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ABSTRACT

This paper summarizes the key elements of a panel presentation at the Americas Conference for Information Systems (AMCIS) 2007 that reviewed the current status of the joint Association for Computing Machinery (ACM)/Association for Information Systems (AIS) undergraduate information systems model curriculum revision project. After providing a brief historical overview of IS model curricula and describing the reasons why a revision is overdue, the paper focuses on three main aspects of the current revision proposal. These include: 1) extending the reach and applicability of the curriculum model beyond business schools and making it a genuinely global model; 2) separating core topics from career track electives and including career tracks in the model; and 3) revising the curriculum development model to be significantly more inclusive using modern Web-based technologies.

Keywords: undergraduate IS curriculum, curriculum development process, computing education, model curriculum

I. INTRODUCTION

This paper summarizes the Americas Conference for Information Systems (AMCIS) 2007 panel presentation on the work of the Association for Computing Machinery (ACM)/Association for Information Systems (AIS) joint task force, which has been charged to lead the process of revising the undergraduate information systems model curriculum. Specifically, the panel presented a status report on the current revision effort, including a description of new mechanisms for designing and maintaining the curriculum. The ACM/AIS undergraduate IS curriculum task force hopes to broaden the participation in the revision effort, by providing Web 2.0 technologies, starting with a wiki, to be the repository and the main communication forum for curriculum development and maintenance. This will be a change from the prior curriculum

development efforts, as the IS community at large will be encouraged to participate *directly* in the process. Further, the scope of target audience has been expanded beyond the business school centric models of the prior IS curriculum efforts. Specifically, the task force believes that the new curriculum model will be applicable to many domains beyond business such as biology, law, or healthcare. In addition, as IS academics, it should be our goal not only to refine our processes for developing and maintaining our curriculum, but also to provide a conceptual framework and a technology implementation that could be used by any academic discipline in their curriculum revision process.

The current revision process started in January-February of 2007, and it will be completed by the end of 2008. The co-chairs are Joe Valacich (Washington State University) and Heikki Topi (Bentley College). The other members of the committee are Kate Kaiser (Marquette University), Jay Nunamaker (University of Arizona), Janice Sipior (Villanova University) and Gert-Jan de Vreede (University of Nebraska-Omaha). The task force would also like to acknowledge the contributions of Ryan Wright, a Ph.D candidate at Washington State University, who has assisted the work of the task force in countless ways. This ongoing curriculum revision will be a significant effort, given the objectives of not only updating the curriculum but also reengineering the processes utilized for designing and maintaining its content.

This paper is organized as follows. Section II is an overview of the background and history of past IS curriculum revision efforts is presented. This is followed by a description of the primary motivations driving the curriculum revision effort as well as an overview of the new curriculum structure. The paper concludes with a description of the curriculum wiki, our proposed mechanism for gaining broader community involvement in the revision process.

II. BACKGROUND AND BRIEF HISTORY

The AMCIS 2007 panel consisted of members from the ACM/AIS joint task force charged with updating and revising the IS undergraduate model curriculum. Prior to this current effort, the most recent version of the IS undergraduate model curriculum is IS 2002 [Gorgone et al. 2003], published in early 2003. IS 2002 was a relatively minor update of IS'97 [Davis et al. 1997]. Both IS 2002 and IS '97 were joint efforts by ACM, AIS, and DPMA/AITP (Data Processing Management Association/Association of Information Technology Professionals) IS'97 was preceded by DPMA'90 [Longenecker and Feinstein 1991] and ACM Curriculum Recommendations 1983 [ACM 1983] and 1973 [Couger 1973]. As defined by IS 2002, the information systems (IS) academic field:

> *encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function); and (2) development and evolution of technology infrastructures and systems for use in organizational processes (systems development). [Gorgone et al. 2003; p. 2]*

IS 2002 included detailed course descriptions and prescriptive advice on how to offer a quality IS degree program.

IS 2002, however, was primarily a model curriculum targeted for North American schools. In its development, assumptions about student background and specific local degree program constraints drove many of the design decisions. For instance, IS 2002 consists of 10 courses, which reflects the maximum practical size of a program within an AACSB (The Association to Advance Collegiate Schools of Business) business school. As such, many felt that IS 2002 was not particularly relevant outside the United States. Although it was argued that the fundamental body of computing and information systems knowledge was central to understanding information systems, its design limited its acceptance and use, particularly outside the U.S. and Canada.

Updates to IS 2002 over IS'97 included adding *IS 2002.2 – Electronic Business Strategy, Architecture and Design*, given the emergence of the Internet as a platform for business and

information systems. To adhere to the 10-course limit, two IS'97 courses were merged into an 11th course, *IS 2002.P0 – Personal Productivity with IS Technology*; this course was described as a "prerequisite" in order to retain the 10-course limit. All other courses remained the same except *IS'97.9 – Physical Design and Implementation with a Programming Environment,* which was changed to *IS 2002.9 – Physical Design and Implementation in Emerging Environments*. The transformation in application development environments (e.g., Microsoft .NET, Enterprise Java, and so on) was the catalyst for this change to the curriculum.

The architecture of IS 2002 consists of five presentation areas: 1) information systems fundamentals, 2) information systems theory and practice, 3) information technology, 4) information systems development, and 5) information systems deployment and management processes. The material in these five presentation areas is operationalized in one prerequisite course and 10 major courses (see Figure 1). Closely based on IS'97, the courses were revised based on an updated body of knowledge and a set of learning units. IS 2002 provided the structure and sequence that permitted the completion of the curriculum in two years, which, again, is a constraint of many AACSB business schools.

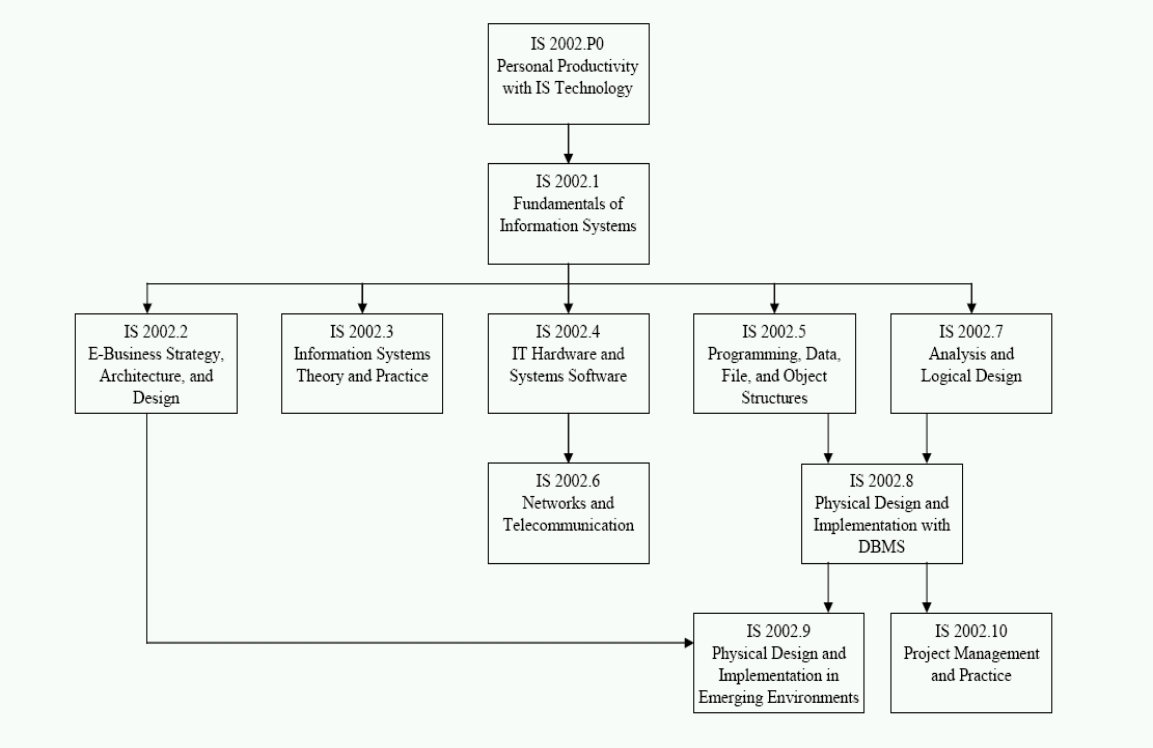


Figure 1. IS 2002 Course Structure

The motivations for updating IS'97 with IS 2002 were driven primarily by the emergence of the Internet and the widespread use of the Web as a platform for electronic business/commerce, and secondarily, by the increased computer literacy of most students. Next, we look at the forces driving the current revision effort.

III. MOTIVATIONS FOR THE CURRENT CURRICULUM REVISION

There are several motivation for the IS curriculum update. First, and most obvious, is timing. The last comprehensive undergraduate curriculum revision was IS'97. Also, most of the work done on IS'97 was done in the mid-1990s, making the curriculum elements closely linked to a specific set of technologies quite antiquated. Second, there has been a great deal of change in technology and industry practices. This major contextual change has several factors driving it, including:

1. Complex globally distributed information systems development – The full extent of the distributed nature of IT development was not fully visible during the development on the previous curriculum. The skills needed by IS graduates have, consequently, changed significantly. Increasingly, many IS jobs for business school graduates require capabilities in the management of globally distributed development resources.
2. Web technologies and development – Mature modeling and development platforms for the web environment have become a core part of IS development.
3. ERP/Packaged software – Information systems and business processes have become closely integrated, and increasingly often, core infrastructure applications are based on large-scale enterprise systems so that the focus is shifted from development to configuration.
4. Ubiquitous mobile computing – Global organizational life using a variety of devices has become dependent on mobile and ubiquitous platforms.
5. IT control and infrastructure frameworks – Frameworks and standards such as COBIT, ITIL, and ISO 17799, have become very important sources of guidance for IT/IS practices in organizations. We have to at least ask the question about what their role is in IS curricula.

Clearly, the professional context in which our graduates do their work has changed considerably over the past decade, and this change should be reflected in the curriculum.

Third, the interest in the study of IS as a field has dramatically declined among students at most institutions. Therefore, it is imperative that the IS community as a whole addresses this problem from several different perspectives, including curriculum design. Finally, the IS discipline must address its core principles and values within and through the curriculum. By doing so, the importance of clearly articulating the identity of the IS discipline can be established and strengthened.

Of course, this list cannot be inclusive of all motivations for the curriculum revision. We hope, however, that these issues clearly stress the importance of substantially and systematically overhauling the current curriculum.

The task force believes that three core processes should drive the current revision effort:

1. To expand the scope of the model curriculum beyond business/management;
2. To provide greater flexibility for schools adopting the curriculum by separating the core of the curriculum from career track electives; and
3. To utilize Web 2.0 technologies to create a platform for enabling broader community participation in the development and maintenance of the curriculum.

The next section examines the need to reach beyond business schools with the next version of the curriculum. This is followed by a description of the new curriculum structure. Finally, we conclude by briefly describing the wiki environment designed to support the revision process.

IV. REACHING BEYOND THE BUSINESS SCHOOL

There is an ongoing debate regarding the nature and identity of information systems as a discipline. At the center of this debate is whether information systems is exclusively a business discipline (i.e., exists *only* within a business domain), or whether information systems can exist in a variety of domains, including law, biology, healthcare, and so on.

Earlier model curricula have clearly identified business as the domain in which IS was located. As shown in Figure 2 (excerpted from IS 2002), business was the exclusive domain for prior versions of the model curriculum where domain content was shown as “business fundamentals.” Although IS 2002 clearly acknowledges that IS programs could and do exist outside business schools, it also took the position that the primary (exclusive) domain for graduates was business and

"technology-enabled business development" (further clarified as systems analysis and design, business process management, systems implementation, and IS project management).

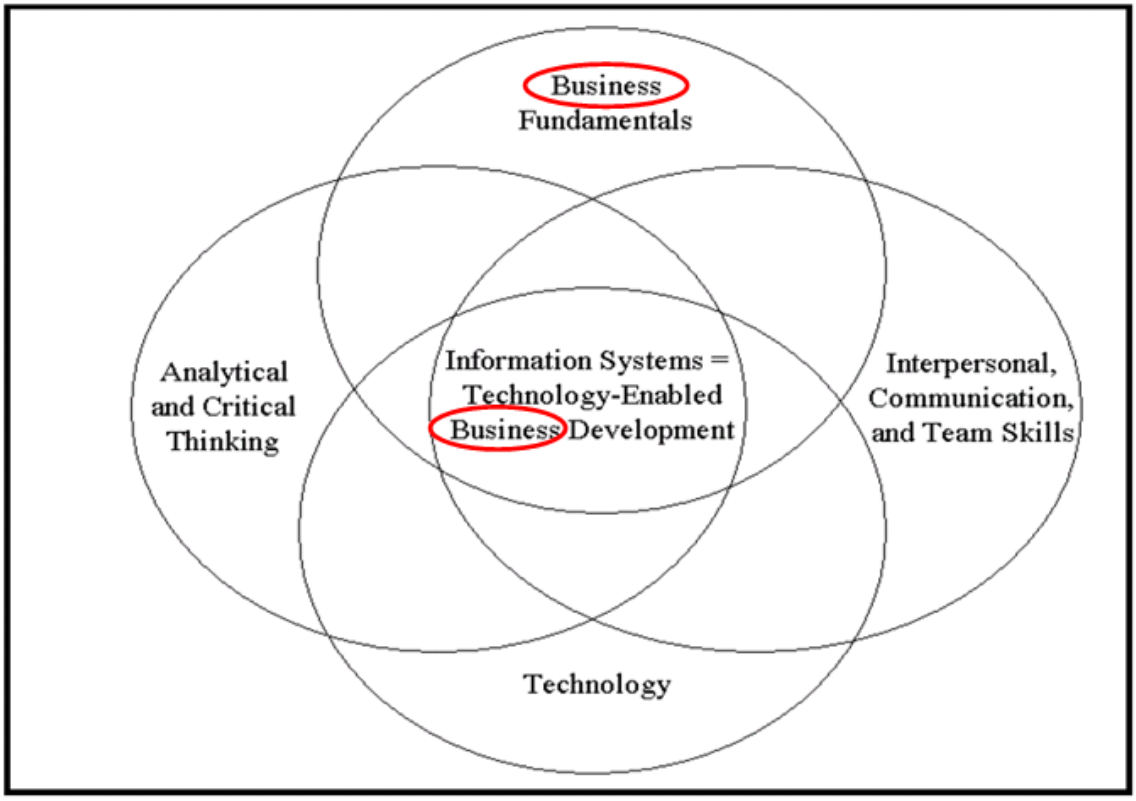


Figure 2. IS 2002: Exit Characteristics

Although the task force acknowledges that business is an important (and, in practice, the dominant) domain for information systems, information systems are driving change and innovation in a broad range of contexts, including the public sector, nonprofit organizations, law, healthcare, and so on. Consequently, the task force believes that the context for the information systems model curriculum must be broader than business. The intent is not to suggest that we should severe the ties of the information systems community with the schools of business and management; on the contrary, any proposed revisions have to be compatible with the needs of the majority of current IS programs that reside within business schools. The main justification underlying the proposal to make the curriculum more context independent is to emphasize that the core knowledge and skills in information systems are applicable to a rich variety of domains, and that it is our community that possesses this expertise. In many ways, we want to claim ownership of our core capabilities and not limit them to an unnecessarily narrow context.

The task force believes that, by definition, information systems is a discipline that integrates technology and organizational processes with domain expertise. Therefore, a degree program in information systems should never be implemented without a domain context – a program that only focuses on technology or technology-related organizational processes is a program in software engineering or information technology (see, for example, Shackelford 2005), not a program in information systems. A new version of the exit characteristic diagram included in Figure 3 illustrates the continued importance of the domain knowledge as a defining characteristic of every information systems program.

The next section will outline a new framework for addressing how to add flexibility to the curriculum while still addressing AACSB needs.

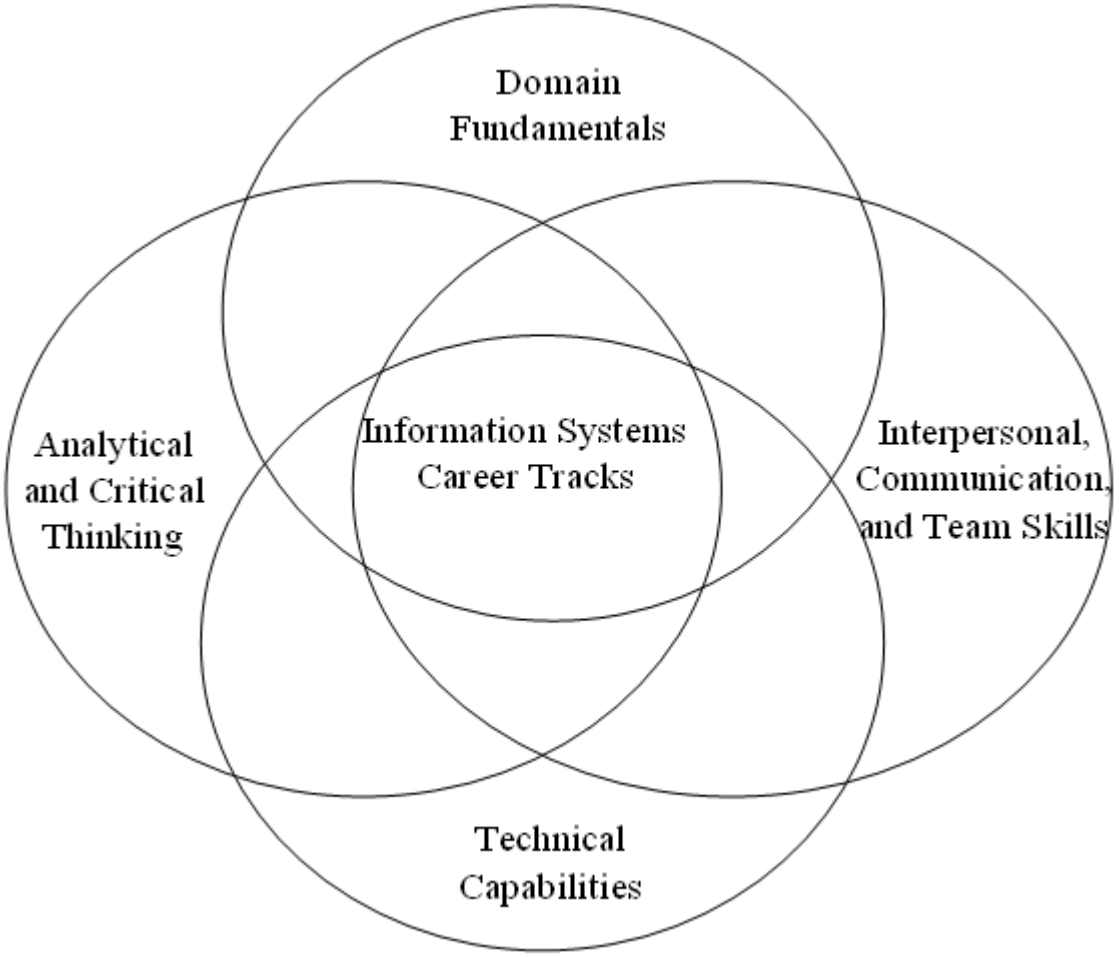


Figure 3. Revised Exit Characteristics

V. CURRICULUM STRUCTURE

The IS 2002 curriculum had taken a "one size fits all" philosophy, whereby there is no separate core specified within the curriculum. In essence, all courses are required (See Figure 1). Unfortunately, this model left little room for local innovation and adaptation in institutions that wanted to adopt the model curriculum in its entirety. For many schools, it was impossible to follow the curriculum guidelines because they had fewer courses in their program than the 10 specified in IS 2002. On the other hand, at other institutions there might be much more room available for IS courses, and again, the fixed-size model curriculum is an obstacle. As a result, many institutions did not find IS 2002 to be responsive to their particular situations.

To overcome this limitation of IS 2002, the task force wanted to introduce greater flexibility into the new curriculum. To do so, the task force identified a set of core topics that will be common to *all* information systems programs. The six core topics are:

1. Foundations and Role of Information Systems
2. Data and Information
3. Systems Analysis and Design

4. IT Infrastructure and Controls
5. Project Management
6. Application Development

It is important to note that these six topics are not six separate courses; they could be implemented as courses or as components within fewer courses. The key point is that the task force *strongly believes* that there is indeed a core body of knowledge to the information systems discipline, which is captured in this list of core topics. In essence, the task force is making a strong statement regarding what defines information systems by defining the core. The proposed model curriculum acknowledges that not all programs are able to cover all aspects of the core at the same level of depth, but some level of coverage of these topics is required for a program to be identified as an information systems program.

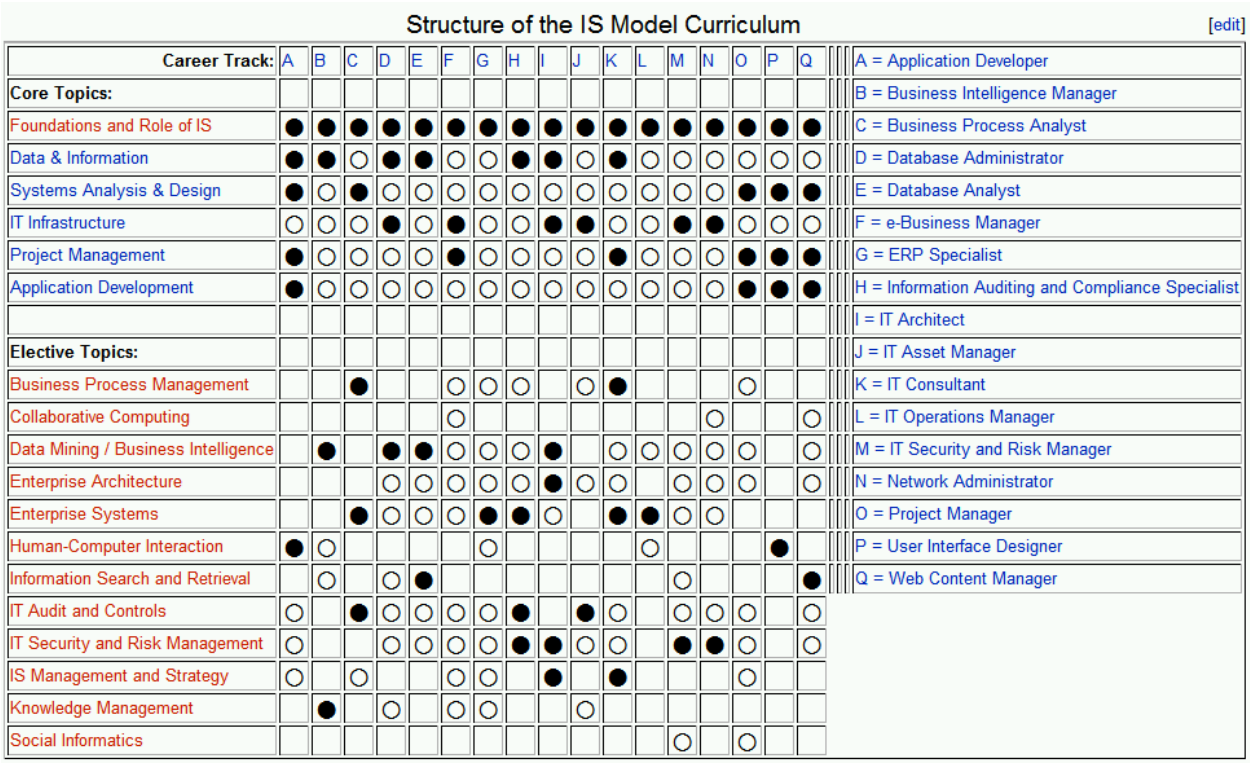
It is outside the scope of this document to provide a detailed analysis of the specifics of the core topics. A few observations are, however, necessary to clarify the nature of the topics and to demonstrate that, even though the list of topics appears to be very predictable at the surface level, there are significant changes beyond IS 2002 at the subtopic level driven by the changes in the external environment.

- *Data and Information* includes the core data management subtopics, but it also incorporates a broader coverage of business intelligence, privacy and security, and data quality.
- *Systems Analysis and Design* includes, in addition to traditional SA&D subtopics, business (or other domain) process modeling/management. The curriculum specifically acknowledges that the way SA&D is covered varies significantly between institutions, taking into account how significantly the environment and approaches to SA&D have changed over the past decade.
- *IT Infrastructure and Controls* includes, in addition to computer architecture and data communications subtopics, coverage of the IT controls and management frameworks, such as ITIL and COBIT.
- *Project Management* is included as a separate topic area in the core to acknowledge its importance as a set of capabilities that permeates the entire IT/IS effort. This topic area includes the coverage of issues related to globally distributed IT work.
- *Application Development* is included in the core because the task force believes that all IS graduates should be: a) capable of at least basic levels of algorithmic problem solving and systematic analysis and structuring of problems using programming techniques, and b) able to understand issues related to IS implementation through practical experience, however rudimentary it might be.

Another departure from IS 2002 is that the model curriculum will not specify a single career objective (i.e., technology-enabled business development) but will provide numerous career tracks. These career tracks will integrate a combination of the core topics and some set of career track electives. How the core topics are instantiated depends on the needs of a specific career track (e.g., either briefly or very comprehensively, depending on the needs of the target career track selected by a particular program). Career tracks, obviously, can be associated with one or several domains: for example, a database administrator career track is compatible with business, government, nonprofit, and healthcare domains (and many others).

Further, core topics are complemented by elective topics, which round out the curriculum for a particular career track. Like core topics, elective topics can be covered either comprehensively or briefly, depending on how a particular topic is operationalized for a particular career. Figure 4 shows an example of various career tracks (i.e., columns) and their corresponding content coverage (i.e., rows). In the figure, the solid dots represent significant coverage, the empty dots represent some coverage, and cells with no dots have no coverage of the corresponding topic. For example, in the application developer career track (see Figure 4 – column A), foundations

and role of IS, Data and Information, Systems Analysis and Design, Project Management and Application Development topics will be covered comprehensively. IT Infrastructure is a core topic that is covered in the application developer career track, but not at the same level of depth as in tracks that justify full coverage. In this proposal, the elective topics for the application developer career track include a comprehensive coverage of the human-computer interaction topic and brief coverage of IT audit and controls, IT security and risk management, and IS management and strategy.



Structure of the IS Model Curriculum [edit]

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	A = Application Developer
Core Topics:																		B = Business Intelligence Manager
Foundations and Role of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	C = Business Process Analyst
Data & Information	●	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	○	D = Database Administrator
Systems Analysis & Design	●	○	●	○	○	○	○	○	○	○	○	○	○	○	●	●	●	E = Database Analyst
IT Infrastructure	○	○	○	●	○	●	○	○	●	●	○	○	●	●	○	○	○	F = e-Business Manager
Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●	G = ERP Specialist
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●	●	H = Information Auditing and Compliance Specialist
																		I = IT Architect
Elective Topics:																		J = IT Asset Manager
Business Process Management			●			○	○	○		○	●				○			K = IT Consultant
Collaborative Computing						○								○			○	L = IT Operations Manager
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○	M = IT Security and Risk Manager
Enterprise Architecture				○	○	○	○	○	●	○	○		○	○	○		○	N = Network Administrator
Enterprise Systems			●	○	○	○	●	●	○		●	●	○	○				O = Project Manager
Human-Computer Interaction	●	○					○					○				●		P = User Interface Designer
Information Search and Retrieval		○		○	●								○				●	Q = Web Content Manager
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○	
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○	
IS Management and Strategy	○		○			○	○		●		●				○			
Knowledge Management		●		○		○	○			○								
Social Informatics													○		○			

Figure 4. Structure of IS Model Curriculum

The new structure makes it also possible to integrate intended learning outcomes in the curriculum model by specifying each intersection of a career track and topic as a set of learning outcomes (expressed as skills, knowledge, and attitudes). For example, there could be a specific set of learning outcomes related to the data and information topic within the application developer career track, which, in turn, could be used to specify the subtopics and the level at which they are covered.

This proposed curriculum structure allows the curriculum to be much more dynamic than the prior version. Additionally, it supports the rapid expansion of the curriculum into new exciting domains (e.g., bioinformatics) and the easy addition of new topics and new career tracks as warranted by the inclusion of new domain areas, new technologies, or new concepts.

Another significant change that the new structure allows is basing the model curriculum on topics rather than courses. The goal here was to create a vehicle for providing the right material to the students for a particular career track (e.g., the appropriate depth of coverage within a topic area). For instance, the structure recognizes that programs focusing on the application developer career track will cover some topics at a different level of depth than programs focusing on the business process analyst career track. Finally, by separating the core curriculum from career track electives, we are able to provide the flexibility desired by nontraditional IS programs while also offering exciting options for programs constrained by AACSB or other restrictions.

Although Figure 4 outlines several career tracks and elective topics, these are obviously not exclusive but are intended to illustrate the richness of the curriculum varieties that this framework structure allows the community to create and maintain. The separation of the core from the elective topics and the inclusion of career tracks in the curriculum allow us to define the discipline and provide prescriptive guidance regarding the required elements in a program, while encouraging creativity and innovation through career tracks. The task force believes that this has the potential to make the discipline stronger and more attractive for academic institutions, students, and employers.

It would be impossible for any task force to design specific curricula for every program's need. For this reason, the task force proposes a unique approach to involving the community in developing best practices and a conceptualization of career tracks and elective topics. In addition, it is natural that we as IS academics embrace modern technology to enable this process. The next section delineates how the IS community is invited to be involved in this revision.

VI. COMMUNITY DRIVEN CURRICULUM

Traditionally, curriculum projects have been largely based on the work of a small task force that has shared its work at a variety of conferences and incorporated the feedback from the sessions to the model curriculum. In addition, written drafts have been shared widely and comments solicited. Also, surveys have been used to gather industry input. This process is driven by a few individuals with little input from the academy as a whole.

Engaging the entire IS community will be a metric of success for this task force's work. One of the first tasks in the current curriculum revision project was to establish a feedback mechanism that is globally accessible. For this, the task forced turned to current thinking in system design, expressly Web 2.0 [O'Reilly 2005]. Through the use of Web 2.0 technologies, we hope to create a platform and harness the collective intelligence of the global IS community. The specific Web 2.0 platform selected is MediaWiki, an open source wiki platform originally written for Wikipedia. By using this Web-based platform, the task force believes that it can better engage the broader IS community to assist in developing and maintaining the curriculum. Despite its relative simplicity, ours appears to be a novel approach for developing curricula. It is our hope that the task force's work can help other academic disciplines find ways to improve their curriculum development processes. We will develop our approach (both process and technology) further over time, and it is possible that other academic disciplines will find it directly applicable at some point in the future.

IS CURRICULUM WIKI

The current version of the IS curriculum wiki is available at:
http://blogsandwikis.bentley.edu/iscurriculum.

There are seven main sections on the wiki. They are:

1. **Process and Principles for Maintaining Model Curricula**
2. **Use of the IS Curriculum**
3. **Information Systems as Profession and Field of Academic Study**
4. **Exit Characteristics of Information Systems Graduates**
5. **Curriculum Structure and Content**
6. **Curriculum Background and Context**
7. **Additional Materials Related to the Curriculum Revision Process**

Although our approach is based on a wiki technology, we do not employ traditional wiki procedures, such as allowing anyone to change the curriculum content directly. The task force

recognizes the need to maintain a delicate balance between broad community involvement and the structure and governance mechanisms that are required to give the curriculum the credibility it requires to be useful for a variety of institutional purposes.

The task force is currently drafting all governance and control procedures and, thus, they do not exist in their final form yet. We can, however, already identify several key principles that should guide curriculum development and approval in the future. These include the following:

- Curriculum development should be an ongoing, continuous process punctuated by relatively frequent (maybe annual) decision points that include the approval of a "frozen," approved version instead of the current model consisting of separate, very time-consuming projects that occur every few years.
- All IS academics should be able to contribute to the development process, but there should be a well-defined editorial structure in place that both guides the work of the volunteers and makes recommendations regarding final approvals.
- The editorial structure has to recognize the fact that different types of expertise are needed at different levels of the work. There should be an editor-in-chief for the curriculum as a whole. In addition, senior editors are needed for topic areas that require specialized expertise.
- The processes for nominating and selecting key participants have to be transparent and both well understood and accepted by the members of the community.
- The ongoing process should be able to harness the best pedagogical resources in various curriculum topic areas to contribute to the model curriculum. This is possible only if we as a field acknowledge the importance of contributions to the curriculum development work and reward them appropriately. Any technical mechanism put in place to enable community involvement will fail, unless the members of the community see the value not only for the community but also for themselves and their institutions.
- The community should also be engaged in the process of maintaining and developing further the process and technology platform used for curriculum development.
- Collaboration technology should be used in a way that enables global participation in the curriculum development process. Even though there are very significant national and regional differences in how IS curricula are implemented around the world, the task force believes that the conceptual core of the discipline is the same, and that even in elective topics, similarities are sufficient to justify a global approach. We hope that the wiki platform will become a fruitful environment for global exchange of ideas.

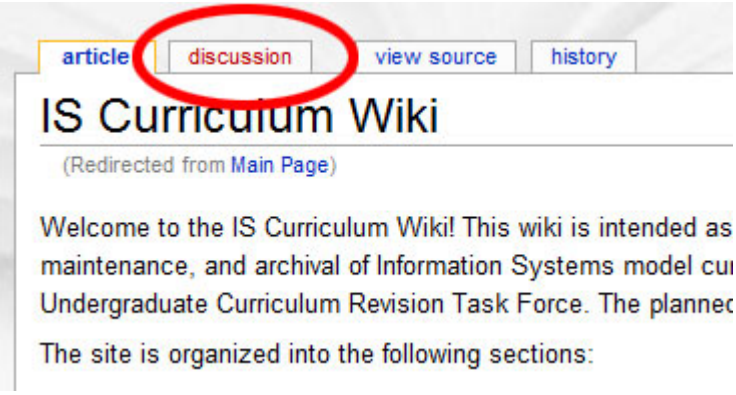


Figure 5. Discussion Feature on the IS Curriculum Wiki

For those wanting to get involved, contributions to the IS curriculum revision process can be done by visiting the Web site, registering with the wiki, and then selecting the discussion tab on any page of the wiki (see Figure 5). The task force encourages all academics interested in the development of the IS discipline to visit the wiki and contribute to the discussion.

VII. CONCLUSION

The joint ACM/AIS task force that is leading the effort to revise the undergraduate IS model curriculum introduced several significant changes to the curriculum itself and to the revision process in a panel discussion at AMCIS 2007. This paper presents a summary of that panel discussion. The task force proposes a structure that separates the core curriculum topics from the elective topics and introduces career tracks as a structural element of the curriculum. This is a significant departure from the earlier model that prescribed a fixed 10 course curriculum. The revision also breaks away from another key characteristic of recent IS model curricula: It is not any more specifically targeted to and constrained by the restrictions of AACSB accredited schools of business and management. The expertise that the IS discipline offers is applicable to domains that go far beyond business, including fields as varied as law, health care, government, and many of the sciences. If we as a discipline do not explicitly recognize the broader applicability of our core expertise, nobody else will do it for us. Finally, the task force proposes a new, community-driven approach to the curriculum development process that utilizes Web-based technology resources to enable broad global participation while maintaining necessary editorial control to ensure the credibility of the process. The task force strongly encourages members of the IS community to contribute to the process.

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