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UNDERGRADUATE INFORMATION SYSTEMS MODEL CURRICULUM UPDATE IS 2002

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Abstract

The information systems discipline has a long history of applying model curricula to guide the particular course offerings of academic institutions. This paper provides an overview of the most recent work on updating the information system model curriculum, referred to as IS 2002 – The Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems. The last major update, IS '97, was completed several years ago. The need for the update is warranted due to the advent of the Internet, the changes in student computing literacy, and the recent information systems accreditation movement. The curriculum updates follow the recommendations of three collaborating organizations: AIS, ACM and AITP. After presenting an introduction and discussion of the need for a curriculum update, the paper describes the key principles and guiding assumptions about the information systems field. Next, the exit characteristics of IS graduates are presented. This motivates a discussion and presentation of the scope of the current curriculum update. The paper concludes by presenting the course architecture, sequence and high-level catalog descriptions.

Keywords: IS education, IS undergraduate curriculum, information systems, IS curriculum model, IS 2002

Introduction

The Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems (IS 2002) is the latest report on model curriculum work in information systems. The previous report was presented in 1997 (IS '97). The first information systems (IS) curriculum effort took place in 1972 (ACM '72, Ashenhurst, 1972) and then again in 1982 (ACM '82, Nunamaker et al., 1982) by the Association for Computing Machinery (ACM). Other organizations, including AIS (Association for Information Systems), AITP (Association of Information Technology Professionals), and IFIP (International Federation for Information) have published IS model curricula. IS '97 was the first major collaboration of the three key organizations with a worldwide membership in information systems: ACM, AIS and AITP. IS 2002 is the second collaborative effort between ACM, AIS and AITP.

Although ACM, AIS, and AITP are worldwide organizations, IS 2002 does not represent a universal global IS curriculum. It does not seek to harmonize the curriculum to meet the requirements of different educational systems around the world. The model curriculum for undergraduate degree programs in information systems is based on the typical degree structure in USA and Canadian universities. The IS model curriculum can serve as a useful reference by curriculum designers and developers outside

North America in designing and developing information systems degree programs as its predecessors have done over the past decades.

The most recent undergraduate curriculum model, IS '97 (Davis et al., 1997) was circulated in draft form in 1994 (Gorgone et al., 1994; IS '95, see Longenecker et al., 1994) and 1995 (Couger et al., 1995) and finalized in 1996. Members of the Joint Task Force presented drafts of IS '97 at numerous conferences from 1994 to 1996 and received significant feedback that substantially strengthened the report. It has been approximately seven years since the current model curriculum has been updated since much of the work was actually completed between 1994 and 1995. Since 1997, the task force members have collected survey data to better understand the changes that have occurred in the information systems discipline. This paper provides a progress report on the updating of IS '97.

The next section is a brief discussion of the need to update IS '97. This is followed by key principles and guiding assumptions about the IS profession that helped to shape the curriculum design and evolution. The exit characteristics of IS graduates are presented next. The scope of the curriculum update is then discussed so that programs transitioning from IS'97 to IS 2002 will better track the model's evolution. This is followed by a brief presentation of course architecture and intended course sequence. Finally, the paper concludes by providing course prerequisites and high-level course catalog descriptions of the IS 2002 model curriculum.

Need for Curriculum Update

Since the last revision of the undergraduate curriculum guidelines, three major factors have spurred the need to reexamine and update the existing standard. In particular, the advent of the Internet, the changes in student computing literacy, and the information accreditation movement all motivate the need to update the curriculum. In this section, we briefly review each of these motivating factors.

During the development of IS' 97, the true importance of Web and Internet systems development and related concepts such as Web-based distributed architectures, Internet protocols, and IP-based internetworking was not yet foreseen. Although it was known that the impact of these then novel concepts could be enormous, their real effect was at the time unrealized and not fully understood. In the intervening years, the Internet has grown to become a major aspect of all IS environments.

Over the past decade, there has been a significant change in basic computer literacy of incoming university students. In the past, very few students entered a university having significant skills in using a desktop computer, with even fewer students owning or having easy access to a computer. Today, with the advent of the Internet revolution and low cost PCs, most students entering a university today have at least a modest level of computer literacy.

There has been interest in the accreditation of programs in Information Systems since the accreditation of programs in computer science was begun in mid-1980s. The work on IS'97 with its support from the major IS professional societies provided the much needed catalyst for IS accreditation to move forward. With the support of the National Science Foundation, the Criteria for the Accreditation of Programs in Information Systems have been developed with IS'97 serving as the basis of the IS curriculum criteria. ABET is the agency with responsibility for accrediting all programs in computing, engineering and technology (Gorgone & Lidtke, 2000). The Computing Accreditation Commission (CAC) has responsibility for accrediting computer science and information systems programs. The first IS accreditation visit of an IS program was completed during fall 2001.

Key Guiding Principles

The key principles that guided the IS 2002 development effort were as follows:

1. The model curriculum should represent a consensus from IS community.

2. The model curriculum should be designed to help IS faculty produce competent and confident entry level graduates well suited for workplace responsibilities.

3. The model curriculum should not be prescriptive; by using the model curriculum guidelines, faculty can design their own courses.

4. The model curriculum should be based on sound educational methodologies and make appropriate recommendations for consideration by IS faculty.

5. The model curriculum should be flexible and adaptable to most IS programs.

Guiding Assumptions About the IS Profession

In conceptualizing the role of information systems in the future and the requirements for IS curricula, it seems apparent that several elements have been (ACM '72, ACM '82, IS '95, IS'97, and ISCC'99) and remain important and characteristic of the discipline. These characteristics evolve around four major areas that permeate all aspects of the IS profession and therefore must be carefully integrated into any IS curriculum:

1. IS professionals must have a broad business and real world perspective. Students must therefore understand that:
   - IS enable the success of organizations
   - IS span and integrate all organizational levels and business functions
   - IS are increasingly of strategic significance because of the scope of organizational systems involved and the role systems play in enabling organizational strategy.

2. IS professionals must have strong analytical and critical thinking skills. Students must therefore:
   - Be problem solvers and critical thinkers
   - Use systems concepts for understanding and framing problems
   - Be capable in applying both traditional and newly learned concepts and skills
   - Understand that a system consists of people, procedures, hardware, software and data.

3. IS professionals must have strong ethical principles and interpersonal communication and team skills. Students must understand that:
   - IS requires the application of professional codes of conduct
   - IS requires collaboration as well as successful individual effort
   - IS design and management demands excellent communication (oral, written, and listening)
   - IS requires persistence, curiosity, creativity, risk taking and a tolerance of these abilities in others.

4. IS professionals must design and implement information technology solutions that enhance organizational performance. Students must therefore:
   - Possess skills in understanding and modeling organizational processes and data, defining and implementing technical solutions, managing projects, and integrating systems
   - Be fluent in techniques for acquiring, converting, transmitting, and storing information
   - Focus on the application of information technology in helping people and organizations achieve their goals.

Exit Characteristics of IS Graduates

The graduates of an undergraduate IS program should be equipped to function in an entry-level position and should have a basis for continued career growth (Lee, Trauth and Farwell 1995; Landry et al 2000). Figure 1 presents a high-level categorization of the exit characteristics that emphasizes the central role of Technology-Enabled Business Development at the intersection of the four major areas that were identified in the initial assumptions about the IS profession. Although not presented here, the full curriculum report divides the main categories further into subcategories and presents concrete, practical representative examples of the exit characteristics in each subcategory. The overarching objective for IS professionals is to enable organizations to utilize information technology to achieve their strategic objectives with a customer service orientation.

Scope of Curriculum Update

Recently a survey of computing faculty in the United States was conducted to ascertain information in two areas. The first was to determine their current view of the appropriate depth of mastery for each of the elements in the IS'97 body of knowledge. The second was to gather similar information for key skill areas identified within IS'97. Some of the observations based on this research have been published (Longenecker et al., 1999; Landry et al., 2000). The primary conclusions can be summarized as:

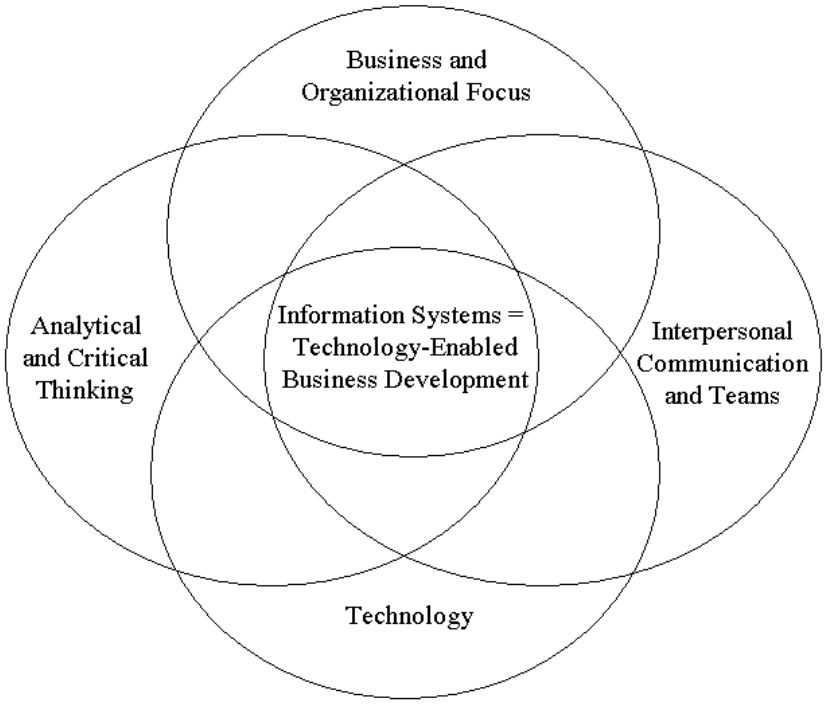

Figure 1. Fundamental Categories of Exit Characteristics Of IS Graduates

1. IS analysts have specific skills at approximately IS'97 skill depth level 3 (the ability to *USE* knowledge) in areas of Interpersonal and Team Skills, Business Knowledge, Organizational Process Development (including IS Systems Analysis and Design), Project Management, Database, Software Development, Web Programming, and Systems Integration.

2. Skills identified in IS'97 as Exit Curriculum Areas match expectations of the computing industry as well as IS faculty.

3. Skill areas produced by programs of Information Technology match expectations of Information Systems faculty.

4. The model courses of IS'97 are acceptable to both IS and IT faculty. Interestingly, both Computer Science and Software Engineering faculty also feel that IS'97 courses are relevant.

When analyzing the survey data and the IS'97 curriculum in summer of 2001, the missing element in the curriculum was a course focusing on Internet-based commerce. At most universities, this course has been a popular required course for several years and so there was a clear discrepancy in the existing model curriculum and what was being operationalized in most universities. Thus, a new course was added to the model curriculum, IS 2002.2 – *Electronic Business Strategy, Architecture and Design*, to address this limitation. Without restructuring other aspects of the model curriculum, the addition of a new Internet-based commerce course to the model curriculum would result in curriculum of eleven required courses. There was a desire by the committee to limit model curriculum to a target of ten courses, or 30 semester units, which therefore would result in the elimination of one of the existing IS'97 courses. This decision was driven by recently approved accreditation standards and by the practical credit hour constraints realized by many IS programs.

IS'97 had a prerequisite course, IS'97.P0 – *Knowledge Work Software Tool Kit*, that assumed students had elementary exposure to a suite of software tools useful for knowledge workers (spreadsheets, databases, presentation graphics, database retrieval, statistics, word processing, and electronic mail). It was also assumed that students could gain this knowledge through a formal course or through self-study modules. Beyond this course, IS'97 had a required course, IS'97.2 – *Personal Productivity with IS Technology*, that focused on improving student skills in using packaged software, in both individual and group work, by designing and developing solutions. Given the need to limit the IS 2002 curriculum to ten courses and the rapid and significant improvement in the general computing literacy of entering students, IS'97.P0 and IS'97.2 were melded into a single prerequisite course, IS 2002.P0 – *Personal Productivity with IS Technology*.

Beyond the addition of the Internet-based commerce course, IS 2002.2, and the melding of IS97.P0 and IS'97.2 into a single prerequisite course (or self-study modules, see below for more details), the remaining courses were retained with appropriate updating of the course "Scope" and "Topic" descriptions. In most cases, this resulted in the addition of Internet centric-content and more contemporary terminology and concepts. For all but one, course names remained unchanged. However, IS'97.9 – *Physical Design and Implementation with a Programming Environment* was changed to IS 2002.9 – *Physical Design and Implementation in Emerging Environments*. This change was motivated by the continual evolution in rapid application development and programming environments. A mapping of the courses and a summary of the changes is represented in Table 1.

Table 1. Mapping Of IS 2002 Courses To IS '97 Courses

IS 2002 Courses		IS'97 Courses
IS 2002.P0 – Personal Productivity with IS Technology	MELDING	IS'97.P0 – Knowledge Work Software Tool Kit IS'97.2 – Personal Productivity with IS Technology
IS 2002.1 – Fundamentals of Information Systems	UPDATE ←	IS'97.1 – Fundamentals of Information Systems
IS 2002.2 – Electronic Business Strategy, Architecture and Design	NEW ←	NO EXISTING COURSE
IS 2002.3 – Information Systems Theory and Practice	UPDATE ←	IS'97.3 – Information Systems Theory and Practice
IS 2002.4 – Information Technology Hardware and Systems Software	UPDATE ←	IS'97.4 – Information Technology Hardware and Systems Software
IS 2002.5 – Programming, Data, File and Object Structures	UPDATE ←	IS'97.5 – Programming, Data, File and Object Structures
IS 2002.6 – Networks and Telecommunication	UPDATE ←	IS'97.6 – Networks and Telecommunication
IS 2002.7 – Analysis and Logical Design	UPDATE ←	IS'97.7 – Analysis and Logical Design
IS 2002.8 – Physical Design and Implementation with DBMS	UPDATE ←	IS'97.8 – Physical Design and Implementation with DBMS
IS 2002.9 – Physical Design and Implementation in Emerging Environments	UPDATE ←	IS'97.9 – Physical Design and Implementation with a Programming Environment
IS 2002.10 – Project Management and Practice	UPDATE ←	IS'97.10 – Project Management and Practice

Course Architecture and Sequence

The IS 2002 curriculum assumes that students have a prerequisite knowledge of desktop computing. Specifically, it is assumed that students have an elementary exposure to a suite of software applications useful for knowledge workers such as word processing, spreadsheets, Email, and Internet browsing. In addition, students are assumed to also have knowledge and skill of IS technology to be a successful knowledge worker as described in the prerequisite course IS 2002.P0 – *Personal Productivity with IS Technology*.

Figure 2 shows the course architecture and sequence of courses within IS 2002, including the prerequisite course IS 2002.P0. The structure is a "suggested" architecture and sequence with the appreciation that each university's situation is somewhat unique. In any event, this architecture allows the entire program to be completed within a scope of two years. This model will therefore fit within the broader curricula constraints of most business schools. For IS programs housed outside business, great flexibility in the sequence can be employed.

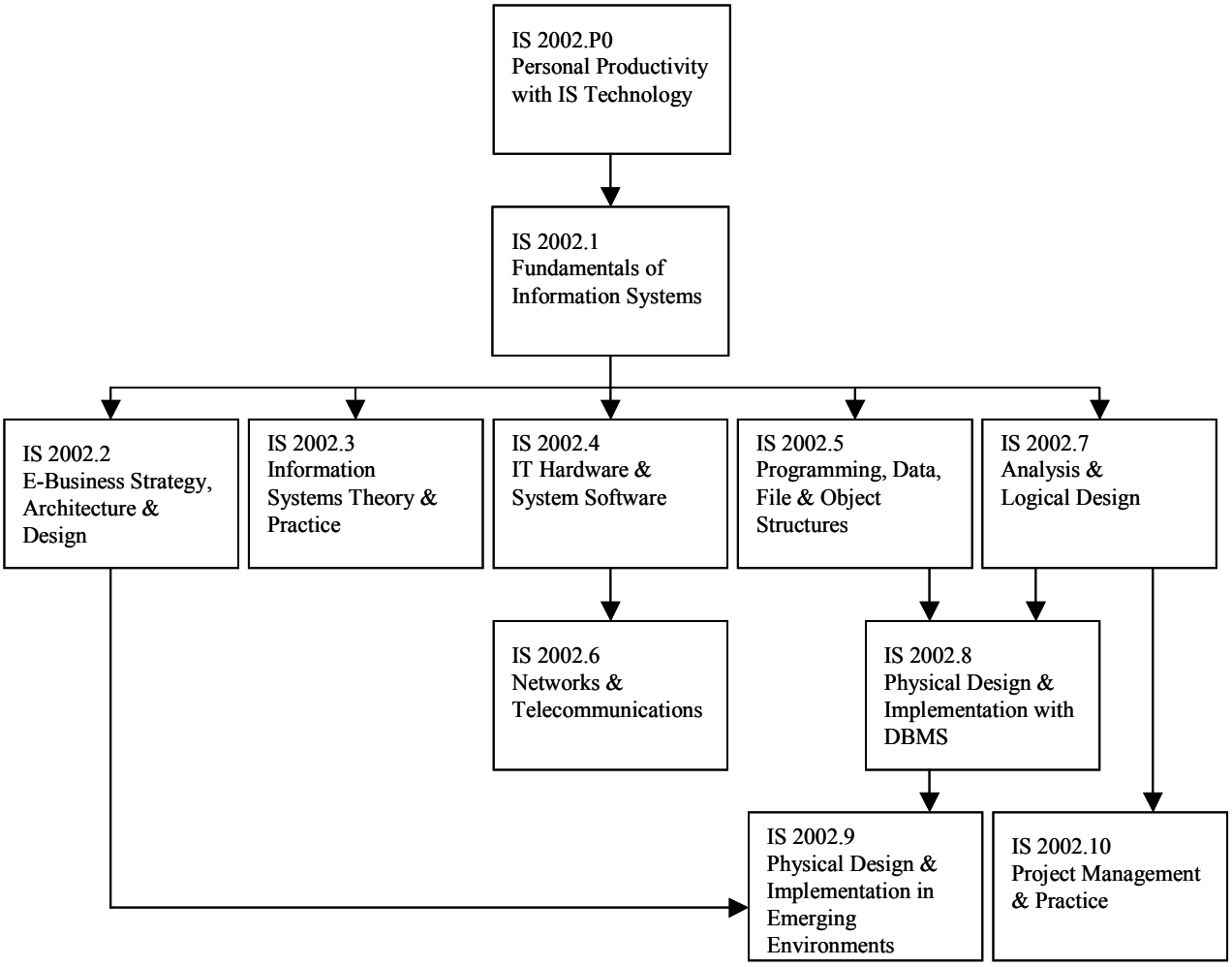

Figure 2. IS 2002 Course Architecture And Sequence

Course Descriptions

In this section, we conclude by providing high-level course catalog descriptions for IS 2002. These include the prerequisite Personal Productivity with IS Technology (IS 2002.P0) course plus the ten courses within the Model Curriculum. Presented in Table 2 below is the title, prerequisite and catalog description for each of the courses.

Table 2. IS 2002 Course Number, Title, and Catalog Description

Course Number & Title (prerequisite)	**Catalog Description**
IS 2002.P0 – Personal Productivity with IS Technology (basic word processing, spreadsheets, e-mail, and Web browsing)	Students with minimal skills will learn to enhance their personal productivity and problem solving skills by applying information technologies to problem situations and by designing and using small information systems for individuals and groups.
IS 2002.1 – Fundamentals of Information Systems (IS 2002.P0)	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 and information system growth and re-engineering are introduced.
IS 2002.2 – Electronic Business Strategy, Architecture and Design (IS 2002.1)	The course focuses on the linkage between organizational strategy and networked information technologies to implement a rich variety of business models in the national and global contexts connecting individuals, businesses, governments, and other organizations to each other. The course provides an introduction to e-business strategy and the development and architecture of e-business solutions and their components.
IS 2002.3 – Information Systems Theory and Practice (IS 2002.1)	Students who have constructed personal information systems will be exposed to the theory of the IS discipline. Application of these theories to the success of organizations and to the roles of management, users and IS professionals are presented.
IS 2002.4 – Information Technology Hardware and System Software (IS 2002.1)	Principles and application of computer hardware and software will be presented through lecture, installation, configuration, and operations experiences.
IS 2002.5 – Programming, Data, File and Object Structures (IS 2002.1)	This course presents 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.
IS 2002.6 – Networks and Telecommunication (IS 2002.4)	Students will gain in-depth experience of networking and telecommunications fundamentals including LANs, MANs, and WANs. Data communication and telecommunication concepts, models, standards, and protocols will be studied. Installation, configuration, systems integration and management of infrastructure technologies will be practiced.
IS 2002.7 – Analysis and Logical Design (IS 2002.1)	Students with information technology skills will learn to analyze and design information systems. Students will practice project management during team oriented analysis and design of a departmental level system.
IS 2002.8 – Physical Design and Implementation with DBMS (IS 2002.5 and IS 2002.7)	Students who have completed the analysis and logical design course will develop a detailed physical design and implementation based on a logical design utilizing a DBMS. The course integrates intensive project work with relevant concepts.
IS 2002.9 – Physical Design and Implementation in Emerging Environments (IS 2002.2 and IS 2002.8)	Students who have completed the analysis and logical design course will extend their knowledge by implementing an information system using a contemporary development environment capable of interacting with a local or a remote DBMS. Teams will use project management principles to implement an information system.
IS 2002.10 – Project Management and Practice (IS 2002.7)	Advanced IS majors operating as a high-performance team will engage in and complete the design and implementation of a significant information system. Project management, management of the IS function and systems integration will be components of the project experience.

Summary and Conclusion

This paper presented a status report on the current updates to the information system model curriculum for 2002. Discussed were the key motivations behind the need to update IS '97, key principles and guiding assumptions about the IS profession that helped to shape the curriculum design, and the exit characteristics of IS graduates. The scope of the curriculum update was discussed so that programs transitioning from IS 1997 to IS 2002 will better understand the model's evolution. This was followed by a brief presentation of the course architecture and intended course sequence. Finally, the paper concluded by providing high-level course catalog descriptions of the IS 2002 model curriculum.

It could be easily argued that the curriculum updating process is too slow and not responsive to the pace of change encountered in practice. In the future, as information technologies continue to evolve and change at an increasingly rapid pace, the need for even more timely updates is clear. Arguably, the largest motivation for the current curriculum update was the advent of the Internet. This global architecture will provide a necessary foundation to ease the updating process and facilitate broader involvement by the IS academic and professional community. Just as the Internet has fundamentally changed business, we too feel that this medium can be used to fundamentally change the curriculum design process. As we move forward, we urge the reader to embrace this opportunity to shape the IS academic discipline so that we can collectively be more responsive to the changing curricular needs of both academia and industry.

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