MSIS 2000

Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems

Association for Computing Machinery (ACM)
Association for Information Systems (AIS)

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INTENDED USERS

The Master of Science in Information Systems (MSIS) model curriculum report has several intended classes of users who have a stake in the achievement of quality IS degree programs:

- academic executives to whom the MSIS systems program report
- academic heads of units where MSIS programs are housed
- MSIS faculty
- other faculty in the school or college where the MSIS program resides
- information systems practitioners
- MSIS students

The MISIS curriculum was developed based on graduate programs in the United States and Canada and is intended primarily to fit that model. Programs in other countries may choose to adapt the model to fit their needs.

FOREWORD

MSIS 2000: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems is the latest report from model curriculum work in the information systems field. The work of IS curricula task groups began in the early 1970s and has continued for almost 30 years. The Association for Computing Machinery (ACM) has been a major organizer for these task groups including the first efforts in the 1970s. Other organizations, including AITP (formerly DPMA) and IFIP (International Federation for Information Processing), have aided model curriculum development.

MSIS 2000 is the second collaborative effort between ACM and the Association for Information Systems (AIS). Both organizations have a worldwide membership. ACM has both professional and academic members in the broad field of computing. Through its Education Board, it supports a wide range of curriculum development including computer science, information systems, and software engineering. AIS, organized in 1994, is composed of faculty members in information systems. The partnership of ACM and AIS, therefore, combines the breadth of interest of ACM and the information systems interest of AIS. All of the members of the task group belong to both organizations.

Although both ACM and AIS are worldwide organizations, MSIS 2000 does not represent a universal model curriculum. It does not seek to harmonize the curriculum to meet the requirements of different educational systems around the world. The model curriculum for graduate degree programs in information systems is based on the typical degree structure in USA and Canadian universities. It is a model for a Master's Degree in Information Systems and not a concentration or option in an MBA program. Placing this model curriculum within a specific context allows it to be directly applicable to designers in the USA and Canada and avoids the difficulties of considering a large number of educational systems. However, the Master's Degree program in Information Systems can be a useful reference for designers of information systems degree programs outside the USA and Canada. The reasoning behind the degree structure and course content descriptions are useful inputs to curriculum designers in different countries with unique constraints.

University-level Information Systems (IS) curricula need frequent updating to remain effective. Model curricula developed by task groups from professional societies aid universities in their curricula development and updating efforts by providing four inputs:

- The common body of knowledge that graduates are expected to know. This helps counter local requirements bias and helps graduates to be prepared for positions in a large geographic area.
- A program structure with suggested courses and course sequences.
- Rationale for the program and the resources required for it.
- Rationale for investment in faculty development to keep faculty members up to date with rapidly changing technology.

The value of model curricula such as MSIS 2000 are also based on a strong, increasing demand for university-trained graduates who can meet the changing needs of the information economy. A degree program in information systems cannot teach every fact or every process that will be needed by the graduate; its objective is to provide the fundamentals that support productive employment and provide a basis for lifelong learning.

The policy and operating procedures of both ACM and AIS are to make the MSIS 2000 model curriculum readily available. The curriculum appears in *Database*, a publication of the ACM Special Interest Group on Management Information Systems (SIGMIS) and in an electronic journal, *Communications of the AIS.* It is also available from the worldwide web at http://cis.bentley.edu/msis. ACM is the holder of the copyright, and any requests for permission to copy or reprint parts of the report should be directed to ACM.

As the President of AIS who appointed the AIS members, a member of ACM, and Co-chair of the task force on computer information systems curricula with the ACM Education Board, I have had multiple points of view in my oversight of the work of the task group. I commend the Co-chairs and members of the task group for the report and the ACM Education Board chaired by Peter J. Denning, and the AIS VP Education, Maryam Alavi, for their support and review efforts.

Gordon B. Davis
AIS President 1998
Co-Chair of ACM Education Board Task Force
for Computer Information Systems Curricula 1998+

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- The members of the ACM Education Board for approving the Committee appointments and for their continued encouragement and approval of the report.

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- Carol Brown, Vice President of Education for SIM for all her help in guiding the project through the SIM's board.

- All the officers and boards of the endorsing organizations: AITP, DSI EDSIG, IACIS, IAIM, INFORMS-CIS and SIM.

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- The many participants who attended the presentation sessions and read portions of the draft that provided feedback to the committee.

- The faculty members from around the world who notified us of the existence of MSIS program at their institutions.

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EXECUTIVE SUMMARY

MSIS 2000: **Model Curriculum and Guidelines for MS Degree Programs in Information Systems** was sponsored by the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). It is endorsed by the leading information systems organizations. This document is a major update and revision to the Information Systems Master's curriculum completed in 1982 (Nunamaker et al. 1982). The model was developed over a period of two years. It was presented at numerous professional meetings throughout the world for comment by academics and was reviewed by a large number of practitioners in the field.

MSIS 2000 is based on the educational system and degree structures common to the United States and Canada. This limits its use outside these systems, but the report still has relevance for the reasoning and design process for curriculum development in other environments.

A set of underlying principles and philosophy was used to guide the development. Essential career development skills including oral, written, and presentation skills; people and business skills; and ethics and professionalism are integrated throughout the curriculum and its individual courses.

The curriculum model is designed as a set of interrelated building blocks.

> *Foundations*: At the foundation level, the curriculum is designed to accommodate students from a wide variety of backgrounds. In particular, the model specifies the business and information systems skills required as prerequisite to the rest of the curriculum.
>
> *Core*: The next level, or core, is a set of primary courses. All graduates require this common core. Some of the core courses are similar in name to those in the 1982 Curriculum, but the contents are a major revision reflecting the changes in the Information Systems field. The core courses are:
>
> - Data management
> - Analysis, modeling, and design
> - Data communications and networking
> - Project and change management
> - IS policy and strategy
>
> *Integration*: A major innovation in this curriculum is in the integration component required after the core. This component addresses the increasing need to integrate a broad range of technologies and offers the students the opportunity to synthesize the ideas presented earlier and to help students implement comprehensive systems across an organization.
>
> *Career Tracks*: Another innovation is that the program architecture is flexible to accommodate individual institutional requirements for an MS degree. This flexibility occurs at both the entry level with the foundation courses that can be tailored to meet individual needs and at the highest level where institutions and students may select specific career tracks that are representative of current organizational needs.

The courses are described in Appendix 1.

The model curriculum is useful for many individuals. For university and college administrators, it defines the resources necessary for a successful program. Faculties are provided with a well-defined model to use in updating their programs. Students with varying backgrounds can use the model to

obtain an overview of the discipline. Information systems professionals and managers have a valuable tool that helps them understand the qualifications and skills they can expect of new hires from programs that follow the model curriculum.

The model curriculum is designed to serve as a set of standards upon which individual schools can base their curriculum. It is compatible with MS programs ranging from 30 to 60 or more units offered in a variety of locations in the university, including business schools, schools of information systems, computer science departments, and liberal arts schools. By adopting this curriculum, faculty, students, and employers can be assured that MS graduates are competent in a set of professional knowledge and skills, know about a particular field in detail from the career track, and are instilled with a strong set of values essential for success in the Information Systems field. In short, it is a program that reflects current and future industry needs.

TASK FORCE REPORT AND RECOMMENDATIONS

This report presents a model curriculum for a master's program in information systems (MSIS). Although based on degree programs in the United States and Canada, the report can be useful input for curriculum development worldwide. This program is the result of two years of effort of a joint committee of the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS).

WHY AN MS IN INFORMATION SYSTEMS?

Over the last four decades, the field of information systems grew at what can only be described as an amazing rate. Starting from a forecast of a commercial market for at most five computers by Thomas J. Watson, then head of IBM, mainframes, PCs, and built-in computers became ubiquitous. More than half the households in the United States and most businesses use them. A very large industry, both inside and outside organizations, creates, manages, programs, and operates these information systems.

Although the higher education system produces large numbers of highly educated people in both information systems (IS) and computer science (CS), skilled information systems people are in short supply in industry. Even scarcer are talented people with advanced knowledge for managing information systems. It is the objective of the MS programs to fill this gap by providing the needed education.

That MS programs can do the job is evidenced by the existence of over 80 MSIS programs in the United States and over a 100 worldwide (Appendix 5). Their graduates are in high demand. Their audience includes people with previous degrees in IS, people with degrees in related fields and considerable experience, and people who seek to enter the field without previous knowledge about information systems. These various streams of students find highly remunerative jobs upon graduation from the MS programs.

WHY A MODEL CURRICULUM?

At present, the MS programs in the United States vary considerably in what they require for entrance and what they teach. The organizations that hire these graduates know little about what a person with an MSIS degree knows since each school is different. The last model curriculum is over 17 years old. The objective of this model curriculum is to specify a common minimum body of knowledge that all MSIS graduates know.

Furthermore, the model curriculum recognizes that, to be employable, students should know some area of IS in detail. The MSIS curriculum is a jumping off point for a career.

CONTENTS OF THE REPORT

This report begins with a description of the objectives of the MSIS program. It then focuses on input—the range of students who can be expected to undertake the degree—and the output—employer expectations.

Given knowledge about the input and output, the report presents a set of principles that were followed in creating the curriculum. Because of the varying institutional requirements for MS degrees among

universities, the program must accommodate degree programs ranging in length from 10 to 20 courses. As a result, the model curriculum allows students with adequate background to complete the degree in 10 courses. The shortness of the MS degree implies that students should enter the program with prerequisite skills in both information systems and business. If they do not have all these skills, their program will need to extend beyond the 10 course minimum. Other principles include the need to add value, the creation of a core of knowledge shared by all graduates, and the integration of non-IS skills. The principles also include the need for students to understand systems integration and to be prepared for a career.

It is recognized that schools will vary in the specializations they offer in preparations for a career, with each school offering its own unique alternative, determined by faculty skills and local needs.

The principles lead to the specification of a curriculum that includes four components: foundations, a core, systems integration, and a career track. The courses required, their rationale, and their interrelations are discussed in the text. Appendix 1 describes the individual courses in detail. Other appendices describe the prerequisite structure, course sequence schedules, staffing requirements, resources (faculty, computing, physical space, and library) required, background, process followed, existing MSIS programs, and a summary of curriculum course requirements.

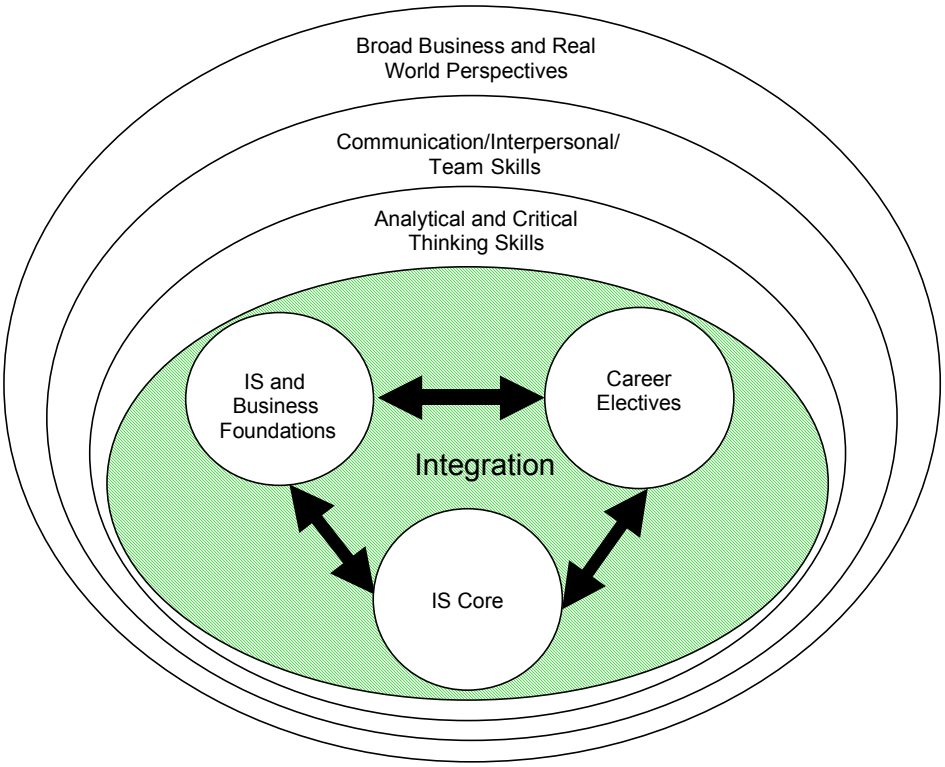

Figure 1. Skills, Knowledge, and Values of MSIS Graduates

OBJECTIVES OF THE MSIS PROGRAM

Students graduating from the MSIS program should be prepared to provide leadership in the Information Systems field.

Graduates will have the following skills, knowledge, and values (Figure 1):

- A core of IS knowledge
- Integration of IS and business foundations
- Broad business and real world perspective
- Communication, interpersonal, and team skills
- Analytical and critical thinking skills
- Specific skills leading to a career

STUDENT BACKGROUNDS

For the foreseeable future, it is anticipated that MS programs will continue to attract students with a wide range of backgrounds. In traditional graduate programs, it is assumed that entering students have a common background obtained through an undergraduate degree in that field. For students entering the MSIS program, this is often not the case. Although students entering directly from undergraduate programs may have a BS degree in IS, often their degree is in computer science, business, or some other field. The MSIS program may also attract experienced individuals including IS professionals and people seeking career changes. Often this experienced group will be part-time evening students or will access the courses through a remote learning environment. The architecture of the MSIS program accommodates this wide diversity of backgrounds and learning environments. Specifically, the MSIS program is appropriate for

- New graduates with degrees in a variety of fields from business students with an IS concentration, computer science, general business degrees, and bachelor degrees in a range of fields including the humanities, social science, engineering, and physical science.
- New graduates with a BS degree in IS.
- Experienced IS professionals seeking to upgrade skills and to understand management issues.
- Professionals from many fields seeking a change in careers.
- International students.

CAREER PATHS

The MSIS program is designed to support both traditional and emerging career opportunities. The number of available career paths for IS professionals increased significantly during the l990s. Rather than being concentrated almost exclusively in large information systems groups in major and mid-sized corporations, job opportunities now also exist in virtually all organizations and in all industries. Career paths now include

- consulting and systems integration
- software development
- networking, telecommunications, and computing infrastructure
- electronic commerce
- consumer products and services

To exploit these expanding opportunities, students must know not only the technology but also the business and environment in which they will work. The career paths are more varied and hence the preparation required is both broader and deeper than a traditional undergraduate IS program. Table 1 shows typical job objectives of MSIS graduates.

Table 1. Typical Job Objectives of MSIS Graduates

Advancement in current job	Outsourcer/systems integrator
First or middle IS management	Project manager
Management consultant	Systems analyst/designer
Internal consultant/senior staff	Technical specialist
CIO	IT Liaison
Business analyst	A Ph.D. program leading to teaching
Entrepreneur	Electronic commerce specialist

THE EMPLOYER'S VIEW

Because of the wide variety of MS programs offered by universities and colleges and the wide variety of student backgrounds (see above), employers are uncertain about the knowledge, skills, and values that newly minted MSIS graduates bring to the job. One objective of the model curriculum, therefore, is to remove employer uncertainty by providing all MS degree holders with a core set of knowledge. Furthermore, to make students more employable, students take a related set of courses (reinforced with practical experience) in a particular field within information systems.

A second objective is to help overcome the skill shortage that exists and is expected to continue in the years ahead. Students graduating with an MS degree should possess enough skills that they can take on responsible rather than entry-level positions and can serve as mentors to people with lower levels of education.

PRINCIPLES OF THE MSIS DEGREE

The following underlying principles and philosophy were used to guide the development of the MSIS curriculum.

- **Professional Degree**. The MSIS is a professional degree that integrates the information and organizational cultures. We recognize the difficulties that people trained purely in one professional culture have in communicating with each other. We believe that MS graduates should have the knowledge and sophistication to bridge the existing chasm.

- **Value Added**. The degree adds value to students studying beyond the bachelor degree. Students invest a year or more of their lives and organizations often sponsor the student financially. Both are entitled to a return on their investment.

- **Core.** The degree includes a consistent set of information systems core courses that are offered by all institutions. As a result, employers are assured that MS graduates are competent in a fundamental set of professional knowledge.

- **Flexibility.** The curriculum is flexible to accommodate students with differing backgrounds, skills, and career objectives. Full-time students with a specific background in IS should be able to complete the program in a year. Students lacking prerequisite knowledge should expect to take at most one additional year to complete the MS degree. This model (based on the curriculum architecture used by many MBA programs) allows all students to graduate with a specified level of competence.

- **Career Tracks.** The program focuses on current and emerging concepts through "career tracks." These tracks should allow students (within the competency of the faculty) to "major" in a specific subject area for which there is demand and to achieve breadth across a topic area.

- **Integration of Non-technical Skills.** Oral, written, and graphic presentation skills; promoting ideas and negotiating; people skills; business skills; team skills; customer orientation; real-world focus; and ethics and professionalism are integrated throughout the program. Each topic is important and, some might argue, each is worth a course of its own. However, given the limited time available for MS work, we believe that the appropriate way for these topics to be presented is by integrating them tightly into the courses. Furthermore, despite their importance, these topics are exceedingly difficult to teach in the abstract.

- **Unit Requirements**. The program architecture is flexible and compatible with institutional unit requirements for an MS degree. These requirements range from 30 to 60 units, depending on the individual school. Schools with long programs are able to extend their offerings beyond the 30 unit minimum to go into greater depth in the prerequisites, the core, and the career tracks.

- **Practicum.** A practicum is recommended as an integrating mechanism to provide real-world experience for the student. A practicum is a term-long project solving a real problem for a real client against a time deadline. For full-time students, it is recommended that they work in teams and that industry supports the project by providing stipends to the students for their work because the financial incentive has been shown to improve the relevance of the project topic and the quality of the student output. For part-time, working students, a project for their employer is usually appropriate as a practicum. At some universities, the practicum also fulfills graduation requirements in that the practicum provides a "culminating experience" in lieu of a master's thesis.

- **Integrating Capstone Course.** The program includes an integrating capstone component. Master's courses are typically treated as independent entities. As a result, students are not able to see or understand how the pieces integrate into a whole. Some schools have created capstone courses, usually built around policy and strategy. However, such a course focuses only on the integration of information systems with the business enterprise and on the role of the CIO. Systems integration is also an important aspect of information systems work that most students will be involved with during their professional careers.

These general principles lead to the idea that programs should ensure that students have solid foundations in information systems and business either before they enter or through a specific set of courses. Furthermore, programs should provide students with a common body of knowledge (i.e., a core) yet be sufficiently flexible to meet both institutional and student needs and objectives. From an operational point of view, flexibility implies that students may gain advanced standing credit and/or substitute other courses for material they already know, thus enabling them to take electives both inside and outside IS. Students should also have the opportunity to obtain practical experience through practicums in industry.

DESCRIPTION OF THE INFORMATION SYSTEMS PROGRAM

The MS program is designed around the set of five building blocks shown in Figure 2. The courses in the *IS Foundations* and *Business Foundation*s blocks are prerequisites for the program. Students with inadequate backgrounds in these areas are required to take additional courses and will, therefore, require additional units to complete their degrees.

The *IS Core* block defines the minimal knowledge required of all MSIS students. This knowledge is both technical and managerial in flavor. The core represents a standard that defines the MSIS program and differentiates it from both computer science programs and IS concentrations within MBA programs.

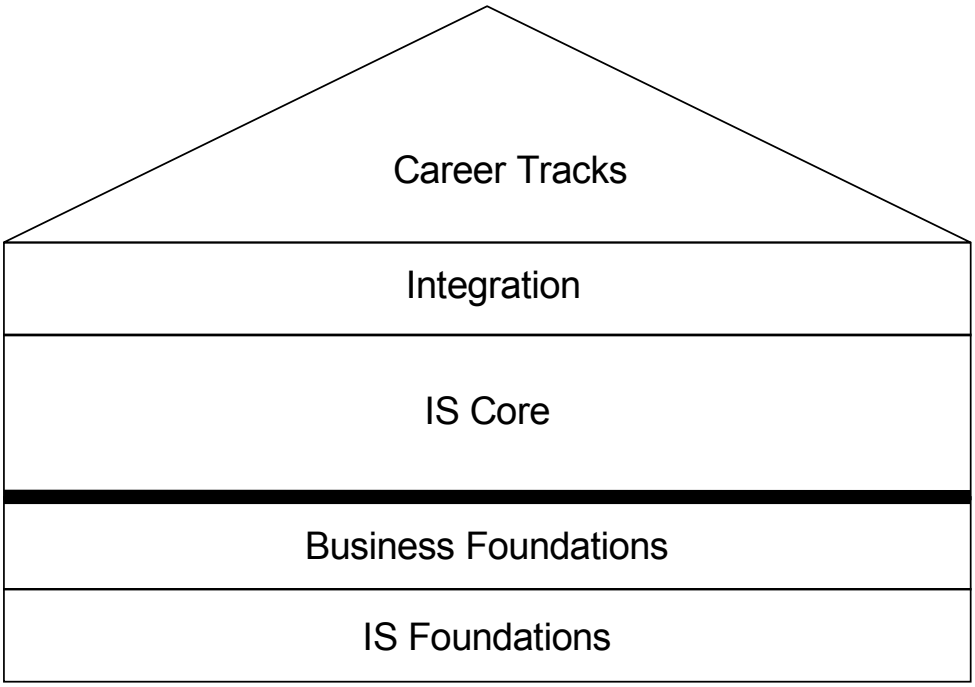

Figure 2: Curriculum Building Blocks

The *Integration* block addresses the need for organizations to integrate disparate internal systems and to communicate with external parties such as suppliers and customers.

The *Career Tracks* block consists of elective courses organized around careers such as electronic commerce or management consulting. Many such career tracks are possible and it is anticipated that different schools will offer one or more tracks that are consistent with the competence of their faculty and the needs of their students and local industry.

Information Systems and Business Foundations Courses

A minimum foundation of essential prerequisite knowledge is needed to prepare students for the remainder of the curriculum. Many students will enter the Master's program with some or all of this knowledge. This material is typically found in undergraduate degree programs. An institution may, of course, require more than this minimum in each of the foundation areas. In addition, an institution may elect to allow a student to substitute professional experience for certain foundation courses.

Foundation courses may be offered at the graduate level. Similar to the MBA common body of knowledge, such graduate foundation courses cover more material at a more conceptual level than comparable undergraduate courses.

Information Systems Foundations

Students entering the MSIS program need the content of the following courses (or their equivalent) to be able to undertake the MSIS core described below. The required IS foundations include the content found in "IS'97 Model Curriculum Guidelines" (Davis et al. 1997).

- Fundamentals of IS (IS'97.1)
- Information Technology Hardware and Software (IS'97.4)
- Programming, Data and Object Structures (IS'97.5 – one or two semesters)

This requirement normally consists of nine to 12 units.

The IS foundations are required to prepare students for the IS core and reflect a minimum level of prerequisite IS knowledge. Note that the IS foundations include at least one programming course. The amount of programming required depends in part on the nature of the MS program being offered at a particular school. For example, a more technical MS program might require two advanced programming courses, whereas for a school focusing on electronic commerce and organizational issues, the ability to program in a simple language might be sufficient. Also, each school determines its required level of competence on IS foundation prerequisites. If a student took a course on an IS foundation topic as an undergraduate with an acceptable grade from an accredited school, some schools will allow transfer whereas others may require competence testing. This is an issue for individual schools, rather than a policy matter to be specified here.

Business Foundations

The minimum area requirements are three courses on the basics of business: one on internal organizational considerations, one on external organizational considerations, and a third course in one area of business. For example, a student may take:

- Financial Accounting
- Marketing
- Organizational Behavior

This requirement normally consists of nine units.

A graduate with an MS in IS needs to know a number of business-related topics if he/she is to function well in an IS job, particularly if that job involves managing in a private or a public organization. Students can sometimes satisfy the business foundation courses by taking equivalent courses in departments other than business. For example, Industrial Engineering sometimes teaches accounting and Psychology or Sociology teaches organizational behavior. Furthermore, foundation courses can be taken at a senior undergraduate level.

Three business courses are a minimal set of knowledge for MSIS graduates. The program is conceived as being a two cultures program, including both the IS and business cultures. Given that IS graduates will work in firms and will interact with business-educated people, they will need to be able to communicate with many people who have a business background. Since many of these people are not likely to know the IS field, it becomes the responsibility of IS people to become culturally bilingual in computing and business. The ability to understand financial accounting, particularly costs, and the ability to understand how companies are organized and how people behave in organizations are required of all IS people. The third business prerequisite course can be tailored by the student and the faculty advisor to what is available in a particular school and is compatible with the career track chosen by the student.

Schools that wish to increase business content through formal graduate business course work can do so. Of course, such a policy will result in a longer program. It is also feasible for a school to create a business track for students who want a pure managerial orientation. However, in that case, students may be better off taking an MBA with a concentration in IS. The present curriculum is not oriented toward the IS concentration within the MBA.

Information Systems Core

The IS core consists of five courses:

- Data management
- Analysis, modeling, and design
- Data communications and networking
- Project and change management
- IS policy and strategy

This requirement normally consists of 15 units.

The topics of the first three courses were included in the ACM'82 curriculum and still remain the foundations of the field. However, in the intervening years, the contents of these courses altered drastically as new technologies and new software became available. Thus, for example, such topics as data warehousing and data mining, object-oriented systems, and ATM (Asynchronous Transfer Mode) were not even known. The intent is to offer courses in these areas suitable for the start of the new millennium.

At the MS level, students should also be knowledgeable in the managerial aspects of information systems. The next two courses (Project and Change Management and IS Policy and Strategy) are designed to accomplish that goal. The Project and Change Management course looks at how systems and technologies are implemented. It includes consideration of project planning, scheduling, and budgeting as well as consideration of the change management required to implement projects.

Project management is an important topic for the IS core because it is essential for success in all IS endeavors and is critically lacking in many IS organizations. Similarly, most IS projects involve transforming an organization from its existing ways of doing things. Such changes are often radical and traumatic to the people involved. Although change management may or may not be included in the business foundations organizational behavior course, students should understand and be able to implement the changes that an IS project creates. The goal of this core course is to reinforce the ideas of the organizational behavior course and make the relation between the technical and organizational aspects of projects more concrete for students, particularly those who come from technical backgrounds.

In the past, IS Policy and Strategy was the capstone course. Given the increasing role that information technology (IT) is playing in the success of modern organizations, the time has come to make this course part of the core knowledge for MS degree holders. This course, which typically is case-based, looks at the IS project portfolio from the view of the senior IS executive and from the view of the business executive. It shows students how policy and strategy considerations affect every aspect of IS and, conversely, how IT transforms organizations and, indeed, the very nature of business.

Final Thoughts on the Core

An objective of the curriculum guidelines is to provide a curriculum that can range from 30 to 60 units (10 to 20 courses) to accommodate the different requirements for MS degrees among universities. It is recommended that core courses should not be waived by presenting undergraduate equivalents. However, in the case of short (10 course) MS programs for students entering with thorough technical preparation (IS'97 or an undergraduate Computer Science degree), the value-added considerations change. Thus, for example, for a CS student with thorough grounding in database and tele-communications, it is more important that the student learn the fundamentals of IS and of business rather than repeating material that may have been covered in an undergraduate CS degree.

Integration

After students complete the core, they need to synthesize what they have learned. Furthermore, system integration is a pervasive aspect of IS practice. In the past, neither synthesis nor integration were included in the curriculum. The present curriculum calls for such an integration component.

Integration can be viewed from three perspectives:

- Integrating the Enterprise
- Integrating the IS Function
- Integrating IS Technologies

Each perspective could merit a course of its own. The curriculum recommends that schools offer one of these courses (described below) or create a course that looks at all three perspectives. The choice depends on the capabilities of the school's faculty, the needs of regional industry, and the objectives of the students.

Each of these courses is described in Appendix 1.

Integrating the Enterprise. This course is oriented toward what to build, not how to build it. It focuses on organizational and managerial issues at the level of the enterprise as a whole. Its objectives are to

- provide an integrated view of the firm and its relations with suppliers and customers
- demonstrate an integrated set of business processes and functional applications that meet business needs

Integrating the IS Function. This course focuses on managing IS functions on a day-to-day basis. Its objectives are to

- design effective/efficient IS organizational processes
- assess the impact of emerging technologies
- define human resource needs and management methods
- IS governance alternatives
- define the role of the CIO
- apply methods to measure and demonstrate the value of IS

Integrating IS Technologies. This course is concerned with how to develop an integrated IS enterprise architecture including

- evaluate and select from architectural and platform choices, priorities, and policies
- assessment of the impact of emerging technologies
- evaluate the role of standards
- evaluate effect of vendor strategies

Career Tracks

The career paths for IS professionals are more varied and dynamic than in the past. To take advantage of the available career opportunities, the advanced student must understand not only technology but also the business and environment in which it is deployed. The recommended curriculum is broader in scope and sufficiently flexible to allow institutions to provide a more focused, professional education meeting student career objectives and organizational needs.

A career track consists of four or more related electives that prepare a student for a specialization. It is anticipated that most schools will offer multiple tracks. The career track or tracks chosen by a particular school, similar to the choice of which integration course to offer, depends on the skills and interest of the faculty and student as well as industry needs. Where appropriate, especially for students with limited experience, a practicum (see below) can be used as a course within the career track.

As shown in Table 2, the curriculum identifies a broad range of career tracks, ranging from the very conventional (e.g., Systems Analysis and Design) to the leading edge (e.g., Knowledge Management) to functions (e.g., Consulting) and more. The tracks, listed in alphabetical order in Table 2, are indicative of the possibilities but are by no means an exhaustive list.

Table 2. Representative Career Tracks

Academia	Enterprise Requirements Planning	New Ways of Working
Consulting	Global IT Management	Project Management
Data Management and Data Warehousing	Human Factors	Systems Analysis and Design
Decision Making	Knowledge Management	Technology Management
Electronic Commerce	Managing the IS Function	Telecommunications

Table 3 shows typical sets of courses that may be associated with these representative career tracks. In each case, four courses are shown. Many institutions will use three of these courses and make the fourth course a practicum.

Experimentation with tracks is recommended. The only certainty is that some tracks will become obsolete over time while new ones will emerge as the IS field changes. The courses listed in Table 3 are an indication of the range of topics that tracks might cover. It is anticipated that schools will choose only a small number of tracks for their own curriculum, where the criteria for selection include

- local industry needs and
- the capabilities available within the school

In addition, tracks can (and should) be multidisciplinary, involving courses in two or more departments, depending on the nature of the track. For example, a student following an Electronic Commerce track might take e-commerce courses in IS, marketing, economics, and management. Some courses may be in a different department or school than IS. For example, the Teaching Skills course in the Academic track may be taken in a school or department of education or the Consulting in Business course in the Consulting track may be offered in a management department.

THE COMPLETE MSIS CURRICULUM

Figure 3 shows a schematic of the complete MSIS curriculum. It is designed to:

- achieve a high standard of quality across all schools that adopt the curriculum,
- provide commonality and uniformity of content in the core competencies achieved by students,
- accommodate students entering the MSIS with very different backgrounds, and
- encompass both one-year and two-year MSIS degree programs..

To achieve these goals, programs can range in size from a minimum of 30 units to a maximum of 60 units based on the “sliding window” concept described below.

Table 3. Representative Career Tracks and Suggested Courses

Academia (path to Doctorate) • Principles of IS Research • Teaching Skills • Statistical Research Methods • Advanced Elective in Teaching	**Knowledge Management** • Knowledge Management and the Learning Organization • Document Management • Data Warehousing • Data Mining and Knowledge Acquisition
Consulting • Consulting in Business • Consulting in IS • Advanced Project Management or Advanced Change Management • Elective in Consulting Area (e.g., knowledge management, ERP, telecom)	**Managing the IS Function (Internal to IS)** • Role of the CIO • Management of Computer Personnel Operations • Management of Telecommunications Resources • IS Security
Data Management and Data Warehousing • Data Warehousing • Knowledge Management • Database Administration • Database Systems Planning	**Management of the IS Function (external to IS)** • Role of CIO • Telecommuting and Virtual Organizations • Outsourcing • End-User Computing
Decision Making • Decision Support and Executive Information Systems • Data Warehousing • Simulation and Modeling • Human-Computer Interaction	**New Ways of Working** • Telecommuting and Virtual Organizations • Workflow and Collaborative Work • Multimedia • Internet, Intranets, and Extranets
Electronic Commerce • Internet, Intranets, and Extranets • Electronic Commerce • WWW and the Value Chain • Consumer Relationship Marketing	**Project Management** • Advanced Project Management • Advanced Change Management • Outsourcing • Virtual Organization or Telecommuting
Enterprise Resources Planning • ERP Systems • Business Processes • Internet, Intranets, and Extranets • Systems Integration	**Systems Analysis & Design** • Advanced Design Methodologies (e.g., Object-Oriented Analysis and Design, RAD, prototyping) • Advanced Project Management • System Integration • IS Consulting
Global IT Management • Transborder EDI and Data Flows • Virtual Organizations • Knowledge Management • Global Cultural Implications for IS	**Technology Management** • Emerging Technologies and Technology Forecasting • Globalization • Advanced Project Management • Organizational Aspects of Technology Management
Human Factors • Ergonomics of Computing • Interface Design • Usability Analysis and Testing • Multimedia Design and Production	**Telecommunications** • Telecommunications Technology • Managing the Telecommunications Resource • Internet, Intranets, and Extranets • Electronic Commerce

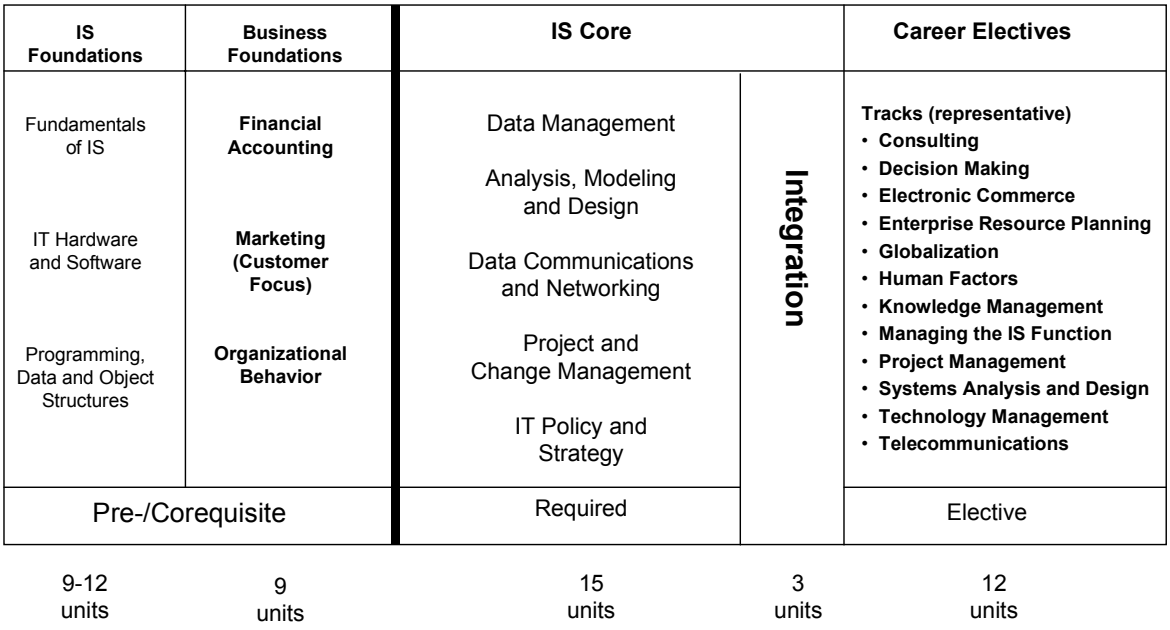

Figure 3. The Complete MSIS Curriculum

As indicated in Figure 3, the MSIS program can be as small as 30 units for well-prepared students. Such students would take:

- 15 units of core courses
- 3 units of integration
- 12 units in a career track

For students with no preparation, a program as long as 60 units could be provided consisting of

- 12 units of IS foundations
- 9 units of business foundations
- 15 units of core courses
- 3 units of integration
- 12 units of career track
- 9 units of electives or additional requirements

Representative programs that range from 30 to 60 units and assume different student preparation are presented below and in Appendix 2.

THE SLIDING WINDOW CONCEPT

The “sliding window” approach is based on the approach used by most two-year MBA programs in business schools. That is, year one of an MBA is devoted to learning the common business core that an undergraduate student would acquire in a business degree. The second year builds on the first. In some schools, a student with a previous business degree can skip over the first year and complete the MBA in one year.

The length of the MSIS program can “slide” from 30 units to 60 units depending on the student’s

background and institutional requirements. For example, a school may wish to offer the prerequisite courses at the graduate level. The sliding window concept will accommodate this approach by permitting the 18 to 21 units as part of the "first year." The total program would then consist of 48 to 51 units:

- 18 to 21 units of prerequisite graduate courses
- 15 units of IS core
- 3 units of integration
- 12 units of career track

The sliding window concept—sliding from a minimum of 30 units to a maximum of 60 units—allows schools to require additional prerequisites (in business and/or IS) or provide more advanced courses (in track options), or do a combination of both. For example, consider the five separate scenarios presented in Table 4, which contrast the differing backgrounds of students entering the MSIS program. The sliding window concept of the MISIS program allows a flexible curriculum architecture to meet unique needs of each representative scenario. This flexibility is summarized in Table 5.

Table 4. Possible Backgrounds of Students Entering the MSIS Program

Scenario	Short Title	Description
1	IS'97 Major	Student with an undergraduate major conforming to IS'97 and little experience
2	Business Major	Student with a BA in business and one IS survey course
3	Computer Science Major	A computer science undergraduate with no IS courses and little experience
4	Other Undergraduate Major	Undergraduate in science, social science, or humanities
5	Professional	Professional returning to school with extensive practical experience

UPDATING THIS MSIS CURRICULUM

The pace of advances in information systems and information technology is expected to accelerate. Because creating a new model curriculum is a lengthy and complex process, many years can be expected to pass before the present effort is replicated and the next curriculum is created. Thus, to keep the MSIS curriculum current, this model curriculum document will be placed on the Web.

Processes that encourage discussion by faculty, IS practitioners, and students will be established. Individual schools will be encouraged to share course outlines, reference material, and innovative pedagogical approaches. The anticipated Web address is: www.bentley.edu/msis.

Table 5. Exemplar Minimum Curricula for Five Different Student Backgrounds

MSIS Building Blocks	Undergraduate Program Scenarios (from Table 4)				
	(1) IS'97 Major	(2) Business Major	(3) Computer Science Major	(4) Other Major	(5) Experienced Professional
IS Foundations	completed	6 units (has taken IS'97 Foundations of IS)	3 units (IS'97 Fundamentals of IS)	9 units	3 units
Business Foundations	completed	completed	9 units	9 units	9 units
IS Core	15 units	15 units	9 units (has Data Comm. and Data Management)	15 units	12 units
Integration	3 units	3 units	3 units	3 units	3 units
Career Track	12 units	12 units	9 units	12 units	9 units (no practicum)
MINIMUM TOTAL UNITS	30 units	36 units	33 units	48 units	36 units

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APPENDIX 1. COURSE DESCRIPTIONS

The course descriptions in this appendix are intended as specifications to be used by individual instructors in preparing course syllabi. Schools will, of course, tailor courses to their strengths and the needs of their students. Although topics within courses will vary and may receive different emphasis as the world of IS evolves, student competencies listed for each course must be achieved.

The required MSIS courses are described using the following conventions, which are based on those used in IS'97.

- Course Number and Title: MSIS2000.xx (Title)
- Catalog: A short description of course objectives and topics, which is suitable for inclusion in a college or university bulletin/catalog.
- Prerequisites: To be included in catalog description.
- Objectives: Specific competencies to be achieved by students as a result of taking the course.
- Topics: Major topic areas covered by the course.
- Discussion as appropriate. This section may place the course in the context of the total curriculum, and/or explain the philosophy underlying the selection of topics, and/or suggest pedagogical approaches for delivering the course.

INFORMATION SYSTEMS FOUNDATIONS

Three courses are recommended as information systems (IS) foundations. Students usually take these foundation courses before they enter the MS program. They are typically undergraduate courses. It is assumed that, if offered as graduate courses, they would be taught at a more conceptual and intense level.

It is also assumed that, prior to starting their MS program, students have the ability to deal with conventional PC software including word processing, e-mail, Internet tools, spreadsheets, presentation graphics, and external database retrieval. Note that this material is covered in the undergraduate curriculum and is not suitable for graduate credit.

The following course descriptions are based on IS'97, modified to the format of MSIS2000.

IS'97.1 – Fundamentals of Information Systems

CATALOG

Systems theory, quality, decision making and the organizational role of information systems are introduced. Information technology including computing and telecommunications systems are stressed. Concepts of organization, information system, and reengineering are introduced.

OBJECTIVES

This course provides an introduction to systems and development concepts, information technology, and application software. It explains how information is used in organizations and how IT enables improvement in quality, timeliness, and competitive advantage.

TOPICS

Systems concepts; system components and relationships; cost/value and quality of information; competitive advantage and information; specification, design and reengineering of information systems; application versus system software; package software solutions; procedural versus non-procedural programming languages; object oriented design; database features, functions, and architecture; networks and telecommunication systems and applications; characteristics of IS professionals and IS career paths.

DISCUSSION

Students with practical end-user computer knowledge will study systems theory and quality concepts as an introduction to information technology concepts and information systems development. Structure and functions of computers and telecommunications systems will be examined. Purpose and organization of standard systems will be introduced.

The concept that information is of significance in stating and attaining organizational goals will be used as the basis for exploring the development of databases to store the information. Information systems will be introduced to process and communicate the information. The dynamic nature of organizations and the necessity for growth and reengineering of the organization as well as its information systems will be presented and used as the motivator for understanding IS development methodologies.

The development path from entry level to senior information systems professionals will be explained. Professional ethical expectations and obligations will be reviewed. The necessity for personal and interpersonal communications skills will be discussed.

IS'97.4 – Information Technology Hardware and Software

CATALOG

Principles and application of telecommunication and computer systems hardware and software are presented through lecture, plus installation, configuration, and operations experiences.

OBJECTIVES

This course provides the hardware/software technology background to enable systems development personnel to understand tradeoffs in computer architecture for effective use in a business environment. It explains system architecture for single user, central, and networked computing systems; and single and multi-user operating systems.

TOPICS

Hardware: CPU architecture, memory, registers, addressing modes, busses, instruction sets, multi processors versus single processors; peripheral devices: hard disks, CDs, video display monitors, device controllers, input/output; operating systems functions and types; operating system modules: processes, process management, memory and file system management; examples of hardware architectures; examples of operating systems; basic network components, switches, multiplexers and media; installation and configuration of multi-user operating systems.

DISCUSSION

Students who are knowledgeable about and have developed personal information systems will gain an in-depth exposure to information technology hardware and software components and their interaction.

A systems view of computer systems will be used to identify computer and telecommunication system components. Peripheral devices will be described and principles of operation will be studied and learned. The operating system software, including I/O drivers, and telecommunication applications and extensions to the operating system will be examined, learned and utilized. Organization of the operating system will be studied to understand how concurrent processes, scheduling, memory management, and I/O are accomplished. The flow of information in the operating system in relation to the computer and to the application software will be considered.

Telecommunication devices will be identified and system integration considerations will be presented. Switches, multiplexers, and media — wire, glass fiber, and radio — will be explored as basic components of telephone, LAN, and WAN systems. Students will gain practical experience with cabling, installing, configuring, and using multi-user operating systems, and LANs, and WANS. Standards, standards organizations, and resulting hardware and software consequences will be identified and studied. General principles will be explained.

IS'97.5 – Programming, Data and Object Structures

CATALOG

Object-oriented and procedural software engineering methodologies in data definition and measurement, abstract data type construction and use in developing screen editors, reports and other IS applications using data structures, including indexed files.

OBJECTIVES

This course provides an understanding of algorithm development, programming, computer concepts and the design and application of data and file structures. It includes an understanding of the logical and physical structures of both programs and data.

TOPICS

Data structures and representation: characters, records, files, multimedia; precision of data; information representation, organization and storage; algorithm development; object representation compared to conventional data flow notation; programming control structures; program correctness, verification, and validation; file structures and representation.

DISCUSSION

Students will gain in-depth understanding of how to define and measure events that produce simple and complex data. Principles, concepts, and practices of successful software development are covered extensively.

Formal problem solving strategies will be presented. Program design methods and strategies including top down implementation will be discussed and implemented. Graphic programming environments will be explored. Capabilities of a number of programming languages will be presented. Skill will be developed in at least one language supporting an indexed file system.

Software engineering principals will be practiced in a systems view. Students will learn to recognize objects and abstract data types; concepts of event driven and data flows; module identification; and modularity including parameters, module naming, cohesion, coupling, and testing. Desired and erroneous practices, and correctness, verification and validation methods will be presented and practiced in generation of both small modules and larger programs.

Specific data structures including arrays, records, stacks, queues, and trees will be incorporated into abstract data types. These are used in creating IS applications including menus, screen record editors — list boxes, dialog boxes, buttons, and menu structures — file and database definition and access modules, transaction posting mechanisms, and simple and control break reports.

MSIS2000.1 Data Management

CATALOG

The concepts, principles, issues and techniques for managing corporate data resources. Techniques for managing the design and development of large database systems including logical data models, concurrent processing, data distribution, database administration, data warehousing, data cleansing, and data mining.

PREREQUISITE

IS'97.5 Programming, Data and Object Structures

OBJECTIVES

This course provides an understanding of the issues in managing database systems as an essential organizational resource. Students learn the enterprise data architecture components, data storage configurations, and information retrieval methods. It expands from the relational model to the multidimensional model, object-relational techniques, and web accessed data.

TOPICS

- The variety and complexity of current data management systems and evolving data management technology
- Techniques for managing the design, development, and maintenance of large database systems and data warehouses; examine methods for handling terabyte data sets and integrating the data with internal and external data sources, including data cleansing
- Relational integrity and concurrency control
- Comparison of normalized and denormalized models
- Limitations inherent in the relational model and possible solutions including object-oriented databases, object-relational databases, and multi-dimensional databases.
- Large text files, multi-media and embedded information needed for a complete information set
- Enterprise data architecture components and data requirements
- Role and responsibilities of the database administrator; maintaining the data base, privacy and security, recovery, and tuning
- Retrieving information using SQL and other methods
- Storage, merging, and transfer methods
- Database model and design to meet user requirements
- Alternative implementation approaches

DISCUSSION

Suggested pedagogical approaches to delivering the course:

1. Design, build and implement a database
2. Exercise the database built under various conditions
3. Query the database using SQL
4. Use SQL to demonstrate implementation problems
5. Evaluate file storage and transfer methods
6. Sort and merge files
7. Interview real or mock users
8. Case discussions to demonstrate management issues
9. Lectures
10. Team projects
11. In-class student presentations

Note: Many of these approaches are applicable to all courses in the MSIS2000.1 through MSIS2000.6 sequence.

MSIS2000.2 Analysis, Modeling and Design

CATALOG

Systems development life cycle; analysis and design techniques; information systems planning and project identification and selection, requirements collection and structuring, process modeling, data modeling, design of interface and data management, system implementation and operation, system maintenance, and change management implications of systems. Globalization issues in systems. Students will use current methods and tools such as rapid application development, prototyping, and visual development.

PREREQUISITE OR CO-REQUISITE

All IS foundations (IS'97.1, IS'97.4, IS'97.5) and all business foundations courses.

OBJECTIVES

This course provides an understanding and application of system analysis and design processes. Students evaluate and choose appropriate system development methodologies and design a system. Students learn the importance of effective communication and integration with users and user systems. The course emphasizes interpersonal skill development with clients, users, team members, and others associated with development, operation, and maintenance of systems.

TOPICS

- Life cycle phases including systems selection and planning, analysis, logical design, physical design, implementation and operation, maintenance
- Techniques for requirements determination, collection, and organization (questionnaires, interviewing, document analysis, observation); joint application design (JAD) and other group approaches (e.g., electronic JAD, computer conferencing).; prototyping
- Team organization and communication; interviewing, presentation design, and delivery; group dynamics; and leadership
- Project feasibility assessment and risk analysis
- Design reviews and structured walkthroughs
- Object-oriented analysis and design
- Data organization and design
- Software and system quality metrics
- Application categories
- Software package evaluation and acquisition
- Globalization issues such as cultural values, information privacy, and data exchange
- Professional code of ethics

DISCUSSION

Context of the course in the total curriculum: The analysis of an organization — its users, data, and business processes — and the subsequent design of computer systems to meet business requirements is at the heart of the information systems field. Understanding the processes and techniques used to design and implement information systems is fundamental to managing — identifying, analyzing, designing, implementing, operating, and evolving — technical resources within an organization. This course provides conceptual understanding of "where systems come from" and practical knowledge for managing the system development process.

Philosophy in the selection of topics: In the analysis, modeling, and design of both large and small information systems, it is typical that multiple individuals participate in the process. It is common that analysts work with users, managers, and other analysts to

design the system while also working with technical specialists and vendors to implement the required designs. Effective communication is at the heart of a successful information systems project. To communicate effectively, a structured and disciplined approach to the systems analysis and design process is required.

Systems design and development is firmly rooted in an organizational context — it is not merely a “technical” or “computer” activity, but a “business” activity. Success requires not only skill in system methodologies and techniques, but also in the management of people and projects. At a very fundamental level, the design and development of organizational information systems involves solving problems and communicating problem diagnoses and solutions to others in a wide range of forums and media. Applying the methods, techniques, and tools used to determine information requirements, and to document these requirements in a thorough and unambiguous form, is fundamental to the success of the project.

Suggested pedagogical approaches to delivering the course:

- Work with a fictionalized case-based problem or real-world customer
- Team-based projects to facilitate group communication, resource and time management
- Present project deliverables to peers and customers in a formal review session
- Assess project feasibility using financial cost and benefit analysis of a proposed system
- Assess project feasibility using non-financial criteria (e.g., schedule, operational, technical, legal, political) and build a business case for the project
- Capture system requirements by designing and using interviews, questionnaires, observation, and surveys
- Identify and structure system requirements using appropriate system modeling techniques for data, process, logic, and events
- Represent system designs using standard system modeling techniques
- Design screens and reports to capture system inputs and produce system outputs to meet the requirements of the customer
- Design the system dialogue and human-computer interface to be highly usable to the customer; develop initial design; and review and refine until customer approves design
- Design system documentation, help, and operation procedures (change control, daily support)

MSIS2000.3 Data Communications and Networking

CATALOG

Telecommunications fundamentals including data, voice, image, and video. The concepts, models, architectures, protocols, standards, and security for the design, implementation, and management of digital networks. Essentials of local area networks (LAN), metropolitan area networks (MAN), and wide area networks (WAN). Transmission and switching efficiency. Regulatory and technical environments. Topics include security and authentication, network operating systems, e-commerce and associated web sites and practices, and middleware for wireless systems, multimedia, and conferencing.

PREREQUISITES

IS foundations courses (IS'97.1, IS'97.4, IS'97.5)

OBJECTIVES:

This course develops a managerial level of technical knowledge and terminology for data, voice, image, and video communications and computer networks to effectively communicate with technical, operational and management people in telecommunications. Students are expected to understand and apply data communications concepts to situations encountered in industry; learn general concepts and techniques of data communications; understand the technology of the Internet; and understand the regulatory environment.

TOPICS

- Telecommunication media
- Modulation techniques and multiplexing
- Network equipment, software, and services
- Communication codes, data encoding, and synchronization
- Channel capacity, error correction strategies, and data compression
- Centralized, distributed, and client/server systems
- Architectures, topologies, and protocols
- Bridges, routers, gateways, and other interconnection devices
- Network management
- Privacy, security, and reliability considerations
- LAN, MAN, and WAN and internetworking
- Telecommunications standards
- Policy and standards-making organizations
- Internet, intranets, and extranets
- Electronic commerce
- Distributed systems
- Middleware for wireless communications, multimedia, and conferencing

DISCUSSION

Philosophy underlying the selection of topics: Because the student should be able to design and supervise the building of organizational telecommunication networks, this course focuses on technical as well as managerial aspects.

Suggested pedagogical approaches for delivering the course: The course may be organized into three major activities:

1. State of the Practice: describe the components, software, and practices of currently installed computer networks.
2. State of the Market: given a set of new requirement for global and/or enterprise-wide computer networking capability (including e-commerce) , identify, examine,

evaluate, and chose a set of available components and software that an organization can buy and/or build to satisfy the requirements. Estimate initial and recurring costs.

3. State of the Art: project the development of aspects of computer communications into the foreseeable future (two to five years) and provide feasibility, capability, and market projections.

MSIS2000.4 Project and Change Management

CATALOG

Managing projects within an organizational context, including the processes related to initiating, planning, executing, controlling, reporting, and closing a project. Project integration, scope, time, cost, quality control, and risk management. Managing the changes in organizations resulting from introducing or revising information systems. Identifying project champions, working with user teams, training, and documentation. The change management role of the IS specialist.

PREREQUISITES AND/OR COREQUISITES:

MSIS2000.1, MSIS2000.2 AND MSIS2000.3

OBJECTIVES

Students develop detailed project plans, schedules, and budgets; estimate project resources; allocate/coordinate resources; and interface with management. They are expected to learn tools and techniques of project planning and management, including the use of project management software. The course develops skills in the human and organizational implications of change including understanding the organizational change process; identifying stakeholders; assessing potential impacts of projects; and overcoming resistance, politics, and other human issues.

TOPICS

- Project lifecycle
- Project stakeholders
- Project management skills (leading, communicating, negotiating, influencing, and presenting)
- Change control (scope, schedule, cost, quality, risk, project team, and senior management)
- Project planning (definition, scope, schedule, costs, quality, resources, and risks)
- Contingency planning
- Project reporting and controls (definition, scope, schedule, costs, quality, resources, and risks)
- The role of IT in organizational change
- The role of IS specialists as change agents
- Envision change and the change process
- Diagnose and conceptualize change
- Deal with the challenges of implementation and understand and cope with resistance
- Deal with issues of motivation, interpersonal relations, group/team dynamics, and leadership in the change process.
- Manage organizational politics
- The limitations of projects as organizational change initiatives
- Organizational influences on project success (culture, organizational structure, rewards, and measures)
- Additional activities required to ensure the success of IT projects (training, job redesign, communication, etc.)
- Hands-on experience using project management software (e.g., Microsoft Project)

DISCUSSION

Context of the course in the total curriculum: This course introduces two major, related topics into the required portion of the MS program: project management and change management. MS degree holders in information systems will inevitably be involved in the management of IS projects and, as a result, in the management of the changes that

projects introduce. This course is fundamental to almost all career tracks and essential for students who undertake a practicum.

Philosophy underlying the selection of topics: Most information systems work is organized as a project rather than being department or function oriented. Therefore, it is essential for IS specialists to know how to manage projects effectively. But good project management alone is not sufficient to ensure organizational success with information systems. Work in this environment is a series of projects, which are conceived, staffed completed, and shut down. Although IS projects are among the most challenging, being able to plan and manage any business project is an increasingly important and marketable skill. This course examines the roles, responsibilities, tools, and techniques for effective project management. A blend of theory and practice, the course addresses project organization, project planning, project execution, and project control. The topics in project management were selected from the Project Management Institute's "Project Management Body of Knowledge." *PMI's Guide to the Project Management Body of Knowledge* can be downloaded from www.pmi.org.

Research shows that projects are a rather risky (i.e., failure-prone) way of attempting to create organizational change. Therefore, IS specialists must understand and be able to apply alternative ways of bringing about organizational change, such as dealing with organizational politics and designing systems that are culturally compatible. Further, organizational success with information systems usually requires the fulfillment of activities that are not always performed by IS specialists, such as job retraining and the development of new measurement and reward systems. IS specialists must understand what needs to get done and how to work with other specialists to ensure that these essential tasks are completed.

One way to frame the course is to look at project and change management as the integration of technical, cultural, and political dynamics and interactions, drawing out more explicitly the critical role of broader human, cultural, and political factors in the change process.

MSIS2000.5 IT Policy and Strategy

CATALOG

The top management, strategic perspective for aligning competitive strategy, core competencies, and information systems. The development and implementation of policies and plans to achieve organizational goals. Defining the systems that support the operational, administrative, and strategic needs of the organization, its business units, and individual employees. Approaches to managing the information systems function in organizations, including examination of the dual challenges of effectively controlling the use of well-established information technologies, while experimenting with selected emerging technologies. Role of the CIO.

PREREQUISITES

MSIS2000.1, MSIS2002, MSIS2000.3

COREQUISITE

MSIS2000.4

OBJECTIVES

Students develop an understanding of the strategic use of information technology from a business perspective at the enterprise level. They are expected to understand the internal management of information systems services from the point of view of the CIO and to examine alternative strategies and tactics available to management to achieve goals. Working students and students with post-baccalaureate experience will be able to examine the current and potential impact of information and information technology on all aspects of their position, firm, and industry. Students without experience will be able to understand the strategic information thrust of potential employers.

TOPICS

- Relationship between IS and the business
- Impact of IS on competitive position
- Aligning IT goals and strategy
- Translate strategic and IT objectives into operating principles for IS planning
- IS planning including infrastructure planning and budgeting
- IS implementation
- Outsourcing vs. insourcing
- Interorganizational systems and electronic commerce
- IS personnel, structure, and leadership
- Risk management
- The virtual organization
- Implications of globalization

DISCUSSION

Philosophy underlying the selection of topics: This course is often taught as a case-based course near the end of the student's MS program. By that time, the student has developed a broad perspective on IS and knows about it at a detailed level. This course, together with the integration course (MSIS2000.6), provides the capstone to the MSIS program.

Suggested pedagogical approaches for delivering the course:

- Students are expected to use business terminology and to relate technological issues in terms comprehensible to a general manager.
- Students are encouraged to understand the issues from the perspective of senior IS and general managers.

MSIS2000.6 Integration

System integration is a pervasive aspect of IS practice. Furthermore, students need to synthesize what they learn in the core. In the past, neither integration nor synthesis were included in the curriculum. The MSIS2000 curriculum calls for a capstone component that focuses on integration and draws together many aspects of previous core courses.

Integration can be viewed from three perspectives:

- Integrating the enterprise
- Integrating the IS function
- Integrating IS technologies

One course emphasizing the integrative role of IS is required. It is recommended that schools offer one of these courses or create a combination course that looks at all three perspectives. This course is offered near the end of the student's MS program. By that time, the student has developed a broad perspective on IS and knows about it at a detailed level.

The four different approaches to this requirement are indicated by the objectives of the courses. Schools may choose to offer any one of these courses in the core and the other courses as electives. Moreover, schools have the option of creating a course that is a combination of two or more of these three courses. This option is labeled MS2000.6.4.

- MS2000.6.1 (Integrating the Enterprise) focuses on organizational/managerial issues at the level of the enterprise as a whole. It is *what to build*, not how to build it.

- MS2000.6.2 (Integrating the IS Function) is concerned with managing the IS function within a firm on a day-to-day basis.

- MS2000.6.3 (Integrating IS Technology) focuses on the technologies required to achieve this integration. This is the course on how to develop an integrated IS enterprise architecture.

- MS2000.6.4 is any combination of selected elements from the above three courses.

MSIS2000.6.1 Integrating the Enterprise

CATALOG

Information systems role in transforming organizations and industries. An integrated view of the organization from an external and internal perspective. IS's internal role in integrating the enterprise through a cohesive set of business processes and functional applications to meet business needs. Enterprise resource planning and enterprise functionality. Collaborative systems. Consideration of external relations with suppliers, outsourcers, and customers.

PREREQUISITES

MSIS2000.1, MSIS2000.2. Ideally taken during the last semester.

COREQUISITES

MSIS2000.3, MSIS2000.4 MSIS2000.5

OBJECTIVES

Understand:

- The *configuration* of business processes that are necessary to run the corporation and their relationships with legacy systems and other functional applications
- How to design an *application architecture* to provide the information needed for decision making and knowledge management
- How IS can enable new organizational forms
- The concept and major components of a typical enterprise-wide conceptual database
- The concept of ERP and how it is implemented in business processes
- The role of collaborative systems in developing more flexible, fast response organizations.

TOPICS

- Organizational needs for integration and flexibility
- Overview of a typical "business architecture"
- The role and content of an enterprise conceptual data model
- Generic business processes
- Business process reengineering
- The integration of business, ERP functions/applications
- ERP trends and major vendors of software and services
- Interorganizational systems (supply chain and EDI)
- Collaborative systems and knowledge management

DISCUSSION

Role of the course in the total curriculum: This course builds on knowledge gained in prior core courses. In particular, MS2000.1 and MS2000.2 provide tools for describing data and processes, respectively, while MSIS2000.5 provides an understanding of organizational (as well as IS) strategy. MSIS2000.6.1 is directly relevant to students interested in the *New Ways of Working, Electronic Commerce, Enterprise Resources Planning* and *Consulting* career tracks.

Philosophy underlying the selection of topics: The intent is to provide a systems-oriented view of the organization and its relations with suppliers and customers. The course focuses on WHAT internal and external systems should do and not on HOW they are built. The emphasis is on providing students with an overall understanding of the complex role of systems in transforming organizations and markets. Topics include the specification of an integrated set of business processes and functional applications to meet business needs. ERP packages provide a concrete example of such an integrated

approach to systems and can be used to illustrate typical business processes and the functionality needed to support organizational areas such as manufacturing, finance, sales, marketing and human resources. A second set of topics focuses on systems support for business-to-business and business-to-consumer transactions and on the principles underlying supply chain management and customer relationship systems and illustrates the networked, interdependent nature of systems. The final topic, collaborative systems, illustrates how systems can support knowledge management and learning and provide the flexibility and intelligence needed to compete in a rapidly changing world.

Suggested pedagogical approaches for delivering the course:

- Lectures
- Case studies on business process reengineering, ERP systems, supply chain management, and customer management
- Exercises using a visual tool for specification of business processes and enterprise data models
- Interaction with an ERP tool (but not ERP systems development, per se)
- Student team projects involving, for example, the specification of an integrated business process
- Student presentations
- Industry lecturers

MSIS2000.6.2 INTEGRATING THE IS FUNCTION

CATALOG

The tactical/operational responsibilities and roles of the CIO. Governance considerations that link the IS-business organizations. Current/emerging issues in creating and coordinating the key activities necessary to manage the day-to-day operations of the IS function. Coordinating skills and organizational IS infrastructure.

PREREQUISITES

MSIS2000.1, MSIS2000.2. Ideally taken during the last semester.

COREQUISITES

MSIS2000.3, MSIS2000.4, MSIS2000.5

OBJECTIVES

Develop ability to:

- Organize and manage the IS function
- Assess the impact of emerging technologies
- Demonstrate the value of IS
- Describe the essential human resources components and structure of the IS organization
- Identify the characteristics of successful IS organizations
- Determine the appropriate conditions for outsourcing
- Recognize the importance/value of aligning IS and business strategies
- Understand the different roles that IS can have in the enterprise

TOPICS

- IS key business processes
- IS governance
- Organizational structure for IS
- Value of IS
- Role of the CIO
- Outsourcing of IS functions
- Systems integration
- Human resources for IS
- Managing emerging technologies

DISCUSSION

Role of the course in the total curriculum: This course builds on knowledge gained in the prior core courses. In particular, it builds on courses MSIS2000.2 through MSIS2000.5, all of which impact IS strategy and/or the design of the processes executed by the IS function. The course is directly relevant to students interested in the *Technology Management*, *Managing the IS Function*, and *Consulting* career tracks.

While MSIS2000.6.1 is concerned with the organization structure and processes of the total enterprise, MSIS2000.6.2 is concerned with the organization structure and processes of the IS organization within the total enterprise.

Philosophy underlying the selection of topics: The topics selected present the important tasks that a CIO performs on a day-to-day basis. Emphasis is placed on the considerations and techniques to perform these tasks appropriately.

Suggested pedagogical approaches for delivering the course: This course typically combines lecture and cases. Students are expected to use business terminology to derive an IS organization (structure, processes, and skills) that leverages technology across the firm. Students are encouraged to understand the issues from the perspective of senior IS managers.

MSIS2000.6.3 INTEGRATING IS TECHNOLOGIES

CATALOG

Development of an integrated technical architecture (hardware, software, networks, and data) to serve organizational needs in a rapidly changing competitive and technological environment. Technologies for intra- and inter-organizational systems.

PREREQUISITES

MSIS2000.1, MSIS2000.3. Ideally taken during the last semester.

COREQUISITES

MSIS2000.2, MSIS2000.4, MSIS2000.5

OBJECTIVES

- Make intelligent choices about computer architectures and platforms with appropriate emphasis on both organizational integration and flexibility
- Provide an understanding of interoperability: issues and technologies
- Provide an appreciation of the choice between open standards and proprietary solutions
- Understand the strategies of major hardware and software vendors with regard to technologies and standards

TOPICS

The course covers current and emerging architectures and technologies with an emphasis on methods that create vertical (within a technology type) and horizontal (across technology types) integration.

- Concepts of interoperability and standardization
- Computer platforms and information architectures (e.g., network, middleware, legacy system, client-server, and web-based technologies)
- Software component architectures
- Enterprise-wide data models
- Packaged solutions for integrating systems (ERP, workflow management systems, collaborative technologies, extranets)
- Industry technology directions

DISCUSSION

Role of the course in the total curriculum: MSIS2000.6.3 builds on knowledge gained in the prior core courses, in particular in courses MSIS2000.1 and MSIS2000.3, which are concerned with the data and communications aspects of IT infrastructure, respectively. The course is directly relevant to students interested in the *Telecommunications*, *Technology Management*, *Data Management and Data Warehousing*, *Managing the IS Function* and *Consulting* career tracks.

While MSIS2000.6.1 and MSIS2000.6.2 are concerned with organization structure and processes, MSIS2000.6.3 deals with the underlying infrastructure that enables the development of flexible, fast-response organizational structures and processes.

Philosophy underlying the selection of topics:

- The objective is to show how disparate computer platforms and networks can be integrated to provide a flexible and efficient infrastructure for the organization.
- The course provides an overview of *HOW* internal and eternal systems can be integrated and not what these systems do except in a generic sense. The emphasis is on providing students with an overall understanding of information architectures,

current and emerging technologies, industry standards and trends, and the problems faced by IT managers as they attempt to satisfy rapidly changing demands with a mixture of legacy and emerging technologies.

- Topics include concepts of interoperability and the role of middleware in integrating applications across heterogeneous computing platforms. However, these topics will no doubt change over time. Less technical topics include the role of ERP packages, data warehousing software, and workflow management systems in integrating applications and users. Finally, students need to understand how standards, standards groups, and the major hardware and software vendors shape the evolution of systems.

Suggested pedagogical approaches for delivering the course:

- Lectures
- Term projects investigating emerging technologies
- In-class technology demonstrations
- Student team projects involving, for example, the investigation of a company's information architecture
- Student presentations
- Industry speakers

MSIS2000.6.4 INTEGRATING THE ENTERPRISE, IS FUNCTION AND IS TECHNOLOGIES

CATALOG

This course combines the three integration courses described previously:

- Integrating the Enterprise
- Integrating the IS Function
- Integrating IS Technologies

PREREQUISITES OR COREQUISITES

The complete IS core (MSIS2000.1 through MSIS2000.5)

OBJECTIVES

The course introduces the student to all aspects of integration (applications, IS organization, and technology). This version of the integration course provides a generalist rather than a specialist view. Focus will depend on how the course is constructed.

TOPICS

The course covers all aspects of organizational, IS functional, and IS technologies integration (e.g., organizational, technical, resources).
Topics should be selected from the three integration courses described previously.

DISCUSSION

Context of the course in the total curriculum: This course builds on knowledge gained in prior core courses, as well as serving as a combination or summary of MSIS2000.6.1, MSIS2000.6.2, and MSIS2000.6.3. This course cuts through all functions and units of the organization.

Philosophy underlying the selection of topics: The objective is to (1) provide a systems-oriented view of the organization and its relation with suppliers and customers, (2) address the IS function within the firm, and (3) show how disparate computer platforms and networks can be integrated to provide a flexible and efficient infrastructure for the organization. This course address both the WHAT and HOW of integration.

Suggested pedagogical approaches for delivering the course: Focus will depend on how the course is constructed. Teaching techniques might include:

- Lectures
- Term projects investigating emerging techniques, applications, and technologies
- In-class demonstrations
- Student team projects
- Student presentations
- Industry speakers
- Case studies

APPENDIX 2. PREREQUISITE STRUCTURE, COURSE SCHEDULES AND STAFFING

Figure A2-1 shows the prerequisite structure for the MS in IS program. The courses are grouped into four blocks:

1. Foundations (F1 through F3 and B1 through B3),
2. MSIS Core (C1 through C5),
3. Integration Course (C6), and
4. Career Track Electives (T1 –T4).

Strict precedence is indicated by the arrows between the blocks. Within each grouping the courses are listed in the preferred order in which they should be taken by students. Scheduling requirements may override this preferred order.

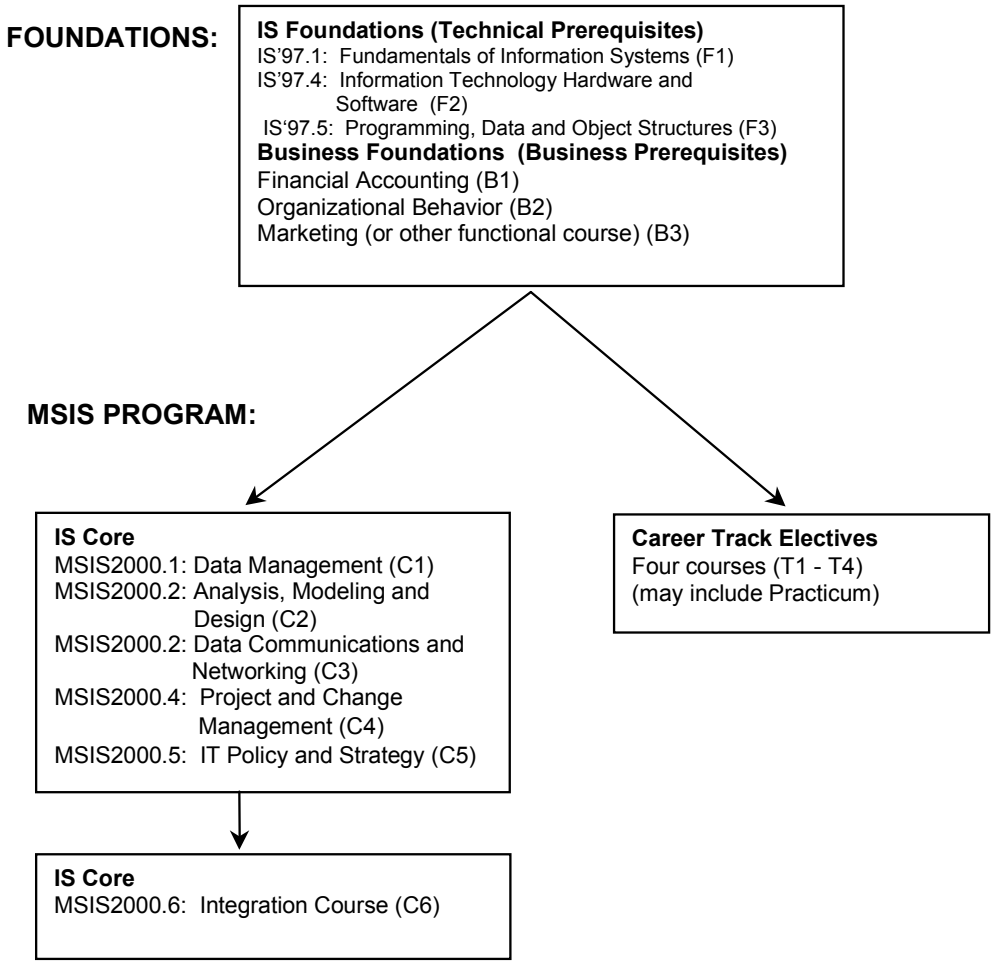

Figure A2-1. Prerequisite Structure

Tables A2-1 through A2-4 show suggested course sequences viewed from a student perspective. The tables distinguish between:

- full-time and part-time students
- students who have no foundation course, and students who have completed all the foundation requirements
- for full-time students, whether the students take four or five courses per semester

Note that in the case of part-time students with no foundation courses, it is assumed that students enter in the Spring. In that way, students without prerequisites and those with prerequisites can be merged into a single group in the fall.

Key for Tables A-2-1 through A2-4:

B1, B2, B3 — **B**usiness Foundation Courses
F1, F2, F3 — Information Systems **F**oundation Courses
C1, C2, C3, C4, C5, C6 — Information Systems **C**ore
T1, T2 , T3 — Career **T**rack Elective
T4* — Practicum or Career Track Elective

Table A2-1. Course Schedules for Full-Time Students Entering the MSIS Program with No Prior IS or Business Background

Semester	Spring	Summer	Fall	Spring	Summer
Courses (5 per semester)	F1, F2, F3 B1, B2		C1, C2, C3 B3, T1	C4, C5, C6 T2, T3	T4*
Courses (4 per semester)	F1, F2, F3 B1	B2, T1	C1, C2, C3 B3	C4, C5 T2, T3	C6 T4*

Table A2-2. Course Schedule for Full-time Students Entering the MS with All Foundation Courses Satisfied

Semester	Fall	Spring	Summer
Courses (5 per semester)	C1, C2, C3 T1, T2	C4, C5, C6 T3, T4*	
Courses (4 per semester)	C1, C2, C3 T1	C4, C5 T2, T3	C6 T4*

Table A2-3. Course Schedules for Part-Time Students Entering the MS with No Prior Background

Semester	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer
Courses (2 per semester)	F1 B1	F2 B2	F3	C1 B3	C2 C3	T1	C4 T2	C5 T3	C6
							T4*		

Table A2-4. Course Schedule for Part-Time Students Entering the MS with All Foundation Courses Satisfied

Semester	Fall	Spring	Summer	Fall	Spring	Summer
Courses (2 per semester)	C1 C2	C3 T1	T4*	C4 T2	C5 T3	C6

Table A2-5 shows the courses that need to be offered for each of the alternatives shown in Tables A2-1 through A2-4. It is assumed that full time students without foundation courses enter in the Spring semester.

Table A2-5. Staffing Requirements for MSIS Program

	Fall	Spring	Summer
Full-time 5 courses/semester All Foundations taken	C1, C2, C3 T1, T2	C4, C5, C6 T3, T4*	
Full-time 4 courses/semester All Foundations taken	C1, C2, C3 T1	C4, C5 T2, T3	C6 T4*
Full-time 5 courses/semester No Foundation taken	C1, C2, C3 T1, T2	C4, C5, C6 T3, T4*	
Full-time 4 courses/semester No Foundations taken	C1, C2, C3 T1	C4, C5 T2, T3	C6 T4*
Part-time No Foundations taken	C1, C4 T2	C2, C3, C5 T3	C6 T1, T4*
Part-time All Foundations taken	C1, C2, C4 T2	C3, C5 T1, T3	C6 T4*

APPENDIX 3. RESOURCE REQUIREMENTS

A successful MSIS degree program requires adequate resources. It must be understood that graduate programs are normally more resource intensive than undergraduate programs. In particular, given the rapid changes in IS technology, programs in IS that are computing intensive are even more resource intensive than those that stress organizational issues.

A knowledgeable and enabled faculty is at the core of any successful program. In addition, computing, laboratory, classroom, and library resources are essential elements. In a rapidly changing technical environment, students should be exposed to a variety of computing hardware and software resources that represent the settings in which they will work. The requirements imply that MS programs involve a substantial commitment on the part of the institution.

FACULTY

Faculty members are vital to the strength of an MS program. With the curriculum's emphasis on both concept and practice, the MS faculty should have both academic training and practical experience. In many cases, particularly true for emerging topics in new career tracks, adjunct faculty may need to be appointed to cover specialized topics. The number of faculty must be sufficient to provide course offerings that allow the students to complete a degree in a timely manner. The interests, qualifications, and number of full-time faculty must be sufficient not only to teach the courses but also to plan and modify the courses and curriculum over time. Table A2-5 in Appendix 2 outlines typical staffing requirements.

The IS field is moving at a rapid pace and MS programs must reflect leading edge practices so that the student receives value from the degree for a number of years after graduation. As a result, faculty members must remain current in the discipline. Professional development and scholarly activities are a joint obligation of the institution and the individual faculty member. Given the rapidly changing technology, it is particularly important that faculty members have sufficient time for professional development and scholarly activities. To make sure that the faculty remains current, resources should be provided for faculty to attend conferences, workshops, and seminars regularly and to participate in academic and professional organizations. The MS program is enhanced significantly when faculty acquire practical experience in the profession through activities such as consulting, sabbatical leaves, and industry exchange programs. Graduate faculty members should regularly contribute to the discipline through publication.

Faculty must also develop teaching materials for their students. To do so, they need to have technology available (including networking and Internet access) at least equivalent to and compatible with that available at the leading industrial sites where students will be placed.

Master's courses typically require greater preparation and more intense student interaction than undergraduate courses. Furthermore, most institutions will offer only one section of a given graduate course in a semester. Thus, for example, there is no opportunity to teach multiple sections with a single preparation. The net result is that teaching loads for faculty in MS programs should be less than those for faculty only teaching at the undergraduate level.

COMPUTING

The university must ensure that the most current technology used in industry is available to both students and faculty. Although It is reasonable to expect all students to have access to their own

personal computers, their systems will have a wide range of capabilities. At present (1999), it is necessary for the institution to provide a database system, case tools, object-oriented software, project management software, and other specialized software packages beyond an office suite. Furthermore, many schools will want to provide mainframe as well as PC experience to their MS students.

The rate of change in technology suggests a maximum three-year upgrade cycle so that at least a subset of the equipment and software is replaced each year. University laboratories must be maintained with these requirements in mind. It is strongly recommended that a computing resource plan be in place that is reviewed and updated frequently. It is important that institutions budget computer-related upgrade costs so that they become a line item in the department's or school's regular budget.

The specific computing requirements depend on the offerings of the institution, and particularly on the career tracks selected.

PHYSICAL SPACE

Physical space requirements include faculty and staff offices, classrooms, study rooms, and laboratories. Not only must the space be sufficient, but it must provide adequate electrical and network infrastructure and climate control. Classrooms should be equipped with the capability for multimedia presentations by both faculty and students.

LIBRARY

The more senior, research-oriented faculty and student body must be supported with adequate library facilities. These facilities include both books and journals. Fortunately, most journals in IS are relatively inexpensive and electronic journals are starting to appear.

APPENDIX 4. BACKGROUND AND PROCESS

HISTORY

The last MS model curriculum in IS was published in 1982 (Nunamaker et al. 1982). This program is summarized in the sidebar. By the late 1980s, it became clear that the curriculum needed to be revisited. A meeting of interested parties was therefore held at the University of Arizona under the leadership of Jay Nunamaker. The output of the meeting was that the existing curriculum was judged still serviceable. The only major change developed was splitting the decision support course into two separate courses, one in DSS and the other in Artificial Intelligence, with students selecting one or the other. The rest of the program remained the same. No documentation of this meeting was published.

The next step occurred at the first AIS Americas meeting, held in Pittsburgh in August 1995. Paul Gray of Claremont Graduate University, after a set of discussions over e-mail, invited all interested schools to send a representative to a meeting. Approximately 50 people attended, including representatives of schools with and without MSIS degrees. It was agreed to meet again in the following year. Two of the attendees, John Gorgone of Bentley College and Vijay Kanabar of Boston University, offered to study existing programs so that a baseline could be created that indicated what was then being offered. The results were published in Gorgone and Kanabar (1997) and reported at a meeting at AIS Americas 1996 jointly chaired by Paul Gray and John Gorgone. In brief, the study found approximately 50 MS programs in the U.S. (see Appendix 5), with half in Business Schools and half elsewhere in the university. The content and length of these programs varied widely. It was clear that a new model curriculum would be appropriate.

SIDEBAR: THE 1982 MODEL CURRICULUM

Nunamaker et al. (1982) describes the distinctive character of IS curriculum, general prerequisites, degree programs (MS and MBA), and implementation. The MS in IS includes AACSB common body of business knowledge and ten IS courses to prepare a student to become, primarily, a systems designer. It includes prerequisites and course requirements.

General Prerequisites: (1) finite mathematics, (2) elementary statistics, (3) elementary computer programming, (4) elementary economics, and (5) elementary psychology.

Specific Prerequisites: Computer programming and quantitative methods;
AACSB Common Body of Knowledge

IS Technology Courses:
- IS1 Computer Concepts and Software Systems
- IS2 Program, Data, and File Structures
- IS4 Database Management Systems
- IS6 Data Communications Systems and Networks
- IS7 Modeling and Decision Systems

IS Concepts in Organizations
- IS3 Information Systems in Organizations
- IS5 Information Analysis
- IS8 Systems Design Process
- IS9 Information Systems Policy
- IS10 Information Systems Projects (Practicum)

The basic guidelines used by colleges have been the ACM's 1982 curriculum. While Curriculum '82 is still a useful course reference, course content has changed drastically. The external job market changed and IS graduates had a broader range of opportunities. New technologies appeared: World Wide Web, end-user development, data warehouses, rapid application development, enterprise resource planning, and more. New concepts became important: competitive and strategic use of IS, project management, change management, and collaborative work. More skills are needed in GUI and object-oriented design. Some MS programs became more technical while others are interested in change agent roles or the economics of computing. Organizations today continue to invest heavily in information technology and information resources. These trends of rapid change and heavy investment are not likely to end.

A follow up meeting was held at AIS Americas 1997 which led, in turn, to the appointment by Gordon Davis, the incoming President of the Association for Information Systems (AIS), of the Joint ACM/AIS MSIS 2000 Curriculum Committee. The committee is co-chaired by John Gorgone for ACM and Paul Gray for AIS. Each member of the Curriculum Committee is a member of both professional societies. The Committee began work in January 1998.

PROCESS FOR DEVELOPING THE CURRICULUM

Interactive E-Meetings. The Curriculum Committee first held two interactive meetings over the Internet, using AIS's Virtual Meeting Center (VMC), created by Munir Mandviwalla of Temple University. The first considered a "straw model" curriculum and the second focused on what the content of a graduate "IS core" should be. A meeting of the full Curriculum Committee at Bentley College on June 18-20, 1998, followed these virtual meetings.

The meeting at Bentley produced the outlines of the program presented in this report. To involve the full IS community, a series of presentations were made at the fifteen national and international meetings listed in Table A4-1.

At these meetings, the underlying concepts were developed and the proposed curriculum discussed in detail. Participants in these meetings filled out forms listing what they liked best and least about the curriculum and made suggestions for changes. Many of these suggestions are included in the final recommendations.

The co-chairs of the Committee met at Claremont Graduate University in April 1999 in preparation for a June meeting of the entire committee at Bentley College. These meetings completed development of the curriculum and created the initial drafts of the final report. The report was then discussed in a meeting with the IS community at the Americas Conference of Information Systems (AMCIS 99) meeting in Milwaukee in August 1999. The final draft was completed in time for the ICIS 1999 meeting in Charlotte, North Carolina.

Table A4-1. Presentations on the MSIS 2000 Curriculum

Meetings/Conferences	Location	Date
Association for Information Systems (AIS) Americas Conference on Information Systems	Baltimore, MD	Aug 1998
International Association for Computer Information Systems (IACIS)	Cancun, Mexico	Oct 1998
Information Systems Education Conference (ISECON) of Association of Information Technology Professionals (AITP)	San Antonio, TX	Oct 1998
INFORMS, College on Information Systems	Seattle, WA	Oct 1998
Decision Sciences Institute (DSI)	Las Vegas, NV	Nov 1998
Conference Board[1]	Washington, D.C.	Nov 1998
Conference Board	Los Angeles, CA	Dec 1998
International Conference on Information Systems	Helsinki, Finland	Dec 1998
International Academy for Information Management	Helsinki, Finland	Dec 1998
Hawaii International Conference for Systems Science	Maui, HI	Jan 1999
ACM Special Interest Group in Computer Science Education	New Orleans, LA	Mar 1999
Association for Information Systems (AIS) Americas Conference on Information Systems	Milwaukee, WI	Aug 1999
Information Systems Education Conference (ISECON) of AITP	Chicago, IL	Oct 1999
Interchange99 of Society for Information Management (SIM) International[2]	Atlanta, GA	Oct 1999
Joint session of International Academy for Information Management and International Conference on Information Systems	Charlotte, NC	Dec 1999

[1]The Conference Board members are senior IS executives of very large firms.
[2]SIM members are senior IS executives (CIOs).

APPENDIX 5. EXAMPLES OF MSIS PROGRAMS THROUGHOUT THE WORLD

This appendix lists MS programs in information systems from throughout the world that have been reported to the Task Force. To create this list, the Task Force began with the 50 programs identified in Gorgone and Kanabar (1996). We then added programs about which we knew and programs that responded to messages sent via the ISWorld list serve. This list is designed to indicate the number and range of universities worldwide who are offering MS degrees in the field. The level and depth of the content of these degrees varies. Inclusion in the list does not indicate that the program meets or is close to the curriculum proposed here. The Task Force apologizes to those schools whose programs are not listed because we were not aware of them.

Australia	Curtin University
	Monash University
	University of Queensland
	University of South Australia
Canada	Ëcole des Hautés Études Commerciales
	Queens University
	University of British Columbia
	University of Waterloo
Finland	University of Jyväskylä
Hong Kong	Chinese University of Hong Kong
	City University of Hong Kong
	University of Science and Technology
Israel	Ben Gurion University
	Technion (Israel Institute of Technology)
	Tel Aviv University
Netherlands	Erasmus University
New Zealand	Victoria University of Wellington
Slovenia	University of Maribor
South Africa	University of Capetown
United Kingdom	Manchester University
	University of Leeds
	University of Sheffield
United States	Air Force Institute of Technology
	Arizona State University
	Baruch College, CUNY
	Baylor University
	Bentley College
	Boise State University
	Boston University
	Brigham Young University
	Brooklyn College
	California Polytechnic State University San Luis Obispo
	California State University, Los Angeles
	California State University Sacramento
	Case Western Reserve
	Central Michigan University
	Claremont Graduate University
	Colorado State University

	Creighton University
	De Paul University
	Drexel University
	Duquesne University
	Eastern Michigan University
	Florida Gulf Coast University
	Florida International University
	Florida State University
	Friends University
	George Mason University.
	Georgia College and State University
	Georgia State University
	Golden Gate University
	Hawaii Pacific University
	Illinois Benedictine College
	Illinois State University
	Johns Hopkins University
	Kean College
	Kennesaw State University
	Lawrence Technological University
	Louisiana State University
	Marywood College
	Middle Tennessee State University
	Mississippi State University
	New York University
	Northern Illinois University
	Nova Southeastern University
	Pace University
	Pennsylvania State University at Harrisburg
	Regis University
	Rensselaer Polytechnic Institute
	Roosevelt University
	Seattle Pacific University
	Southern Illinois University at Edwardsville
	Southwest Missouri State University
	Stevens Institute of Technology
	Strayer College
	Syracuse University
	Temple University
	Texas A & M International University
	Texas A & M University
	Texas Tech University
	University of Arizona
	University of Arkansas
	University of Baltimore
	University of Colorado at Denver
	University of Denver
	University of Detroit
	University of Florida
	University of Illinois at Chicago
	University of Illinois at Springfield
	University of Iowa

	University of Maryland, College Park
	University of Maryland, Baltimore County
	University of Memphis
	University of Miami
	University of Michigan
	University of Missouri, St. Louis
	University of Nebraska-Lincoln
	University of North Texas
	University of Pittsburgh
	University of South Alabama
	University of South Florida
	University of Texas at Arlington
	University of Texas at Dallas
	University of Virginia
	University of Wisconsin at Madison
	University of Wisconsin Milwaukee
	University of Wisconsin Whitewater
	University of Wisconsin Oshkosh
	Virginia Commonwealth University
	West Coast University
	West Paul Stillman College
	Western New England College

APPENDIX 6. SUMMARY OF CURRICULUM COURSE REQUIREMENTS

FOUNDATION

IS Foundations (Technical Prerequisites)

IS'97.1 – Fundamentals of Information Systems
IS'97.4 – Information Technology Hardware and Software
IS'97.5 – Programming, Data and Object Structures

Business Foundations (Business Prerequisites)

Financial Accounting
Organizational Behavior
Marketing

IS CORE

MSIS2000.1 – Data Management
MSIS2000.2 – Analysis, Modeling and Design
MSIS2000.3 – Data Communications and Networking
MSIS2000.4 – Project and Change Management
MSIS2000.5 – IS Policy and Strategy
MSIS2000.6 – Integration. One of the following:
- MSIS2000.6.1 – Integrating the Enterprise
- MSIS2000.6.2 – Integrating the IS Function
- MSIS2000.6.3 – Integrating IS Technologies
- MSIS2000.6.4 – Integrating the Enterprise, IS Function and IS Technologies

CAREER ELECTIVES

Four career-oriented courses — may include a practicum. See Table 3 (page 13) for representative lists.

APPENDIX 7. REVIEWERS AND PARTICIPANTS AT CONFERENCES

Last Name	First Name	Affiliation
Adams	Carl	University of Minnesota
Adams	Dennis	University of Houston
Alavi	Maryam	University of Maryland
Alter	Steven	University of San Francisco
Armstrong	Deb	University of Kansas
Balthazard	Pierre	University of North Carolina, Greensboro
Barnett	William	Northwestern State University of Louisiana
Blankenship	Ray J.	Western Kentucky University
Borton	John	University of Southern Colorado
Buono	Anthony F.	Bentley College
Burd	Stephen	University of New Mexico
Burky	Louise B.	Indiana University of Pennsylvania
Chand	Donald R.	Bentley College
Chung	H. Michael	California State University, Long Beach
Clark	Stan	Stevens Institute of Technology
Cooper	Betty	Northeast Louisiana University
Cornford	Tony	London School of Economics
Coturier	Gordon	University of Tampa
Cresap	Linda	Minot State University
Daigle	Roy	University of South Alabama
Damodaran	Mel	University of Houston, Victoria
Dasigi	Venu	Southern Polytechnic State University
Davis	Gordon	University of Minnesota
de Souza Dias	Donaldo	Federal University of Rio de Janeiro
Deans	Candace	Thunderbird-AGSIM
Dick	Geoff	University of New South Wales, Australia
Dillon	Tom	Western Kentucky University
Dishaw	Mark	University of Wisconsin, Oshkosh
Dologite	Dorothy	City University of New York
Doran	Mike	University of South Alabama
Dreher	Felix	Pittsburgh State University
Duncan	Doris	California State University, Hayward
Dutt	Jim	Bloomsburg University
Easton	Annette	San Diego State University
Eatman	John	University of North Carolina-Greensboro

Emery	James	Naval Postgraduate School
Feinstein	David	University of South Alabama
Fendrich	John W.	Bradley University
Fiedler	Kirk	University of South Carolina
Finnell	Charles	University of Arkansas
Fisher	Len	University of San Francisco
Fjermestad	Jerry	New Jersey Institute of Technology
Freitas	Henrique	Universidade Federal do Rio Grande do Sul, Brazil
Friedman	William	Louisiana Tech
Gogan	Janis	Bentley College
Gorla	Narasimthiah	Hong Kong Polytechnic University
Granger	Mary	George Washington University
Guevara	Maria	Universidad de Carabobo, Venezuela
Hadidi	Rassule	University of Illinois, Springfield
Hardgrave	Bill	University of Arkansas
Harrington	S	Georgia College and State University
Hefley	Bill	Carnegie Mellon University
Heintz	Jim	University of Kansas
Hershey	Gerald	University of North Carolina, Greensboro
Hirschheim	Rudy	University of Houston
Hislop	Greg	Drexel University
Hodges	William	University of Quebec at Montreal
Holland	Chris	Manchester Business School
Hoplin	Herman	Syracuse University
Huff	Rick	University of Southern Colorado
Huston	Terry	Saint Louis University
Hwang	CS	National Sun Yat-Sen University
Ivanov	Kristo	University of Umeå, Sweden
Jacobson	Carolyn	Marymount University
Jaska	Pat	University of Texas at Arlington
Johnson	Linda	Western Kentucky University
Jorhic	Jurij	University of Yubljena, Slovenia
Joshi	Kailash	University of Missouri, St. Louis
Käkölä	Timo	University of Jyväskylä, Finland
Kaplan	Bonnie	Quinnipiac College
Keenan	Peter	University College, Dublin
Kendall	Ken	Rutgers University, Camden
Kendall	Julie	Rutgers University, Camden
Kleen	Betty	Nicholls State University

Knapp	Constance	Pace University
Koh	Chang	University of North Carolina, Greensboro
Kohun	Fred	Robert Morris College
Koop	Becky	Wright State University
LaBarre	James	University of Wisconsin, Eau Claire
Larsen	Tor J.	Norwegian. School of Management
Laskaris	Lisa	University of Arizona
Lee	Patrick	Fairfield University
Lee	Matthew	City University of Hong Kong
Leitheiser	Bob	University of Wisconsin, Whitewater
Lesjak	Dusan	University of Maribor, Slovenia
Longenecker	Herbert	University of South Alabama
Luftman	Jerry	Stevens Institute of Technology
Madey	Greg	Kent State University
Mamaghani	Farrokh	St. John Fisher College
Manabe	Ryutaro	Bunkyo University (Japan)
Mann	Joan	Old Dominion University
McCubbrey	Don	University of Denver
McLean	Eph	Georgia State University
Min	Jungki	Haitai Dairy Co., Ltd.
Misshad	Rich Halstead	Southern Polytechnic
Myers	Martha	Kennesaw State University
Myers	Michael	University of New Zealand
Naumann	David	University of Minnesota
Nelson	Kay	University of Kansas
Nickerson	Robert	San Francisco State University
Papp	Raymond	Central Connecticut State University
Parker	Kevin	St. Louis University
Philippakis	Andy	Arizona State University
Pick	Jim	University of Redlands
Poulymenakou	Angeliki	London School of Economics
Ragowsky	Arik	Wayne State University
Rai	Arun	Southern Illinois University, Carbondale
Raisinghani	Mike	University of Texas at Arlington
Ram	Sudha	University of Arizona, Tucson
Ravichandran	T	Rensselaer Polytechnic Institute
Renwick	Janet	University of Arkansas
Rettenmayer	John	Northeast Louisiana University
Riemenschneider	Cindy	University of Arkansas

Robbert	Mary Ann	Bentley College
Robertson	J. Douglas	Bentley College
Roets	Rinette	Rhodes University of South Africa
Rohatgi	Mukesh	Old Dominion University
Rollier	Bruce	University of Baltimore
Rosenthal	Paul	California State University, Los Angeles
Samaddar	Sub	Western Illinois University
Saraswat	Satya Prakash	Bentley College
Sauter	Vicki	University of Missouri, St. Louis
Schiano	William T.	Bentley College
Schulte	Bill	George Washington University
Schultze	Ulrike	Southern Methodist University
Scott	Judy	University of Texas at Austin
Senn	Jim	Georgia State University
Seykf	Sabine	University of St. Gallen, Switzerland
Sharda	Ramesh	Oklahoma State University
Srivihok	Anongnart	Kasetsart University , Thailand
Speier	Cheri	Michigan State University
Spence	Wayne	University of North Texas
Stern	Myles	Wayne State University
Stewart	Glenn	Queensland University of Technology, Australia
Stohr	Ted	New York University
Strong	Diane	Worcester Polytechnic Institute
Tastle	Bill	Ithaca College
Thompson	Ron	University of Vermont
Trower	Jonathan	Baylor University
Varden	Stuart	Pace University
Vijayaraman	B.S.	University of Akron
Von Dran	Ray	Syracuse University
Wagner	Gerald E.	California Polytechnic University, Pomona
Wagner	Gerald (Jerry)	California State Polytechnic University, Pomona
Wagner	Jennifer	Roosevelt University
Walstrom	Kent	University of Arkansas
White	Norman	New York University
Wild	Rosemary	San Diego State University
Windsor	John	University of North Texas
Wood	Jim	Northeast Louisiana University
Wood	Wallace A.	Bryant College
Wu	Ji-Tsung Ben	University of Maryland