Comparing Current IS Curricula to the IS 2002 Model Curriculum

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Abstract

Information systems applications and technologies are facing constant and rapid change. It is the responsibility of the education system to give students the skills to meet the requirements of an entry level position and at the same time prepare them to learn new skills. Are today's colleges and universities providing the right type of education for future IS professionals? In this paper, we examine the current IS curricula of over 130 AACSB-accredited business programs to determine how closely they are modeled after the IS 2002 Model Curriculum. We discuss the possible impact of programs that do not offer complete coverage of the model curriculum.

Keywords: IS 2002 Model Curriculum, IS Curricula, IS Professional Skills, AACSB Programs

1. INTRODUCTION

Information systems technologies and applications are facing constant, rapid change. IT professionals will be expected to keep up with this change by continually updating and refining their skills in order to remain current. It is the responsibility of the education system, particularly at the college undergraduate level, to prepare future IT professionals for the dynamic environment of the 21st century (Lightfoot 1999). The education system must give students the necessary skills in current industry practice to satisfy requirements for an entry level position while at the same time provide students with the fundamental background and abilities to learn new skills through their career (Cougar et al. 1995; Davis 1997; Lee et al. 1995).

Questions that have to be asked of today's educations programs are; "Are colleges and universities responding fast enough to the business and technology changes that define the role of information systems in today's organization? Are we providing the right type of education for future information systems (IS) professionals? (Trauth et al. 1993) The IS education process has been criticized as incapable of producing qualified, employable IS professionals (Archer 1983; Cardinali 1988), and universities have been faulted for teaching obsolete technologies and irrelevant or obsolete programming languages (Mandt 1982).

A key concern of curricular designers is striking the right balance between technical and business knowledge (Rogow 1993). However, the skill mix of many IS professionals today favors technical expertise—Weber (Weber 2004) refers to these as vocational skills—over people-handling ability (Trauth et al. 1993).

Educators in IS departments want to help students develop a deep understanding of the information systems field. A key part of deep understanding is developing a framework of background knowledge and concepts so that acts and experiences have

a context. Developing a deep understanding in IS requires the curriculum cover the fundamental principals of programming logic, algorithms, and data structures, to name a few – concepts that underlie every programming language and end-user tool that has ever been developed (Lightfoot 1999).

A survey (Lee et al. 1995) has found that current IS curricula are often ill-matched with business needs. Many subjects emphasized in the typical IS curricula were assigned low priorities by practitioners.

The authors recently conducted an examination of current curricular offerings in over 130 AACSB-accredited business programs of the course requirements for IS majors in these programs. In this paper, we review the results of those findings and examine the possible implications for IS graduates.

This paper is structured as follows. In section two, we review the major categories of the IS 2002 Model Curriculum and the rationale for inclusion of each of these categories within the curriculum. In addition, we examine the assumptions on which the model curriculum was built for further indications that the needs of the current generation of IS graduates may not be being met. In section three, we present our findings with regard to the current IS curricula within AACSB-accredited business programs. The next section examines the possible impacts of programs not offering a full array of coverage of the model curriculum. In this section, we examine the current role of IS personnel especially in light of increased activity in offsourcing more of their IS operations. We conclude with some suggestions for current directors of IS programs and

2. IS 2002 MODEL CURRICULUM

The IS 2002 Model Curriculum (IS02MC) is an update of the previous efforts to create a reference model for IS programs in the United States, Canada, as well as internationally; the current model curriculum is a revision of the IS '97 Model Curriculum. The revision was mainly spurred by three

motivating factors: the Internet, changes in student computing literacy, and the IS accreditation movement.

The IS02MC was guided by five key principles; two of which are important for this study. First, "the model curriculum should be designed to help IS faculty produce competent and confident entry level graduates well suited to work-place responsibilities" and, second, "the model curriculum should guide but not prescribe. Using the model curriculum guidelines, faculty can design their own courses." (Gorgone et al. 2002, p.5) Given these two principles the IS02MC is a recommendation from the IS community about the types of courses and skills IS undergraduates should be receiving as an outcome of their educational experiences. The curriculum, if broadly implemented, provides a student the necessary skills to function as an IS professional.

The curriculum was developed around four major characteristics of the IS profession (Gorgone et al. 2002, p.6). First, IS professionals must be exposed to a broad business and real world perspective; including understanding the role IS play in organizational performance. Second, IS professionals must possess strong analytical and critical thinking skills in order to be able to fashion solutions that intermingle people, processes, procedures, hardware, software and data. Third, IS professionals must possess the ability to deal with other people in the organization. Strong interpersonal skills (especially communication and team) as well as strong ethical principles are expected out of today's IS professionals. Lastly, IS professionals must have strong technical skills. They must be able to design and implement complex information technology solutions that aid decision-makers within the organization.

Given these factors the IS02MC was designed to provide IS educators and curriculum designers with opportunities to give students the broadest possible base of skills that can help them acquire their initial positions and also help them develop in their careers. The IS02MC gives students a strong mix of technical analytic, managerial and interpersonal skills; which is what has

been found to be desired by employers (Archer 1983; Cardinali 1988; Lee et al. 1995; Trauth et al. 1993). By not following the guidelines set forth by the IS02MC IS educators and curriculum designers are shortchanging students by not providing them with the full "recommended" set of skills.

3. REVIEW OF CURRENT IS CURRICULA

Our review of Information Systems curriculums consisted of examining the courses required in an IS major in 134 AACSB accredited business programs. Each of the courses were categorized (based on the course title and course description) into one of the categories in the IS02MC. Please note that each course was only put into one category that seemed to fit best based on the available information. The results of our survey are summarized in Tables 1A and 1B.

Sixty-seven of the schools examined do not require a Fundamentals of Information Systems (IS 2002.1) course. Fifty-five schools require one course and 13 schools require two courses. The most popular title for this course is Management Information Systems. Other course titles include; Foundations or Fundamentals of Management Information Systems, Introduction to Management Information Systems, and Principals of Management Information Systems.

The Information Systems Strategy course (IS 2002.2) is included in the model curriculum to illustrate the importance of linking information system goals and objectives to goals and objectives of the business. This is critical to the success of the IS function as well as the business itself. However, eighty-nine (65.9%) of the schools do not include this course in their IS curricula. Thirty-five schools (25.9%) require a single course while 11 schools require two or more courses in this area, illustrating the importance of this subject.

	No Course Req'd	1 Course Req'd	2 Courses Req'd
IS 2002.1 Fund. of IS	67 49.6%	55 40.7%	13 9.6%
IS 2002.2 IS Strategy	89 65.9%	35 25.9%	8 5.9%
IS 2002.3 E-Business	104 77.0%	31 23.0%	0 0.0%
IS 2002.4 Hardware & Software	125 92.6%	9 6.7%	1 0.7%
IS 2002.5 Prog., Data, File & Object Structure	33 24.4%	50 37.0%	31 23.0%
IS 2002.6 Networks & Telecom.	46 34.1%	84 62.2%	4 3.0%
IS 2002.7 Systems Analysis & Design	24 17.8%	102 75.6%	8 5.9%
IS 2002.8 Physical Design of DBs	8 5.9%	127 94.1%	0 0.0%
IS 2002.9 Physical Design of Emerging Tech	93 68.9%	38 28.1%	4 3.0%
IS 2002.10 Project Mgmt	103 76.3%	31 23.0%	1 0.7%

Table 1A: Percentage of IS02MC Coverage

	3 or more Courses Req'd
IS 2002.1 Fund. of IS	0 0.0%
IS 2002.2 IS Strategy	3 2.2%
IS 2002.3 E-Business	0 0.0%
IS 2002.4 HW & SW	0 0.0%
IS 2002.5 Prog., Data, File & Object Structure	21 15.6%
IS 2002.6 Networks & Telecom.	1 0.7%
IS 2002.7 Systems Analysis & Design	1 0.7%
IS 2002.8 Physical Design of DBs	0 0.0%
IS 2002.9 Physical Design of Emerging Tech	0 0.0%
IS 2002.10 Project Mgmt	0 0.0%

Table 1B: Percentage of IS02MC Coverage

E-Business Strategy, Architecture, and Design (IS 2002.3) focuses on the links between business strategy and networked technologies. One hundred and four of the school curricula (77.0%) examined have no required course in this field, 31 schools require one course. The most popular course titles include; Client/Server Computing, E-Business, and Electronic Commerce.

With regards to the suggested course on Information Technology Hardware & Software (IS 2002.4), one hundred and twenty-five (92.6%) schools do not have a requirement in the area. Nine schools (6.7%) require a course on hardware and software and one school requires two courses in this field. Courses taught in this area are evenly split between a Hardware and Software Concepts course and an Introduction to Operating Systems.

A course covering the material suggested by IS 2002.5, Programming, Data, File, and Object Structures is required by 50 schools. Thirty-one schools require two courses and 21 require three or more classes. Thirty-three schools do not have a requirement in this area. It is interesting to note that schools that require only one course typically teach a comprehensive course entitled Business Application Development. Schools that require two or more courses in this area typically split the materials into a programming course, and possibly advanced programming class, and a file and data structures course. Some of the common programming languages taught include; COBOL, C++, Java or J, Visual Basic.

Topics related to networking and distributed computing is covered in IS 2002.6, Networks and Telecommunications. Eight-four schools (62.2%) require one course as part of the Information Systems major, four schools require two classes, and a single program requires three classes. The remaining 46 schools (34.1%), do not require a course in this area.

The second most common course included in the Information Systems curriculum is the course the covers the concepts of Analysis and Logical Design (IS 2002.7). One hundred and two schools require a course in analysis and design. Eight schools require two courses and one school requires 3 classes. By far the most common course title is Systems Analysis and Design. Schools that require two classes typically split the materials into an analysis class and a design class.

By far the most popular course included in the IS curriculum is the Physical Design of Databases (IS 2002.8). Only eight schools (5.9%) do not have a database requirement, the remaining 127 schools require a single database design class.

IS 2002.9, Physical Design of Emerging Technologies is an important course for graduating seniors. Many individuals will get their first IS job because of their knowledge

of a new technology. However, ninety-three schools (68.9%) do not require a class in one of the emerging technologies. Thirty-eight schools (28.1%) require a single class while four schools (3.0%) require two courses as part of the IS major.

Finally, IS 2002.10, Project Management is an important topic for IS majors. Project management is a necessary component because it teaches the student how to produce business applications in a timely fashion and on budget. Our survey shows that only thirty-one (23.0%) schools require a separate course in project management and one school requires two courses in the subject. The remaining schools, one hundred and three (76.3%), do not required course in this area. One possible reason for so few schools having a required course on this topic is that some of the materials may be covered in other classes, such as Systems Analysis & Design or Operations Management.

While the model curriculum is meant to be a set of suggested courses and objectives and not a list of requirements, it may be helpful to look at the number of courses in the model curriculum actually required by a school as part of the IS curriculum. This is shown in Table 2.

# of Classes	Count	Percentage
0	0	0.0%
1	5	3.7%
2	8	5.9%
3	13	9.6%
4	23	17.0%
5	37	27.4%
6	29	21.5%
7	14	10.4%
8	6	4.4%
9	0	0.0%
10	0	0.0%

Table 2: Number of IS02MC Courses Required

Our results show that no school requires all the courses in the model curriculum. There are several possible reasons for this. First, a school or department may not be able to employ enough faculty members to teach the entire curriculum. Second, all the courses in the model curriculum would total

approximately 33 semester hours; this would leave little room for university and business school requirements. And finally, since some of the courses are prerequisites for other courses and most students do not start their major until the junior year there would not be enough time to complete the major.

Our results also indicate some schools require only one or two of the courses in the model curriculum while some require as many as eight classes. This will impact the preparation of the student to enter the IS profession and can cause serious differences in the quality of the students.

4. IMPACTS ON GRADUATES

This analysis of current offerings compared with the IS 2002 Model Curriculum leaves serious questions as to the level of preparedness of students entering the IS profession. As we stated earlier, two questions are being asked of today's educations programs are; "Are colleges and universities responding fast enough to the business and technology changes that define the role of information systems in today's organization? Are we providing the right type of education for future information systems (IS) professionals? (Trauth et al. 1993) Given what we have found in our survey, the answer to both of these questions is probably no.

Weber's (Weber 2004) suggestion that IS programs are too focused on "vocational" skills and need to also provide students with managerial and interpersonal skills as well is borne out in our findings. Many of the programs show a strong emphasis on technical skills; systems analysis & design, programming, database, and networking.

What are the implications of this type of emphasis; what is the impact on the students?

These technical skills are necessary for students to acquire first jobs. Employers are looking for graduates that can "hit the ground running" and provide the needed technical skills in the most often used technologies (databases, networks, and

programmed solutions). But are they enough to sustain career advancement? As the IS02MC suggests, IS professionals need a blend of technical, analytical, managerial, and interpersonal skills. Where are students to get these other skills? By not requiring IS students to take courses—and in some cases not even offering these courses—in some of the areas of the model curriculum we can see what students are not getting in their current studies.

4.1 WHAT ARE STUDENTS MISSING?

Failure to require (and even offer) courses within the IS02MC means that skills that are the primary focus of those courses are not being given to students.

In particular, not offering the IS 2002.4: Hardware and Software—the most underrepresented course in our findings—students are not getting an understanding of current operating systems and their functions; this lack of knowledge could force IS professionals to make under informed decisions regarding the upgrading of enterprise technology due to upgrades in computing equipment. In addition, this course also covers the knowledge of hardware and software components and their interaction. This could also lead to poor decisions being made with regard to technology upgrades.

The IS 2002.3: E-Business course was the newest addition to the IS02MC. Gorgone et al. (Gorgone et al. 2002) state that this course was the missing element in the curriculum based on the analysis of survey data and the IS '97 Model Curriculum. Students not taking this course may not understand the integration of computing and communications technologies that comes through the Internet. In addition, this courses discusses business operations issues across many different areas (i.e., marketing, logistics, accounting), and legal and ethical issues involving the use of the Internet. One final important consideration of this course is the fact that students taking this course can get further exposure to programming. Languages such as JavaScript, VBScript, and XML could be taught so that students may get further

refinement of their programming—more importantly logical thinking—skills.

While many students will be only a small part of a larger team in industry they need to understand and know the role that they will play as part of that team. The IS 2002.10: Project Management course usually covers issues of teamwork, reporting and communication of status and results, as well as issues in systems integration. Without this course, students will be at disadvantage over students that have many of these important interpersonal skills. As stated earlier, many of these issues—except for maybe the system integration—might be covered in the Systems Analysis & Design course.

Information systems play an important and vital role in today's organizations. Information systems planning—the main focus of IS 2002.2—must be coordinated with business strategy and business processes. IS professionals must understand the organizational decision-making process and the role information systems—both traditional and decision support—can play in making the can play in making organizations more effective.

While many IS departments are moving to object-oriented (OO) development, however, many still use traditional methods utilizing entity-relationship diagrams and data flow diagrams. The IS 2002.9 course, Physical Design and Implementation in Emerging Environments, gives students exposure to multiple development environments; that is if traditional methodologies were used in the systems analysis & design course then OO techniques are explored in this course and vice versa. In addition, this course gives students another opportunity to test their project management skills as well as dealing with user training and system delivery issues.

The introductory course in the IS02MC, IS 2002.1: Fundamentals of Information Systems, stress the use of data and information as corporate asset that needs to be both cleaned and secured. The issues of data quality and information security are important concepts that even new IS

professionals must be able to understand and appreciate.

In addition to missing these particular topics in specific courses, taken in total the students miss having many topics reintroduced and emphasized. In particular, students only get a discussion on ethical and professional behavior in the systems analysis & design course; they only get programming in the programming course, and only are introduced to project management while learning about programming or databases as well.

5. CONCLUSIONS/FUTURE WORK

Unlike the Marketing and Management majors which have been within School's of Business for many years and are very similar across undergraduate programs, the Information Systems major is relatively new to the business field and is still in a state of flux. Proof of this is the fact that this is the fourth re-write of the model curriculum in the past decade. It is important to mention that this is the first model curriculum to be jointly sponsored by both the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS).

Another reason that the IS major differs from school to school is that the computing field is facing constant and rapid change. As a result, most Information Systems curricula must be updated frequently in order to remain current. A school whose curriculum closely follows the model curriculum may have been recently updated while another school may still be in the process of updating their curriculum.

Examining the results of our survey we find that a number of schools are teaching only a small subset of the model curriculum. As was mentioned earlier in this paper, the purpose of the model curriculum was to recommend courses and not to prescribe courses. However, by teaching only a small subset of the model curriculum one conclusion that can be drawn is that some students are graduating unprepared for a "career" in the Information Systems area. In addition, the quality of the graduates from different schools could differ greatly.

The most commonly taught courses in the model curriculum are: Database Design and Implementation, Systems Analysis & Design, and Programming, Data, File, and Object Structures. All three of these classes are left over from the Computer Science area. Although these courses are necessary to prepare the student for a first job in the IS area, requiring extra courses in these fields (some schools require three or four programming classes and two analysis classes) at the expense of other courses that are part of the model curriculum could also impact the future employment of these graduates. For example, as mentioned earlier Programming, Systems Analysis & Design, and Database Implementation classes are all required for that initial job in the IS field. These are the same jobs that are being outsourced overseas. To insure the future employability of IS graduates we must begin stressing the strategic role of information systems and its links to business strategy.

How is an employer to know whether a prospective employee is capable and qualified for employment in the IS area? One way for the employers to make sure that prospective employees are capable is to require accreditation of the IS programs from one of the technical associations, such as the ACM, AIS, and Association of Information Technology Professionals (AITP); much in the same manner that business programs are accredited by the AACSB. This is mentioned as one of the prime motivators for this model curriculum update. Another way to make sure that new employees are qualified is through a certification exam similar to the CPA exam for accountants. As curriculum designers in the information systems area, we believe that it is better for us to take action to insure the quality of IS graduates before either of these actions are forced upon us.

For future work we propose to survey the Deans of the school of business accredited by the AACSB to determine what courses they feel need to be taught as part of the IS curriculum and which courses they feel could be eliminated. We will also ask the Deans to recommend ways that information systems could be integrated into the other business majors.

In addition, this study seems to contradict a recent study of the research being done in the fields of IS, CS, and SE. Glass et al. (Glass, 2004) recently compared the topics found in leading IS, CS, and SE journals. These findings seem to contradict the findings of this curriculum study. Glass et al. found that over 65% of topics covered in IS journals deal with organizational issues related to IS design and development and only about 15% of the topics deal with the areas of Database Design and Implementation, Systems Analysis & Design, and Programming, Data, File, and Object Structures. The authors plan on looking into this issue of teaching vocational skills but actually doing research in managerial areas.

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