Information Systems Curricula 2003

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Abstract

The goal of the study is to determine which courses are currently being offered in Information Systems (IS) undergraduate College of Business programs, to profile these curriculums, and to compare this profile to the most recent IS model curriculum--the IS 2002 Model Curriculum. Of 330 university web sites examined with potential IS undergraduate degree programs, 222 web sites were identified with complete information on program requirements. The resulting profile matches the IS 2002 Model in eight out of eleven courses with two Model courses being represented by two profile courses each and one profile course not matching a Model course.

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Tomorrow's professionals educated by the academic field of Information Systems rely upon university information systems departments to provide current and forward-looking instruction and education. According to the Occupational Outlook Handbook, 2002-03 Edition, the industry of computer and data processing services is projected to be "the fastest growing industry in the U.S. economy" (Bureau of Labor Statistics). As a result, systems analyst, computers scientist, and database administrator positions are expected to increase 36% or more, considered "much faster than the average" by the Bureau of Labor Statistics.

There is a strong demand placed on information systems instructors to educate students and to impart current and relevant knowledge. To succeed, information systems programs must maintain up to date course offerings. This is becoming increasingly difficult because of the constantly changing IT environment. Although technology fads cannot, and should not be incorporated into programs, an information systems program should not be viewed as timeless.

The goal of the study is to determine which courses are currently being offered in Information Systems (IS) undergraduate College of Business programs, to profile these curriculums, and to compare this profile to the most recent IS Curriculum Model--the IS 2002 Model Curriculum.

Methodology

Scope

The scope of this study included collecting course data from the web sites of information systems programs within colleges of business at universities in the United States. No distinctions were made between accredited and non-accredited universities or colleges of business. Course data were collected from accredited and non-accredited programs alike.

Data Collection

With this study, course data were collected via university web sites. In the previous study, surveys were sent to the program directors or chairpersons of information systems departments in colleges of business (Gambill, 1998; Maier, 1996). The preliminary list for the current study was drafted from the list of survey recipients. Added to the list from the previous study were universities appearing in online directories within the following sites: ISWorld Net, Link411, and Peterson's Education Portal.

Attempts were made to gather data from 330 university web sites with 328 of those web sites belonging to U.S. universities. Two hundred twenty-two universities researched had a CIS business degree program, 72 had no CIS business degree program, and 34 were undetermined. Overall, data were collected from 222 U.S. universities with CIS business degree programs.

Over 150 hours were spent to gather all of the course data in this study. On average, each web site took just over 27 minutes. This time included moving from the University home page to the program page, locating the program's course information, and cataloguing the courses. Those university web sites that required more than the average time did so because they were unusually difficult to navigate. Several web sites seemed to lack a direct route to the needed information and, therefore, required much more time than the average.

Results

Overview

Of the eleven courses outlined in the IS '97 Model Curriculum, two courses were combined and one course was added to create the IS 2002 Model curriculum. IS '97.P0 – Knowledge Work and Software Tool Kit and IS '97.2 – Personal Productivity with IS Technology were merged to form IS 2002.P0 – Personal Productivity with IS Technology. IS 2002.2 – Electronic Business Strategy, Architecture and Design was added where there was not an IS '97 equivalent. The remaining courses were updated but maintained the same title. Appendices A and B list the IS '97 and 2002 Model Curriculum Course Topics for Undergraduate Degree Programs in Information Systems, respectively, to allow a topical comparison of the two models.

Data Aggregation

There were over 500 different required and elective course names identified in this research. The course information and tables that follow are aggregated numbers. For example, there may have been many names for a database course such as Database Applications, Database Concepts, Database Systems, Database Design, etc. However, in reporting the percentages, all these courses were reported under a single course name. This was done for all courses where there were several courses obviously in the same category.

Profile and Comparison

Table 1 lists the top 20 courses in rank order by percent of schools requiring the course for their IS majors. Table 2 lists the top 20 courses in rank order by percent of schools offering the course as an elective. Along with the course title and the percentage of programs requiring or offering the course as an elective, the corresponding IS 2002 Model Curriculum Course number is also listed. Courses not matching up with IS 2002 are listed as NA.

Table 3 shows a profile of CIS curriculum from the data gathered taking into account a combination of required and elective course. The number of required courses, and therefore elective courses, varies from program to program. The average number of courses required for the 222 programs researched was 6.6. The minimum, median, and maximum numbers of required courses were 0, 7, and 16 respectively. Table 3 shows a profile of a CIS curriculum as determined by data gathered from 222 programs in universities across the country. The median number of courses required by the 222 programs was used to determine the number of required courses listed in the profile.

The seven required courses in the profile are the top seven courses required by CIS programs as determined by the percentage of programs requiring the course. The number of elective courses was determined by simply subtracting the median of seven from the IS 2002 Model Curriculum course total of eleven. The four elective courses in the profile are the elective courses ranking three, four, five, and nine offered by CIS programs as determined by the percentage of programs offering the course as an elective. These were the top four ranked after courses were removed because they were in the top seven required courses.

Table 1 ***Top 20 Required Courses***

Rank	Course	Percentage Requiring Course	IS 2002 Model Course
1.	Programming Languages	100%	5
2.	Database Systems	72%	8
3.	Analysis & Design Combine	66%	7
4.	Data Communications	55%	6
5.	Fundamentals of IS	46%	3
6.	Computer Concepts	45%	1
7.	Systems Analysis I	32%	7
8.	Systems Analysis II	32%	9
10.	Micro Computing	18%	P0
11.	Internet	10%	2
12.	ES/DS/GDSS/AI	9%	NA
13.	Operating Systems	7%	NA
14.	Distributed Processing	5%	NA
15.	Special Topics in IS	5%	NA
16.	Business Systems and Information Systems	4%	NA
17.	Software Engineering	4%	NA
18.	Project Management	3%	10
19.	Business Communications	2%	NA
20.	Enterprise Systems (ERP)	1%	NA

Table 2 ***Top 20 Elective Courses***

Rank	Course	Percentage Offering Course	IS 2002 Model Course
1.	Programming Languages	100%	NA
2.	Fundamentals of IS	54%	3
3.	Special Topics in IS	45%	NA
4.	Internet	42%	2
5.	ESS/DSS/GDSS/AI	41%	NA
6.	Computer Concepts	31%	1
7.	Data Communications	26%	6
8.	Micro Computing	24%	P0
9.	Enterprise Systems (ERP)	13%	NA
10.	Database	11%	8
11.	Privacy & Security	10%	NA
12.	Systems Analysis & Design Combined	9%	7
13.	Operating Systems	9%	NA
14.	Project Management	8%	10
15.	Systems Analysis I	8%	7
16.	Systems Analysis II	8%	9
17.	Business Systems & Information Systems	6%	NA
18.	Software Engineering	6%	NA
19.	Business Communications	6%	NA
20.	Distributed Processing	3%	NA

As is evident by Table 3, not all of the courses in the IS 2002 Model appear in the profile. IS 2002.4 – Information Technology Hardware and System Software and IS 2002.9 – Physical Design and Implementation in Emerging Markets were offered at less than 1% of the schools. IS 2002.10 – Project Management and Practice was taught at only 8% of the schools. It is important to note that elements of these three courses are often taught in other courses. Another difference is that IS 2002 has one Analysis and Logical Design course and two courses that deal with physical design, IS 2002 – 8 and 9. Seventy-five percent of the schools in the profile offer a single Systems Analysis and Design course.

Table 3 Profile *of CIS Curriculum*

Rank	Course	Required or Elective	IS 2002 Model Course
1.	Programming Languages	R	5
2.	Systems Analysis & Design Combined	R	7
3.	DBMS Concepts I	R	8
4.	Data/Telecommunications & Networking	R	6
5.	Fundamentals of IS	R	3
6.	Computer Concepts	R	1
7.	Micro Computing	R	P0
8.	Special Topics in IS	E	NA
9.	Internet Applications	E	NA
10.	DSS/ES/ESS/NN	E	2
11.	Enterprise Systems (ERP)	E	NA

In addition to the profile curriculum, it is interesting to note the extent to which select programming courses are offered at the 222 university programs researched. Table 4 provides information about programming courses offered in IS programs. The programming language courses offered as required or elective courses are listed in descending order by the percentage of programs offering the course as either a requirement or an elective. It is surprising to note that COBOL is still offered more often than any other programming language. Thirty-two percent require COBOL and another 32% offer COBOL as an elective course. Visual Basic is the second most offered programming course with 15% requiring the course and 10 % offering it as an elective.

Conclusion

Although the most recent curriculum model prior to the IS 2002 Model Curriculum was the IS ’97 Model Curriculum, very few changes were evident. Appendices A and B illustrate the differences between the two models in course topic description. The only true changes were the integration of two lower level courses into one and the addition of a course covering e-business and e-commerce. With the rapid growth and change occurring in the information systems field, it was expected that the model curriculum would be updated rather than undergoing a minor revision.

Future Research

The current IS Model Curriculum encompasses a single, general direction within the field of information systems in colleges of business; however, the needs and desires of students and the industry vary greatly. A single-track CIS program does not suit the needs of every student working toward a CIS business degree. Additional research needs to be conducted to stimulate discussion and exploration with regard to the creation and implementation of multiple-track CIS business degree programs.

Table 4 Percentage *of Programs Requiring and/or Offering Select Programming Languages*

Programming Language	Percentage Requiring Course	Percentage Offering Elective	Percentage Offering Course (Required and/or Elective)
COBOL	32.4%	31.5%	64.0%
COBOL I	20.3%	14.9%	35.1%
COBOL II	9.0%	11.7%	20.7%
COBOL I and II Combined	3.2%	4.1%	7.2%
Object-Oriented	0.0%	0.5%	0.5%
Web Programming	0.0%	0.5%	0.5%
C/C++	9.5%	16.2%	25.7%
Visual Basic	15.3%	10.4%	25.7%
Business Programming (language na)	15.3%	9.5%	24.8%
Object-Oriented Programming (language na)	7.7%	17.1%	24.8%
Java	3.6%	9.9%	13.5%
Survey of Computer Languages	3.6%	4.1%	7.7%
Other Programming Languages (language na)	0.0%	5.0%	5.0%
BASIC	1.8%	1.8%	3.6%
Assembly Language	0.9%	1.4%	2.3%
RPG	0.0%	2.0%	2.0%
PASCAL	0.0%	1.0%	1.0%
CICS Application Programming	0.0%	1.0%	1.0%
FORTRAN	0.0%	1.0%	1.0%

Comparison of IS '02 Curriculum Model and the "Typical IS Curriculum"

IS '02 Courses	**Curriculum Profile**
Personal Productivity with IS Technology	Microcomputer Applications Required 18% Elective 24%
Fundamentals of Information Systems	Fundamentals of Information Systems Required 46% Elective 54%
Electronic Business Strategy, Architecture and Design	Internet Required 10% Elective 42%
Information Systems Theory and Practice	Computer Concepts Required 45% Elective 31%
Information Technology Hardware and System Software	
Programming, Data, File and Object Structures	Programming Courses Required 100% Elective 100%
Networks and Telecommunication	Data Communications Required 55% Elective 26%
Analysis and Logical Design	Systems Analysis & Design* Required 90% Elective 5%
Physical Design and Implementation with DBMS	Database Required 72% Elective 11%
Physical Design and Implementation in Emerging Environments	
Project Management and Practice	

* Most schools (75%) teach a combined SAD: ES/DSS/GDSS/AI Not accounted for in IS '02

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Appendix A

IS '97 Model Curriculum Course Topics for
Undergraduate Degree Programs in Information Systems*

Course		**Course Topic**
P0	*Knowledge Work Software Tool Kit*	*Word processing, E-mail, Internet tools,* spreadsheets, databases, presentation graphics, *external database retrieval, introduction to statistical software.*
1	Fundamentals of Information Systems	Systems concepts; system components and relationships; cost/value and quality of information; competitive advantage of information; specification, design, and re-engineering 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.
2	*Personal Productivity with IS Technology*	End user systems versus organization systems; analysis of knowledge work and its requirements; knowledge work productivity concepts; software functionality to support personal and group productivity; organization and management of software and data; accessing organization data, accessing external data; selecting a computer solution; developing a macro program by doing; designing and implementing a user interface; developing a solution using database software; refining and extending individual and group information management activities.
Course		**Course Topic**
3	Information Systems Theory and Practice	Systems theory and concepts; information systems and organizational systems; *decision theory and how it is implemented by IT, TQM and reengineering*; level of systems: strategic, tactical, and operational; system components and relationships; information systems strategies; roles of information and information technology; roles of people using, developing, and managing systems; IS planning; human-computer interface; *network and telecommunications systems management; electronic commerce; implementation and* evaluation of system performance; societal and ethical issues related to information systems design and use.
4	Information Technology Hardware and Software	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 operating systems; *basic network components, switches, multiplexers and media; installation and configuration of multiuser operating systems.*

5	Programming, Data and Object Structures	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.
Course		**Course Topic**
6	Networks and Telecommunication	Telecommunication *devices, media, systems*; *network hardware and software; network configuration;* network applications; *coding of data; cost benefit analysis;* distributed *versus centralized* systems; architectures, topologies, and protocols; installation and operation of bridges, routers and gateways; network performance *analysis*; privacy, security, reliability; installation and configuration of *LAN and WAN* networks; monitoring of networks; *management of telecommunications,* and communications standards. *Intranet and internet.*
7	Analysis and Logical Design	Life cycle phases: requirements determination, logical design, physical design, *test planning,* implementation planning, *and performance evaluation*; *communication,* interpersonal skills, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches: project management, joint application development (JAD), and structured *walkthroughs*; *object oriented* design; software *production and reviews*; *prototyping; database design; software quality metrics; application categories; software package evaluation and acquisition;* professional code of ethics.
8	Physical Design and Implementation with DBMS	*Data models and modeling tools/techniques*; structured and object design approaches; models for databases: relational, *hierarchical, networked* and object oriented *designs*; *CASE* tools; data dictionaries, repositories, *warehouses*; implementation*: Windows GUI coding and/or implementation, code/application generation; client-server planning, testing, and installations; system conversion, end user training/integration* and post implementation review.
Course		**Course Topic**
9	Physical Design and Implementation *with Programming* Environments	*Selection of client-server programming language environment; software construction:* structured, event driven, and object oriented application design; testing; software quality assurance; system implementation; user training; system delivery; post implementation review; configuration management; maintenance; *reverse engineering and re-engineering. Both full client and thin-browser active server based approaches are considered.*
10	Project Management and Practice	Managing the system life cycle: requirements determination, *logical* design, *physical design, testing,* implementation; system and database integration issues; network *and client-server* management; *metrics for project management and system performance evaluation*; managing expectations*: superiors, users, team members and others related to the project*; determining skill requirements and staffing *the project*; cost-effectiveness analysis; reporting and presentation techniques; *effective* management of *both* behavioral and technical aspects of the project; change management.

* Italicized text denotes deletions from the topic description when the IS ’97 Model was updated to the IS 2002 Model.

Appendix B

IS 2002 Model Curriculum Course Topics for
Undergraduate Degree Programs in Information Systems*

Course		**Course Topic**
P0	Personal Productivity with IS Technology	Knowledge work productivity concepts; advanced software functionality to support personal and group productivity concepts using functions and features in computer software such as spreadsheets, databases, presentation graphics, and Web authoring. Although identified as a course, this material can be delivered as self-study modules, as modules associated with other courses using the software, or as a full course.
1	Fundamentals of Information Systems	Systems concepts; system components and relationships; cost/value and quality of information; competitive advantage of information; specification, design, and re-engineering 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; information security, crime, and ethics. Practical exercises may include developing macros, designing and implementing user interfaces and reports; developing a solution using database software.

Course		Course Topic
2	Electronic Business Strategy, Architecture and Design	Electronic commerce economics, business models, value chain analysis, technology architectures for electronic business, supply chain management, consumer behavior within electronic commerce environments, legal and ethical issues, information privacy and security, transborder data flows, information accuracy and error handling, disaster planning and recovery, solution planning, implementation and rollout, site design, Internet standards and methods, design of solutions for the Internet, intranets, and extranets, EDI, payment systems, support for inbound and outbound logistics.
3	Information Systems Theory and Practice	Systems theory and concepts; information systems and organizational systems; decision support; quality; level of systems: strategic, tactical, and operational; system components and relationships; information systems strategies; roles of information and information technology; roles of people using, developing, and managing systems; IS planning and change management; human-computer interface; IS development process; evaluation of system performance; societal and ethical issues related to information systems design and use.
4	Information Technology Hardware and System Software	Hardware: CPU architecture, memory, registers, addressing modes, busses, instruction sets, multi processors versus single processors; peripheral devices: hard disks and other storage devices, video display monitors, device controllers, input/output; operating systems functions and types; operating system modules: processes, process management, memory and file system management; examples and contrasts of hardware architectures and operating systems.
Course		**Course Topic**
5	Programming, Data, File and Object Structures	Data structures and representation: characters, records, and files; precision of data; information representation, organization, and storage; algorithm development; programming control structures; program correctness, verification, and validation; file structures and representation. Programming in traditional and visual development environments that incorporate event-driven, object-oriented design.
6	Networks and Telecommunication	Telecommunication configurations; network and Web applications; distributed systems; wired and wireless architectures, topologies, and protocols; installation, configuration, and operation of bridges, routers, switches, and gateways; network performance tuning; privacy, security, firewalls, reliability; installation and configuration of networks; monitoring and management of networks; and communications standards.
7	Analysis and Logical Design	Life cycle phases: requirements determination, logical design, physical design, and implementation planning; interpersonal skills, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches: project management, joint application development (JAD), and structured prototyping; database design; software package evaluation, acquisition, and integration; global and inter-organizational issues and system integration; professional code of ethics.
Course		**Course Topic**
8	Physical Design and Implementation with DBMS	Conceptual, logical, and physical data models, and modeling tools; structured and object design approaches; models for databases: relational and object oriented; design tools; data dictionaries, repositories, warehousing, and data mining; database implementation including user interface and reports; multi-tier planning and implementation; data conversion and post implementation review.
9	Physical Design and Implementation in Emerging Environments	Topics may include selection of development environments and standards; structured, event driven, and object oriented application design; testing; software quality assurance; system implementation; user training; system delivery; post implementation review; configuration management; maintenance; multi-tiered architectures and client independent design.
10	Project Management and Practice	Managing the system life cycle: requirements determination, design, implementation; system and database integration issues; network management; project tracking, metrics, and system performance evaluation; managing expectations of managers, clients, team members, and others; determining skill requirements and staffing; cost-effectiveness analysis; reporting and presentation techniques; management of behavioral and technical aspects of the project; change management. Software tools for project tracking and monitoring. Team collaboration techniques and tools.

***** Underlined text denotes additions to the topic description when the IS '97 Model was updated to the IS 2002 Model.