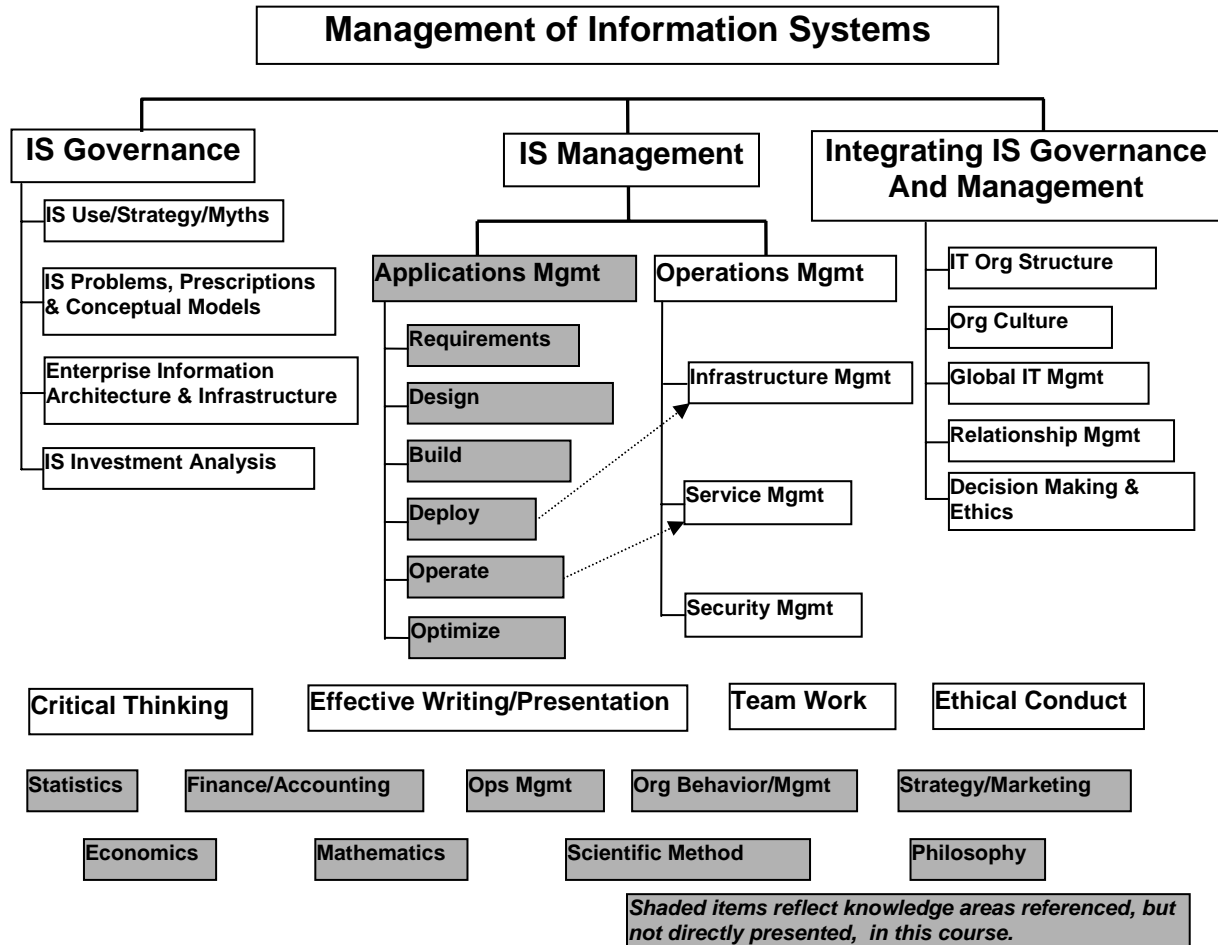


Figure 2. Course Map for Capstone Management of IS Course

our students. During lectures or discussion we explicitly relate the relevancy of these external subject areas to class topics so that students will more fully appreciate how the disparate concepts they have encountered during their program of study “hang together.”

Our course addresses three dominant ideas: (1) IS governance, (2) IS management, and (3) the integration of these two functions. IS governance and IS management reflect a useful distinction.

*Whereas the domain of IT management focuses on the efficient and effective supply of IT services and products, and the management of IT operations, IT*

*governance faces the dual demand of (1) contributing to present business operations and performance, and (2) transforming and positioning IT for meeting future business challenges [Peterson, 2004, p. 44].*

While Peterson’s [2004] depiction of these concepts reflects a somewhat tangential relationship between governance and management, we conceptualized an overarching concept, management of IS, that includes IS governance and IS management and explicitly describes an area of overlap or integration between the two domains as reflected in Figure 3.

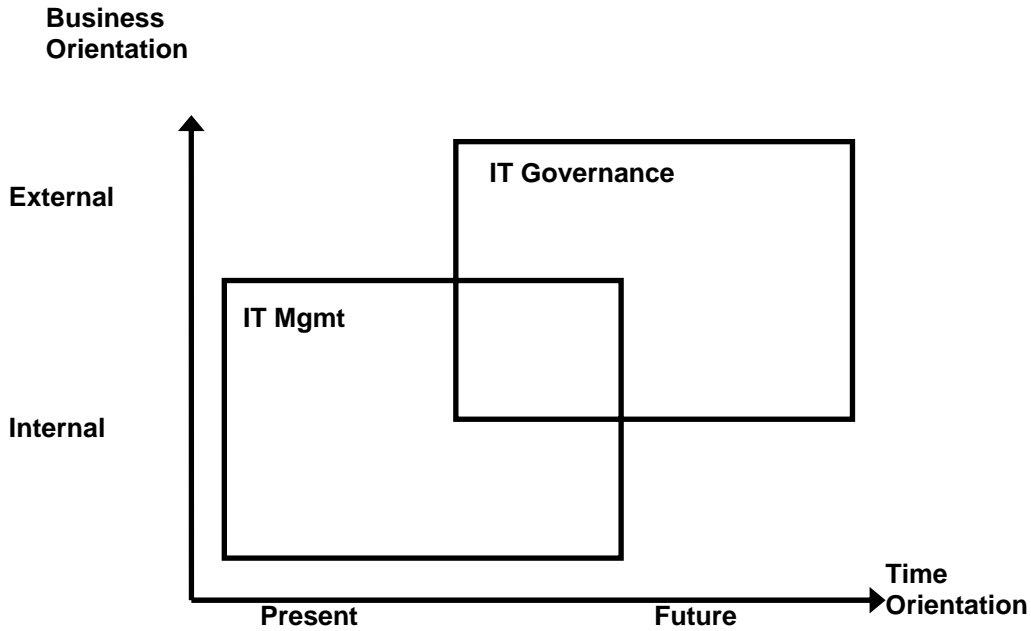


Figure 3. Conceptualizing the Management of IS [adapted from Peterson, 2004]

Table 2 provides the general sequencing of course topics and identifies assigned readings. The course is designed around 15 modules (weeks). At the undergraduate level, we allocate more time to the presentation of IS management-related topics, believing this approach reflects nearer-term needs and the intellectual maturity of students better.

**LOGIC AND EXPLANATION OF COURSE TOPICS**

**Module 1. Class Introduction**

Because this course is intended to be taken in the last semester of a student’s program of study, the introductory module of this class includes a limited baseline knowledge assessment. The baseline assessment is a short examination that gives students an opportunity to demonstrate an understanding of selected concepts they encountered in prior courses (e.g., correlation and causation, time value of money, opportunity costs). This test serves as a limited quality check on the effectiveness of our curriculum and provides the instructor an opportunity to explain the relevance of non-IT knowledge to IT practice.

The instructor provides a short lecture and leads a somewhat philosophical discussion of “knowledge.” While the students are inundated with a variety of theory and concepts throughout their studies, relatively few spend much effort reflecting on the nature of what they learn and why. The lecture includes quotes from Schön’s [1983] book *The Reflective Practitioner*, illustrating distinctions between theoretical and experiential knowledge and between tacit and explicit knowledge and discussing sources of knowledge. The objective of this discussion it to get the students actively engaged in thinking about both the usefulness and the limitations of theoretical



Table 2. Course Topics and Reading Assignments

Module	Topic	Readings
Mod 01	Individual Benchmarking/Course Introduction/Knowledge/Theory/Critical Thinking/Review of IT strategy	IT matters? [Carr, 2003; Brown and Hagel, 2003]
Mod 02	IT Governance: IT problems/challenges (macro and micro-levels)	IT Practice [Kern et al., 2001] Chapters 1&2. IS Problems [Markus and Keil, 1994]
Mod 03	IT Governance: IT management prescriptions and models; Introducing IT governance	Information Orientation [Marchand et al., 2000]; IT Governance [Weill and Ross, 2004]
Mod 04	IT Governance: Building the enterprise information architecture (change/service/security mgmt exercise)	Enterprise Information Architecture [Zachman, 1987]
Mod 05	IT Governance: Planning IS investment analysis (Linux and Windows-based Infrastructures TCO analysis)	IT Investment Analysis [Garrigues et al., 2004]
Mod 06	IT Mgmt: Developing a world class Infrastructure – process orientation and organizational implications	IT Processes and Organization [Kern et al., 2004] Chapters 3 - 6
Mod 07	IT Mgmt: Intro to Infrastructure Management (ITIL)	Visible Ops [Behr, Kim and Spafford, 2004]
Mod 08	IT Mgmt: Service Management – Service Delivery (ITIL)	IT Service Mgmt, Sections 1-10 [McFarlane and Rudd, 2003]
Mod 09	IT Mgmt: Service Management – Service Support (ITIL)	IT Service Mgmt, Sections 11-17 [McFarlane and Rudd, 2003]
Mod 10	IT Mgmt: Security/Information Assurance Mgmt (ITIL)	Chapters 1 and 7, security cases and principles [McCarthy, 1997]
Mod 11	Integrating IT mgmt: Linking governance and management; SLAs and relationship management	SLAs: The Heart of the Matter [nextslm.org, 2004a]; Best Practices [nextslm.org, 2004b]
Mod 12	Integrating IT Mgmt: IS organization structure	IT organization [Kern et al., 2001] chapters 7 – 9 & epilogue
Mod 13	Integrating IT Mgmt: Organizational culture/ IT culture/managing global IS	Organizational Culture [Schein, 1996; Larsen and King, 1996]
Mod 14	Integrating IT mgmt: Personality matters: Cognitive biases, group influence and managerial decision-making	Executive delusions [Lovallo and Kahneman, 2003]
Mod 15	Personal and Business Ethics	ACM Code of Conduct [ACM, 1992]

models presented in class and motivate their participation in the experientially oriented group activities.

Finally, module one includes a brief review of IT strategy. Students were exposed to much of this material previously in the core IS course.

### Modules 2 and 3. IS Governance Overview

The next two modules seek to assist the students in developing an overall conceptualization of the course, introducing IS governance and establishing the relevance of that content to their future professional endeavors. Specifically, the instructor seeks to establish the relevancy of the course by:

- Presenting his conceptualization of the course as reflected in Figures 2 and 3. We define the management of information systems as including IS governance and IS

management functions or activities. In rudimentary terms, IS governance includes the processes that an organization uses to do the “right stuff” with information technology; IS management includes the processes that an organization uses to help it ensure that it is doing the information technology stuff right.

- Encouraging the students to debate arguments offered in Carr’s [2003] article about whether IS is truly strategic while reinforcing concepts regarding the roles that IS can play in business. Students also analyze myths of strategic systems identified by Senn [1992].
- Identifying the “IT productivity paradox” and common problems and complaints regarding IS services. It engages the students in a discussion regarding why these problems exist. Discussion relies on problems outlined in the Kern et al. text and is supplemented by problems discussed in current trade literature.
- Introducing students to the prescriptive IS management literature, several IS management models [e.g., Sambamurthy and Zmud, 1994; Rockart et al., 1996; Ross et al., 1996; Feeny and Wilcocks, 1998; Marchand, et. al., 2000].
- Asking students to analyze the practical benefits and limitations of several common IT management prescriptions.
- Introducing the concept and practice of IS governance, relying primarily on the work of Weill and Ross [2004] and Peterson [2004].

Whenever possible, we encourage students to relate the content of these lectures and discussions to their own experiences.

#### **Modules 4 and 5. IS Governance Processes**

The next two modules address two important activities that an organization should conduct in support of its governance efforts. The first is the creation of an enterprise information systems architecture; the second is the conduct of IS investment analysis. In the presentation of both activities we emphasize the importance of effective working relationships between IS professionals and business managers. In addition to lecture and discussion, students are given in-class exercises relating to their group projects (discussed below) providing at least a limited opportunity to apply these concepts. Furthermore, we emphasize to the students that they are using concepts learned in their finance and operations management classes to perform these tasks.

#### **Modules 6 through 10. IS Management Organization and Processes**

These five modules provide a fairly detailed examination of the internal organization of and processes employed within large IS support activities.<sup>2</sup> After reviewing a wide variety of academic texts and practitioner-oriented books, we selected *IT Organization: Building a World Class Infrastructure* [Kern, Galup & Nemiro, 2000] as the primary course text. As with any text, the book does have its limitations, but we have found it to include an insightful discussion of the day-to-day challenges faced by IS-operations personnel and the most thorough discussion we read concerning the internal IS organizational structure. Frankly, we do not share all of these authors’ conclusions and recommendations but use this disagreement to illustrate that professionals can legitimately debate solutions to complex problems.

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<sup>2</sup> We acknowledge in the course concept map (Figure 2) that application management is a critical function of most IS activities. However, because our core CIS curriculum requires multiple programming courses, two systems analysis courses (the second of which includes planning and implementation of a significant project), a database course, and the opportunity to select a project management course as an elective, we believe that the students do receive an adequate exposure to applications management processes.

While Kern, et al. identify key operational processes required for effective IS operations management, it is fairly weak in addressing how these processes are accomplished. We supplement the text with practitioner-oriented readings published by the Information Technology Process Institute and the IT Service Management Forum [Behr et al., 2004; McFarlane and Rudd, 2003]. *IT Service Management* [McFarlane and Rudd, 2003] is a condensed version of the two service-management related publications of the IT Infrastructure Library (ITIL) describing critical processes associated with service delivery and service support. *The Visible OPS Handbook* [Behr et al. 2004] is another condensed publication that suggests an approach for implementing ITIL processes in an organization. These documents form the primary basis for lectures, discussion and in-class exercises on the primary operational processes of IT infrastructure management, IT service management and security management. We are not entirely satisfied with this material and continue to seek content better suited to classroom use.

### **Modules 11 through 14. Integrating IS Governance and IS Management and Understanding Barriers to Effective Management Practice**

In these four modules we close the loop by helping our students recognize the critical interdependence of IS governance and IS management activities. We begin the last major topic area by expanding the previously introduced concept of “service level agreements” (SLAs). SLAs are introduced in our presentation of service management. We emphasize that both business and technical factors must be addressed for SLAs to be effective. We differentiate the use of IT metrics for internal management of the IS function from metrics more directly relevant to IS users. These readings reinforce the necessity of building effective working relationships between the IT organization and business activities supported.

We then assign several readings that address organizational and individual behavioral issues that can undermine the establishment of effective working relationships, undermine implementation and impede effective use of information technology [e.g., Schein, 1996; Larson and King, 1996; Lovallo and Kahneman, 2003]. We strive to reinforce concepts students were exposed to in their marketing and organization behavior courses and demonstrate the relevancy of these concepts the effective management of information systems.

### **Module 15. Business and Personal Ethics**

We close the course with a discussion of business and personal ethics. However, we do not save the entire subject of ethics for last. We find multiple occasions to identify ethical issues as we proceed through the course. At this point we want students to take the time to reflect on the types of situations they may encounter in their professional careers. We point out that ethical decisions that appear easy to make in the classroom may prove much more difficult to make on the job when facing the possible loss of employment. We also advise students to consider the types of cognitive biases and group behaviors discussed in the previous classes and how they might influence someone to behave in a manner inconsistent with his or her personal values. Finally, while we do not espouse a particular ethical framework, we advise students that evidence suggests that those who have considered ethical dilemmas prior to actually being faced with them generally are more successful in acting in a manner consistent with their values.

### **DESCRIPTION OF MAJOR GROUP ASSIGNMENTS.**

Because we are unable to place each student in an appropriate work environment to gain the desired experience, we developed the following assignments to provide the students with useful experiences that we hope will help improve their understanding and integrate the wide range of material they encounter in this class and in their entire program of study. The class includes three significant group assignments:

#### **Assignment 1: IT Manager Survey**

Students are required to conduct an interview with a local IT manager. The baseline interview includes questions about the manager’s hiring practices and preferences and a discussion of the

most significant job-related issues that the manager faces. This assignment asks for two deliverables. The first consists of the completed questionnaire. The second is an informal in-class presentation where the students share their findings and experience with other members of the class.

We see several benefits to this assignment. The students receive at least a limited exposure to the views and perspectives of multiple managers working in a variety of IT managerial positions and organizations. We can generally count on the managers to identify issues that relate to class content. This knowledge helps establish the relevancy of at least some of the class content and allows students to relate general concepts to practice. An ancillary benefit of this assignment is that it allows students to meet and speak with IT managers and help them be more comfortable when they go on job interviews.

### **Assignment 2: Business Plan**

This assignment constitutes a major semester-long project to develop a business plan for a start-up IS services firm. In addition to submitting the written plan, students present their plan formally to a board of faculty members and IT professionals for evaluation. The logic for this assignment is that since it is not practical for our students to set up and operate an IS facility, and we do not have the means to give all students developmental internships, we want to give them as realistic an IS management experience as possible. To create a realistic business plan, students must conduct competitive market research to identify proposed service offerings, potential competitors, and realistic service charges; design and cost an IT infrastructure; develop an operational concept and staffing plan; and conduct the financial and risk analyses required to assess the viability of the proposed business. This effort requires application of many of the concepts presented in the course and provides students the opportunity to improve their teamwork, presentation, and project-management skills.

### **Assignment 3: Technical Evaluation and Tutorial**

IS professionals can eventually expect to participate in evaluating and recommending the purchase of enterprise-class technology. This assignment calls for each group to select a type of software application associated with infrastructure development or operations, evaluate at least two products, and prepare a decision memorandum recommending the selection of one of the products. Students need to identify, clearly, the proposed requirement, select appropriate criteria (e.g., technical, functional, cost) on which to base the purchasing decision, and develop a sufficient understanding of the technology required to perform this evaluation. In addition to the decision memorandum, students prepare a technical tutorial for presentation to the class. This assignment provides students with the opportunity to demonstrate an ability to perform professional quality product evaluations and practice their presentation and writing skills.

## **V. A TENTATIVE ASSESSMENT OF RECENT CHANGES**

At the time of this writing in 2004, the primary author just completed his first effort at teaching a class largely based on the course design described in Section IV. On the first day of class, students completed a knowledge survey based on the learning objectives listed in Table 2. They assessed their current knowledge concerning the learning objective on a five-point scale, where a "1" indicates no substantive knowledge of the subject, a "3" indicates that they recognize the subject area but are not sure they can fully explain it, and a "5" indicates that they are confident they could fully explain or apply the identified concepts. The results of this preliminary survey indicated that the students did not feel that they possessed much understanding of the learning objectives identified. Their averaged responses were fairly tightly clustered, with a low average response of 1.90, a high average response of 2.42 and an overall mean for all students and all learning objectives of 2.36.

As part of the final class evaluations, students again assessed their level of understanding in the identified learning objectives. While the improvement was significant (the mean response for all

students and all learning objectives rose 1.02 points to 3.38) the instructor was disappointed with the results of this initial effort. After explicitly covering the material in readings, lectures, discussion and assignments, we hoped to see scores in the 4-plus range.

We attribute these less-than-desired results to two factors:

First, the class size was small (12 students). Two students failed to find much relevance in any of the class material. Not surprisingly, their self-assessed learning achievement was lower than the class average. However, even excluding these scores, we still were not satisfied with the results achieved and looked to instructor performance for further explanation.

Second, the business plan development was the key assignment intended to integrate the material provided in the lectures and assigned readings, particularly development of operational concepts, staffing requirements, IT infrastructure, service level agreements, and financial analysis. The instructor dedicated a significant amount of class time to group work on this project and made himself available to provide assistance and respond to questions. However, he failed to establish a set of interim deliverables where student progress could be monitored and the instructor would be able to provide guidance and feedback early enough to help students to adjust their effort. Consequently, the business plans were generally disappointing, and the students did not fully realize the intended benefits of the assignment.

Fortunately, this latter problem is rather easily addressed; interim deliverables will be assigned on the next iteration of this course. In addition, the instructor will continue to refine reading assignments and work to focus the lecture material and improve in-class discussion.

## VI. DISCUSSION AND CONCLUSIONS

We close this article with a brief comparison of the description of our course with similar courses described in the literature. Certainly, we are not the first to suggest that a capstone IS management course would be beneficial. Gupta and Wachter [1998] performed an assessment of IS skills needed by the upcoming generation of IS professionals, evaluated current IS educational programs and offered a well-thought-out capstone course. Although much of our thinking occurred prior to our reading this article, it is gratifying to note a high degree of similarity in the overall aims and objectives for such a course. Gupta and Wachter emphasize experiential learning assignments including: comprehensive case studies, a situational case analysis report (based on a real-life business situation) and completion of a major integrative project (again for an actual organization). We wholeheartedly endorse the premises underlying the sample course they present and believe the assignments described would be quite beneficial. Yet, while Gupta and Wachtel's proposed course provides much of the content integration that we wish to accomplish, we feel it still leaves the presentation of IS operations management too much too chance.

In a more recent review of IS curriculum developments, Brandon et al. [2002] provide a convincing rationale for a capstone course that incorporates a comprehensive IS project. As do Gupta and Wachter, they see the comprehensive project as providing students a significant opportunity to demonstrate competency in "relating business and information technology management (ITM), core ITM disciplines including systems analysis/design, database, applications development, telecommunications" and "creativity/critical thinking, writing, presenting and the ability to work as part of a team" [Brandon et al. 2002, p. 94]. Again, we fully support the objectives of such a course but also find IS operational issues to be generally overlooked.

It is possible to find significant similarity between the IS 2002 model curriculum [Gorgone, et al., 2002] and many of the MIS/CIS/IS programs currently offered in colleges of business. These programs generally include a core IS theory course that presents some level of systems theory, introduces information technology and generally emphasizes the strategic use of information technology in support of business practices. Typically the programs require one or two programming courses, a systems analysis/design course, and a database course. The variability

among programs is greater beyond this core. Many schools now require courses in data communications, systems architecture, project management, or e-commerce. And, of course, a wide range of electives are offered depending on the perceived needs of the particular program and the interests of the faculty.

We argue that the typical business school core curriculum explicitly and implicitly does a reasonably good job of addressing IS development and project implementation. Usually, project management is explicitly covered in the systems analysis/design courses and may be repeatedly touched on in the programming, core information systems theory, and database courses. We would not argue that this coverage of IS development is sufficient, but at least the subject is addressed to some extent. In comparison, IS operational issues may be briefly mentioned in the core IS theory course but generally only at the most rudimentary level.

In closing, we wish to emphasize that we do not disagree with the course and subject areas included within the IS 2002 model curriculum. The issue faced by the developers of the IS 2002, and one that is shared by virtually everyone interested in developing effective IS curricula, is the number of courses that can be required for completion of an IS degree – at least within accredited business schools. As indicated by the model curriculum, once a student completes the required liberal arts general and business core, approximately ten courses remain that can be taken in the IS major.

Given the limitation in the number of courses that can be required, the selection of content to be included in each course becomes even more critical. In almost any area of the IS program, we feel certain we can find academicians and practitioners who would like to add content they believe important. For example, a reviewer of this paper noted the increasing use of IT outsourcing and off-shoring of IT functions and was surprised that this topic was omitted from the course outline. As designers of this course, we considered the inclusion not only of outsourcing, but IT chargeback and IT operations in an international context. In the end the topics were not included for this undergraduate class. We were already concerned about trying to address too many topics and concepts for our students to absorb and decided to invest more time on fewer topics. We note that these topics typically are raised during class discussions. Furthermore, if we were teaching a graduate version of this course, we would be more aggressive in selecting topics and assigning readings such that all three topics referenced above would likely be included.

In contrast, one could question the inclusion of topics on organizational culture, group behaviors and individual cognitive biases in this course. However, our professional experience indicates that these topics have great practical relevance for IT professionals and that our IT students have tended to discount the value of these “soft” topics.

With respect to course and topic constraints, we are left with three rather unattractive options, as follows:

1. The “no change” option in which we accept the model curriculum as the best we are likely to accomplish within the institutional constraints faced by business schools and try to incorporate IT operational issues more effectively within the recommended course structure.
2. Substitute an IT operations-oriented course as outlined in this paper in place of one of the other courses recommended in the model curriculum. We essentially did that at our institution but are not completely satisfied with the tradeoffs entailed.
3. Consider changing the institution. An increasing number of multi-disciplinary information management programs are offered where the constraints of an accredited business degree are eliminated. (e.g., Trauth and Haffner [2000]). However, we would also approach this option with some caution. We do believe that much of the business core curriculum does provide value to our students. Curriculum designers will continue to make difficult tradeoffs in developing programs to meet the needs of their students and

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their students' future employers. We do suggest that the subject of IS operations not be omitted from the curriculum.

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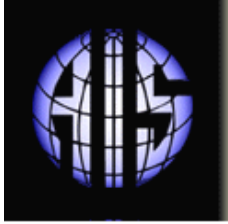
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