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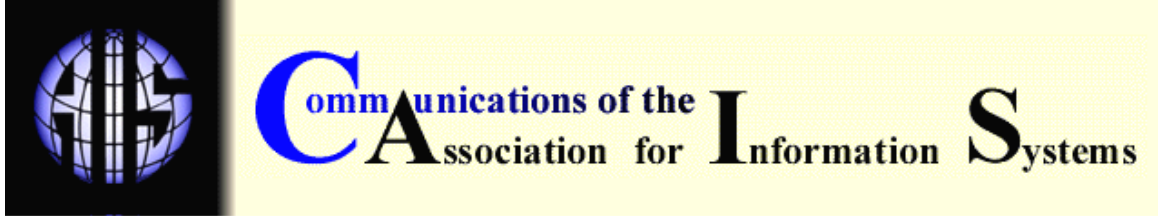
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ABSTRACT

The MSIS 2000 curriculum is now over 5 years old. That curriculum (the first revision for the MS program since 1982) was widely adopted by IS departments throughout the world. A committee established jointly by AIS and ACM started working in summer 2003 on revising and updating the MS curriculum based on the experience of the adopting schools. The work is nearing completion. This paper describes the state of the revisions as of April 2005.

Keywords: MSIS curriculum, MSIS 2006, MSIS 2000, graduate IS curriculum, systems integration, HCI, capstone course

I. INTRODUCTION

This paper outlines the proposed MSIS 2006 curriculum and the rationale behind it. The new curriculum recognizes that the existing MSIS 2000 curriculum Gorgone et al. 2000], based as it is on 30 units (10 courses)[1] of graduate work is limiting as the scope of the IS field grows broader. To determine how best to improve on MSIS 2000, a series of workshops for IS faculty were held in conjunction with conferences such as AMCIS, ICIS, and IAIM (see Section II). The input received from the IS community was concerned mainly with adding topics to MSIS 2000 which were deemed to be underserved. Such changes can only be made if:

      1.   The total number of hours of graduate work is increased, or

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[1] We assume a course to be 14-weeks long per semester, with three units of credit assigned. Variations such as quarters rather than semesters or four units of credit per semester are not discussed.

2.   Deletions are made to compensate for additions.

Given the feedback collected at the workshops, it became clear that changes, additions, and deletions are necessary. As a result, the basic program is increased to 36 units (12 courses). However, because some schools are constrained to 30 or even 24 units (10 or 8 courses) by institutional mandates on MS programs, we also indicate the subset of the program that is recommended for these more constrained situations.

The following sections of this paper discuss the rationale behind the revisions to the MSIS Model Curriculum, which is called MSIS 2006. Members of the IS community should note that this paper is a preview, an interim report subject to comment and revision. Members of the IS community are invited to comment on the version presented here[2].

II. FEEDBACK FROM IS COMMUNITY

Based on their experiences with MSIS 2000 and the changes in the worlds of technology and business, members of the community articulated the need to strengthen the emphasis on the following important concepts:

- Business Processes
- Globalization
- Impacts of Digitization
- Human-Computer Interactions
- Emerging Technologies

Analyzing this feedback, the committee recommends that programs add two of three new courses[3] to the model curriculum and that the other topics listed be integrated throughout the MS curriculum.

III. MSIS 2006

To understand the changes proposed for the MSIS 2006 curriculum, we begin with MSIS 2000 on which it is based. Table 1 shows the existing curriculum.

The changes in moving from MSIS 2000 to MSIS 2006 involve:

- Adding one IS Management course and one IS Technology course.

- Changing the content of the Integration course to an integrated capstone course.

- Revising and expanding the individual courses in IS Technology to account for the increasing sophistication of technology.

- Reducing prerequisites, including deleting the IT Hardware and Software course from the IS Prerequisites and offering a two-course, graduate level, more IS-focused version of the Business Prerequisites.

The resulting MSIS 2006 curriculum is shown in Table 2.

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[2] Send comments to jgorgone@bentley.edu with MSIS 2006 in the subject line.

[3] As the reader will see, these courses are Emerging Technologies and Issues (mandatory in Technology) and a choice between The Implications of Digitization and Human Computer Interaction (HCI) in Management.

Table 1. Existing MSIS 2000 Curriculum
(30 Units plus up to 18 Units of Prerequisites)

IS PREREQUISITES	BUSINESS PREREQUISITES	IS TECHNOLOGY (9 units)	TRACK (12 units)
Fundamentals of IS IT Hardware and Software Programming, Data and Object Structures	Financial Accounting Marketing Organizational Behavior	Data Management Analysis, Modeling, and Design Data Communications and Networking _____ IS MANAGEMENT (9 units) Project and Change Mgmt Strategy and Policy Integration	4 courses in depth on a particular subject including, where possible, a practicum course experience in industry.

Table 2. Proposed MSIS 2006 Model Curriculum.

IS PREREQUISITES	BUSINESS PREREQUISITIES	IS TECHNOLOGY	TRACKS
Fundamentals of IS Programming, Data and Object Structures **(IT Hardware and Software) ******	Financial Accounting Marketing Organizational Behavior *Or:* **Two course graduate sequence on integrated business functions and processes*****	**Enterprise Models** Analysis, Modeling, and Design (including **HCI* and Data Management)** **IT Infrastructure** **Emerging Technologies and Issues** _____ IS MANAGEMENT Project and Change Management Strategy and Policy **Integrated Capstone**** **Implications of Digitization** or **HCI***	4 courses in depth on a particular subject including, where possible, a practicum course experience in industry.

Key: **Bold** indicates change from MSIS 2000
*   If HCI is selected as a standalone course, then it is not included as a major focus within Analysis, Modeling, and Design
**   Replaces Integration course in MSIS 2000
***   A new alternative to Business Prerequisites (see Appendix I)
****   This prerequisite course, required in MSIS 2000, is deleted

IV. MOVING TO MSIS 2006: A TWO STAGE PROCESS

In this section we describe the procedure for moving from MSIS 2000 to MSIS 2006. The section is written at the broad, course level of detail. The specifics of the content of the new courses are

described in Section V.   In addition, we describe variations required for schools whose MS programs are limited to 30 or 24 hours by their institutions.

Moving from MSIS 2000 to MSIS 2006 in one step (e.g., a 'big bang') may be possible for some schools. For most, however, a phased, two-level implementation is recommended. For simplicity, these changes are labeled Level 1 and Level 2.

The two levels differ in what is emphasized.   In Level 1, two courses are added (one in management and one in technology) and two courses are modified. These changes can be made one at a time, almost independent of one another. In Level 2, the emphasis is on upgrading the sophistication and cohesiveness of the entire set of IS technology offerings to be in line with technological advancements. Level 2 corresponds to a full implementation of MSIS 2006.

LEVEL 1 CHANGES – CHANGING THE COURSE STRUCTURE

This first level of change is the simplest one. It is achieved by:

- Deleting one prerequisite (IT Hardware and Software) thereby reducing prerequisites to 15 units.

- Adding one course to the IS Management component and one course to the IS Technology component. These additions raise the number of required units to 36.

- Modifying one or two existing courses.

The program is shown in Table 3.

Table 3. Level 1 Changes
(36 Units Plus up to 15 Units Of Prerequisites**)**

IS PREREQUISITIES	BUSINESS PREREQUISITIES	IS TECHNOLOGY	TRACKS
Fundamentals of IS ~~IT Hardware and Software~~ Programming, Data and object structures	Financial Accounting Marketing Organizational Behavior *Or:* **Two course graduate sequence on integrated business functions and processes**	Data Management Analysis Modeling and Design **(including HCI and Data)** Data Communications and Networking **Emerging Technologies and Issues** _____ IS MANAGEMENT Project and Change Management Strategy and Policy **Integrated Capstone** **Implications of Digitization or HCI**	4 courses in depth on a particular subject including, where possible, a practicum course experience in industry.

Note: Bold denotes changes from MSIS 2000 to achieve Level 1.

In brief, the changes involve the following:

1. In IS Management, the Systems Integration course in MSIS 2000 is renamed "Integrated Capstone" and its content is broadened so that it looks not only at systems integration but also at topics that deal with day-to-day operations such as the ongoing management of the IS function, alignment, and business processes (See Section V). The strategy and policy course is not modified.

2. In IS Management, a new course is added. Schools can choose from either a course on the implications of digitization (e.g., security, ethics, regulation) or a course on Human-Computer Interaction (HCI). If the full HCI course option is adopted, HCI topics is not emphasized as much in the revision of the Analysis, Modeling and Design course.

3. In IS Technology, a new course entitled Emerging Technologies and Issues (Section V) is designed to bring students up to the forefronts of IS in practice. Its implementation can follow the IS Management changes for schools principally oriented toward IS Management.

4. In Business Prerequisites, an alternative two-course graduate level option is proposed. This course, described in Appendix 1, reduces prerequisite requirements for students with insufficient business background upon entrance.

Note that sequencing is possible in the order in which changes are made within Level 1. The choice of order depends on the school's emphasis. Schools with a heavy managerial emphasis and strength could make the changes in the IS Management group first, whereas schools with IS Technology strength could begin with those courses. We stress, however, that schools can start with either management or technology.

LEVEL 2 CHANGES—MORE SOPHISTICATED TECHNOLOGY OFFERINGS

Level 2 incorporates Level 1 and extends the changes in the program to add sophistication and depth to the IS Technology courses. The Level 2 MSIS 2006 IS Technology courses are compared to those in Level 1 in Table 4.

Table 4. Comparison of IS Technology in Level 1 and Level 2

LEVEL 1	LEVEL 2
Data Management	**Enterprise Models**
Analysis Modeling and Design **(including HCI)**	Analysis Modeling and Design **(**including **HCI and Data Management)**
Data Communications and Networking	**IT Infrastructure**
Emerging Technologies and Issues	**Emerging Technologies and Issues**

Note: The Emerging Technologies and Issues Course is the same in Level 1 and Level 2

Although management practices changed substantially in recent years, changes in technology were even greater. Given these changes, the curriculum revision recognizes that today's global firms do less of their own detailed technical work in areas such as programming, data base, data communications, and networking than in the past but more in such areas as designing the IT infrastructure, including the use of the Internet and Web services, and creating enterprise models. Furthermore, IT configurations incorporate emerging technologies, particularly "big ticket" items such as ERP and data warehousing at an ever-increasing pace. For these reasons the following changes are recommended in MSIS 2006:

1. Creating a course focusing on enterprise modeling to replace existing data base courses. Enterprise modeling centers on the technical aspects of the content delivered to users.

2. Expanding the Analysis, Modeling, and Design course so it includes consideration of the way data is used in applications, which is fundamental to analysis and modeling. If a separate HCI course is not offered in the IS Management sequence, the committee recommends that the Analysis, Modeling, and Design course should pay special attention to how humans interact with computers.

3. Creating a course focusing on the firm's IT infrastructure requirements and implementation. Note that such a course includes the major concepts of data communications and networking which are parts of the infrastructure.

VARIATIONS

Before discussing the changes in the courses, we briefly present variations on the program in Table 2 that can be used by colleges and universities that require only 30 or 24 units for an MS degree.

For 30 Unit Programs

- Option 1: Choose three of the five IS Management Courses + first three IS Technology courses + the full Career Track.

- Option 2: Combine IS Management topics in column 3 into three courses, selecting topics as appropriate + first three IS Technology courses + the full Career Track.

- Option 3: Use all five IS Management Courses + all four IS Technology courses, delete the Career Track and add one elective.

- Option 4: Delete the career track option and add two electives.

- Option 5: Choose three of the five !S Management Courses + all four IS Technology courses. Delete the Career Track and add three electives.

For 24 Unit Programs

Delete the Career Track

V. DEFINITION OF NEW/CHANGED COURSES

MANAGEMENT COURSES

Table 5 shows the topics we believe are appropriate for the new courses and for the revised Capstone course in the IS Management sequence. These topics represent a sample of the major topics envisioned by the committee for these courses. Additional details about these courses will be included in the Model Curriculum.

Note that the same topic (e.g. outsourcing, globalization, business processes, e-business) can be covered in several courses but from different viewpoints

The intent for the Integrated Capstone course is that at least six weeks be spent on systems integration since many MS degree holders will be working on integration projects.

Table 5. Definitions of New / Changed IS Management Courses[4]

IMPLICATIONS OF DIGITIZATION	HCI*	INTEGRATED CAPSTONE
Privacy Ethics Govt. regulations (Sarbanes-Oxley, HIPAA) Outsourcing Intellectual Property Virtual Work and Telecommuting Implications of AI E-business Security Digital Divide IT Workforce Globalization	The Participants and Their Roles (end user, IS professional, computer, information) Human-based Issues (perception, cognition, memory constraints, problem solving, affect, behavior) Evaluation Issues (evaluation methods, usability evaluation, user experience evaluation) Interactive Technologies (visual displays, information presentation, control devices input/output media) HCI Design (design principles and guidelines, design process, practical applications) Impacts of HCI (humans, work, organization, society, culture, international)	Systems Integration Managing the IS function (e.g., operations, desktop management, telecommuting, virtual work) Strategic Alignment of IT Globalization Outsourcing Business Processes

TECHNOLOGY COURSES

Table 4 showed the new lineup of technology courses. In Level 1, a new course on Emerging Technologies and Issues is added. This course is kept intact in Level 2. The rest of the technology program receives added sophistication and depth. Once implemented, these changes bring the technology offerings into current practice. Given the ongoing changes in technology, MS programs need to monitor new developments continually and integrate these changes into their curriculum. Schools should expect to integrate topics from the Emerging Technologies and Issues course into their technology offerings as developments move into the mainstream. In summary, the technology component takes a broad view that addresses the total infrastructure for hardware and the delivery of data content and applications for a combination of hardware and software.

Table 6 shows the subjects to be covered in the IS Technology courses.

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[4] The course topics in Tables 5 and 6 are tentative and subject to revision. Suggestions for improvement are sought and should be sent to jgorgone@bentley.edu with MSIS 2006 in the subject line.

Table 6. New and Revised Technology Courses

EMERGING TECHNOLOGIES AND ISSUES	ENTERPRISE MODELING	ANALYSIS,MODELING, AND DESIGN	IT INFRASTRUCTURE
E-business

Large Scale Systems (ERP, CRM,…)

Data Mining

Outsourcing

Web Services and Business Processes

Security

Business Intelligence

Knowledge Management

Mobile and Ubiquitous Computing | Information Content

Data Distribution

Managing SAN

Large Systems (ERP, CRM,...)

Data Warehouses/Data Marts

Business Intelligence

Knowledge Management

Data Mining | Analysis and modeling by starting with a data focus

Includes HCI considerations if Implications of Digitization is chosen rather than HCI as an IS Management course. | IT Architecture

Enterprise Information Infrastructure

Servers & Web Services

Layered Network Architecture

Convergence & Internet Protocols

Multinational Enterprise Global WAN Services

Enterprise Network Design

Wireless Technologies

Network Security

Network Management |

VI. CONCLUSIONS

We believe that the MSIS curriculum and its options outlined in this paper meet the variety of needs of schools around the world. We believe that "one size" does not fit all. Implementing these recommendations should reflect local constraints and objectives. We recognize that some institutions will implement the changes in stages while others will implement them all at once. For example, if a program begins by adopting our recommended Level 1, it adds two courses and revises the Integration course to meet the changing needs expressed by faculties teaching the MSIS 2000 curriculum. When adopting Level 2, the curriculum needs to evolve to a much richer and integrated level of sophistication that closely reflects the rapidly changing infrastructure and technology environments our graduates will face upon graduation.

We recognize that the curriculum is organized by courses. This arrangement is needed because of the way universities present information. However, the curriculum also needs to be examined in terms of issues (e.g., security, compliance, mobility, globalization). To show how the courses cross-cut issues, Appendix II presents a matrix that shows the course-issue interaction.

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APPENDIX I. AN ALTERNATE WAY OF SATISFYING BUSINESS PREREQUISITES

INTRODUCTION

The intent of the Business Prerequisite requirements for the MSIS program is to make sure that entering students are conversant with the knowledge and nomenclature of business that pervades the MSIS program. Over the years, the MSIS curriculum committee found that the standard approach of asking students to take selected traditional, stand-alone business courses (financial accounting, marketing, and organizational behavior) as a way of meeting this requirement left much to be desired. It required students from non-business disciplines to spend nine credit hours on undergraduate courses, almost a whole semester, to build a baseline of business knowledge. Unfortunately, many business topics needed by MS graduates are not usually covered in these courses (at least not from the IS point of view) while other topics not of immediate use to MSIS students are included. We therefore suggest a two-semester, two course graduate sequence that covers the necessary background in finance, accounting, marketing, management, and other business areas at a higher, integrated level that is more relevant for our students.

In this appendix, we present our initial design for this sequence.

THE COURSE

National and global enterprises expect managers to look beyond their specific functional business and/or technical knowledge areas. Past, current, and emerging information technologies contribute significantly to blending traditional boundaries between intra- and/or inter-organizational functions. Global organizations expect managers to bring a cross-functional or multi-functional view of their company and apply it to their current problems, opportunities, and daily activities. They must know how to apply information systems and technology to facilitate innovative, competitive, and often global business solutions. Similarly, information systems personnel must understand and be able to function in today's complex business environment. To do so they need to understand how the business works and how information systems determine the processes by which business is carried on.

The subject of information systems and technology in solving business problems is not new but it is primarily presented in the context of a specific functional area of business, such as accounting, marketing, management, and organizational behavior or departmental "stovepipes" or "silos" with little emphasis on how these functional areas interact within the organization and/or with other organizations. We believe that by looking at business processes that cut across functional areas, future IS managers will be able to understand the organization, its customers, suppliers, and partners, as a progression of related and integrated complex systems. An example is the processes that span multiple organizations, especially the processes that are associated with the supply chain management. The business process approach permits the study of individual processes within the organization to determine the degree to which they add value to the firm. In so doing, the student learns about how the various portions of the firm (and its outsourcers and contractors) are interconnected with one another. Table A-1 lists the topics proposed for this two-semester sequence.

Table A-1. Topics for A Two Semester Graduate Level,
Business Process Sequence

Business Process Analysis
Problem Identification
Business Process Problems
Process Mapping
Modeling Enterprise Processes
Measuring Enterprise Processes
Evaluating Enterprise Processes
Benchmarking
Business Process Reengineering
Creating Alternative Recommendations
Constructing a Business Case for Recommended Solution (s)
Aligning and Linking the Enterprise's Strategy and Its Key Business Processes

Finally, we believe that these courses can well be taught by IS faculty with a strong background in business either in practice or in academic training. These courses should not be assigned to a specialist who is unskilled in or unfamiliar with the business implications of information systems.

APPENDIX II. A MATRIX OF COURSES AND TOPICS

The MSIS 2006 curriculum, like its predecessors, is organized around conventional, discipline-oriented managerial and technical courses taught by IS faculty. Students, when they go back into the workplace, find that many problems are not oriented around the subjects of the courses, but around problem areas each of which uses ideas from several courses. To help faculties understand these interactions, Table A-1 shows how the course offerings in the MSIS 2006 curriculum cut across a representative sample of major IS issues. Specifically, Table A-2 looks at the following issues:

- Security
- Compliance
- Technology Integration

- Business Processes
- Information Volume
- Mobility

- Virtuality
- Sourcing/Globalization

In Table A-2, a strong relationship is shown by a 1, a moderate relationship by a 2 and a weak relationship by a blank. Note that these numbers are opinions. Individuals may disagree on whether a cell is a 1, a 2 or is blank. The important point is to recognize that this matrix of courses and concepts exist and that course designs need to deal with these interrelated concepts.

Table A-2. Matrix of Courses And Topics

COURSE	Security	Compli-ance	Technology Integration	Business Processes	Information Volume	Mobility	Virtuality	Sourcing/ Globaliza-tion
IT Infrastructure	2	1	2	1	2	1	1	1
Analysis, Model-ing, and Design	1	1	1	2		1	1	1
Enterprise Models		1	1	2	2		1	2
Emerging Techno-logies and Issues	1		1		2	1	2	
Project and Change Mgmt.				1			1	2
Strategy and Policy	1	1	1	1	2	1	1	2
Implications of Digitization	2	1	2	1	2	1	1	2
HCI			1	1		1		
Integrated Capstone	1	2	1	1				1

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