

Information Systems Knowledge and Skills for the Business Management Undergraduate

ABSTRACT: *This study was made to determine the most useful information systems knowledge and skills recommended for a business management student graduating with a bachelor's degree. A random group of business program graduates from the Brigham Young University Marriott School of Management was surveyed to determine what they actually found on the job to be the most useful knowledge and skills that would help them succeed in the workplace. A group of professional information systems managers from similar industries was also surveyed. The information systems managers were queried because it was thought they would be able to provide a validating perspective. There was considerable agreement between the two groups as to the basic knowledge and skills, yet, there seems to be some disagreement concerning the value of programming languages and systems development tools and methodologies. Details of the most and least important topics as rated by the two groups are included.*

KEYWORDS: *Management Information Systems, Information Systems Curriculum, Information Systems Skills, Business Management Curriculum*

INTRODUCTION

Information systems (IS) have become the heart of business. Information systems courses in the educational curriculum need constant changing to keep pace with what is occurring in business and industry. Identifying the information system knowledge and skills necessary to prepare business management undergraduate students for this dynamic business workplace is the reason for this study.

There does not seem to be a universally accepted course description or curriculum that defines what is appropriate information systems knowledge and skills for *business management students graduating with a bachelor's degree*. It is reasonable, however, for an employer to expect bachelor level business graduates to have basic IS skills. It is also presumptuous to believe it is possible to provide instruction that will meet the needs of every student/prospective employee. This study was initiated to determine the type and level of capability and the basic information system knowledge presently considered the most useful for a broad range of business workplaces and life situations.

Many studies have been done which focus on a variety of issues concerning basic information system knowledge and skills. Yasin re-

ports that there is "no consensus as to the nature of computer education for business students," and "The quantity and content of computer-oriented courses varies noticeably within the academic community".[1] Furthermore, "Controversy abounds as educators attempt to define the content of the introductory computer course, with no consensus as to which topics should be taught, and whether programming, application packages, or systems concepts should be the focus of the course".[2] Even so, there is no doubt that "students expect to use the knowledge and skills gained in the literacy course in future courses and in the work environment".[3]

Several related studies have been done, and while none adequately fulfill the need to determine the IS curriculum for undergraduate business majors, they do provide a background for the work reported here. Model curriculums have been designed specifically for information system majors, but these curriculums do not provide guidance for the general business major [4,5,6]. Stewart [7] reported on determining information systems education needs for undergraduate accounting students (rather than business students). Two other studies [8,9] addressed a similar question for MBA students (rather than for undergraduate majors) based on MBA faculty surveys. Amini [10] noted that much can be done to improve the students acceptance and perception of the IS course, but did not prescribe the content.

While some [11] have argued that not enough is being taught about information systems in business schools to prepare students for immediate and future opportunities, information overload has become a basic issue in student preparation. Therefore, selectively focusing on the right balance and mix of topics in the IS course is a must. In one attempt to resolve this issue, Kim and Peterson [12] surveyed business majors to ascertain the perceived importance of IS related topics. While this may provide some insight from the student's perspective, it is suggestive of the doctor asking the patient what should be the treatment.

Various other studies report on different issues of IS curriculum development, but none have specifically identified what the business program bachelor's degree needs are when they enter the world of work. For example: A case study of the IS course implementation strategy reported for the Kogod College at American University [13] indicates that business graduates were polled when doing the

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Table 1: Questionnaire Results

From your experience, would you please help us identify the information systems knowledge and skills you would expect from a student obtaining a BS/BA degree in business or management.

(1) Are the following topics those that are important, or should others be emphasized?
 (2) What depth of knowledge or experience should a student have of these topics?

Please ✓ using the following scale:

0—Not Important 1—Awareness 2—Literacy 3—Comprehension
 4—Detailed Understanding 5—Skilled Use

Key
 GRADS = BYU alumni
 IS MGR = Inf Sys Mgrs

MEANS FOR EACH GROUP	GRADS	IS MGR
Introduction to Information Systems		
Definition of Information Systems	2.79	3.52
Characteristics of Data and Information	2.90	3.22
Use of Information Systems for Competitive Advantage	3.24	3.04
Components of a System	2.63	3.09
Information Systems in Organizations		
The Organization as a System	2.51	2.55
Organizational Design and Information Systems	2.48	2.26
Using Information Systems as a Strategic Weapon	2.85	2.78
Organizational Behavior—ex: culture, power, conflicts, intragroup dynamics	2.67	2.83
Information Systems and People		
Leadership, Management, and Motivation in a Technological Age	2.99	2.91
Decision Making with Technology	3.30	2.78
Physiological/Psychological Factors Influencing Success in the Technology Workplace	2.42	2.44
Hardware		
Computers—ex: large, personal and network computing	3.06	2.61
Inside the Computer	2.02	1.87
Input, Processing, Output, and Storage Technologies	2.65	2.09
Information Technology Trends—ex: client/server, multi-media, virtual reality, etc.	2.80	3.0
Software		
Systems software—ex: DOS, OS/2, UNIX, Windows, Macintosh System 7, etc.	3.54	2.87
Application software—ex: word processing, spreadsheets, databases, etc.	4.32	3.39
Programming languages—ex: BASIC, COBOL, Pascal, C++, 4 GL's, etc.	1.79	2.91
Databases		
Concepts and Characteristics	3.01	3.13
File Processing Systems	2.64	2.57
Data Models/Structures	2.65	2.74
Database Management for both Large Systems & Microcomputers	2.77	2.61
Telecommunications		
Communications Media and Devices	2.65	2.41
Networking Alternatives—ex: LAN's, WAN's, VAN's, etc.	2.70	2.39
Applying Telecommunications to Business Problems	2.93	2.44
Strategic Uses of Telecommunications	2.80	2.48
Data Communications	2.65	2.30
Electronic Data Interchange (EDI)	2.82	2.30
Information Superhighway	2.57	2.22
Transaction Processing Systems		
Transaction Processing Cycle—ex: data entry, processing, updating, reporting	2.98	2.61
Transaction Processing Applications—ex: functional area examples	2.65	2.61
Information Reporting Systems/Management Information Systems		
Types of Functional Management Reporting Systems	2.62	2.65
Reporting Alternatives—ex: periodic, scheduled, exception, demand, inquires, etc.	2.70	2.57
Decision Support Systems/Executive Information Systems		
Characteristics, Capabilities and Components of Decision Support Systems	2.65	2.78
Group Decision Support Systems; Groupware	2.51	2.52
Executive Information Systems Characteristics, Capabilities and Components	2.59	2.74

content analysis, but the direct results of that survey were not reported. Haworth and VanWetering [14] reported on a survey to determine corporate viewpoints on the information systems curriculum but their report focused on the methodology and is not sufficiently prescriptive for establishing a business school curriculum. Similarly, Lynch [15] reported on the use of application software packages in business school instruction, but only in a descriptive (not prescriptive) way. Also, Jiang [16,17] reported on recruiters' views of business students' information systems educational expectations.

Many other studies look at related issues, but none completely address what knowledge and skills a business management undergraduate should possess. This concern seems to invite a logical solution: ask those business program graduates who are presently employed in the workplace what they find to be the information systems needs of their jobs. This approach is a solution that would be responsive to actual practices and needs of the workplace.

Historically, the Marriott School of Management at Brigham Young University has designed courses of study that contained the content which seemed relevant. Student feedback and other anecdotal evidence suggested that the course needed some on going adjustments. In 1994, the authors surveyed both recent business school alumni and information systems professionals to gather data that would be useful in redesigning the content of the IS course. It was recognized that this effort was time sensitive because IS is such a dynamic and moving target. This paper presents the results of that study, and reflects the changes already implemented in the required IS course at Brigham Young University for business management undergraduate students.

The study focuses on determining what skills and knowledge are needed *right now* by those who graduate with an undergraduate degree in business management. Survey responses from business program alumni were compared with responses from professional information systems managers to determine if there were *major* differences. The results from this study should also assist instructors, authors, and publishers in preparing and delivering educational materials that reflect the needs of the workplace.

METHODOLOGY

To determine what information systems knowledge and skills a student should possess

when they receive an undergraduate business management degree, it was decided that the best methodology was to ask those who are functioning in the workplace. Two groups of respondents were chosen: (1) business management alumni who are already on the job and have discovered what knowledge and skills are most useful and appropriate; and (2) professional information systems managers from corporations who actually are responsible for designing and preparing systems. These managers were queried because it was thought they may be able to provide a validating perspective as to what skills and knowledge the future will require of employees.

Efforts were made to build on previous studies and references already cited. Content analysis was used to determine the most popular and useful content topics from many current textbooks [18,19,20,21,22,23,24,25,26], DPMA model curriculums [27,28], and introductory information system course outlines from other universities. A questionnaire was prepared using a composite of the content found from the above sources. This questionnaire was tested and revised several times to reflect advice from full-time working professionals who helped to refine the instrument.

The questionnaire was prepared with a total of sixty-two subtopics listed under sixteen main categories. (See Table 1) Each category contained from one to eight sub-topics. The sixteen main categories of the study were:

- 1) Introduction of Information Systems
- 2) Information Systems in Organization
- 3) Information Systems and People
- 4) Hardware
- 5) Software
- 6) Databases
- 7) Telecommunications
- 8) Transaction Processing Systems
- 9) Information Reporting Systems
Management Information Systems
- 10) Decision Support Systems /Executive
Information Systems
- 11) Artificial Intelligence and Expert
Systems
- 12) Systems Development
- 13) End User Computing
- 14) Issues in Management Information
Systems
- 15) Careers in Information Systems
- 16) International Information Systems

Those receiving the questionnaire were asked two basic questions regarding each sub-topic area. 1) Are the sub-topics those that are important, or should others be emphasized? An open-ended response area was provided at

Table 1 (continued)

MEANS FOR EACH GROUP	GRADS	IS MGR
Artificial Intelligence and Expert Systems		
Applications of Artificial Intelligence—ex: robotics, expert systems, natural languages	1.73	2.09
Expert System Characteristics and Development	1.70	2.04
Expert Systems in Business	1.82	2.26
Systems Development		
Traditional Systems Development Life Cycle	1.96	2.78
Systems Development Tools—ex: systems flowcharts, DFD's, ERD's, CASE tools	2.17	2.52
Advantages/Disadvantages of Structured Systems Development	1.97	2.44
Business Process Reengineering	2.31	3.13
Prototyping	2.00	2.83
End User Development of Systems; Advantages and Risks	2.28	2.87
Object Oriented Analysis	2.10	2.44
Event Driven Analysis	2.10	2.17
End User Computing		
End User Computing Tools—ex: project management, graphics, decision aids	3.35	3.26
Work Group Computing	2.66	2.61
Information Centers	2.48	2.44
Resources for End User Computing	2.73	2.30
Managing End User Computing	2.64	2.27
Office Automation Systems—ex: desk-top publishing, e-mail, etc.	3.36	2.83
Issues in Management Information Systems		
Security/Computer Crime and other Threats, Privacy	2.68	2.65
Safeguarding Information Systems—ex: viruses, disaster preparedness	2.97	2.61
Ethical and Societal Dimensions of Information Technology	2.62	2.52
Ergonomic and Health Issues	2.21	1.87
Cost Justification/Feasibility of Information Systems	3.11	2.87
Multinational Issues and Strategies	2.12	2.00
Careers in Information Systems		
International Information Systems		
Strategies for Managing International Information Systems	1.93	1.83
Critical Issues for Global Information Systems	1.97	2.00

the end of the questionnaire where the respondents could identify any content area or concern that they felt was important or missing from the list of topics. 2) For the sub-topics listed, participants were asked the question, "What depth of knowledge or experience should a student have of these topics?" Respondents were asked to check one of six "depth of knowledge" levels presented in the questionnaire for each topic. These levels of knowledge are the same ones used by the Data Processing Management Association [28] as part of their curriculum development process. The six "depth of knowledge" levels are:

- 0 Not Important
- 1 Awareness
- 2 Literacy
- 3 Comprehension
- 4 Detailed Understanding
- 5 Skilled Use

PARTICIPANTS

Group 1 participants consisted of business program graduates who were randomly selected from the undergraduate alumni database of Brigham Young University, Marriott School of Management. Group 2 participants consisted of the professional information systems managers in industry who are responsible for designing and preparing systems in the future. They were selected from *Computerworld's* [29] yearly listing of "The Most Effective Users of Information Systems." Each year *Computerworld* publishes a list of their Premier 100 companies which includes 10 major industry categories with 10 companies in each category. Using *Computerworld's* lists for both 1992 and 1993 one hundred forty-nine different information systems managers were chosen for the survey.

Former business program graduates working in the same 10 industries that

Table 2: Questionnaire Respondents

Categories in Business and Industry	Business Program Graduates		Information Systems Managers		Combined Returns for Each Category
	Sent	Returned	Sent	Returned	
Aerospace	28	15	12	1	16
Petroleum & Chemicals	28	13	13	2	15
Consumer Products & Services	28	10	17	4	14
Financial Services	27	13	16	0	13
Industrial & Automotive Prod.	25	9	17	2	11
Manufacturing	27	13	15	4	17
Pharmaceuticals & Food	27	11	15	4	15
Retailing & Wholesaling	27	9	14	1	10
Transportation	30	12	16	4	16
Utilities	30	13	14	1	14
Totals	277	118	149	23	141
Total Sent	426				
Total Returned	141				
Combined Return Percentage	33.1%				
Business Program Graduates Returns	42.5%				
Information Systems Managers Returns	15.4%				

Table 3: Top 15 Topics of Business Program Graduates

TOPIC	Business Program Graduates	
	Mean	Rank
Application Software	4.32	1
Systems Software	3.54	2
Office Automation Systems	3.36	3
End User Computing Tools	3.35	4
Decision Making with Technology	3.30	5
Use Info Sys. for Competitive Advantage	3.24	6
Cost Justification-Feasibility Info Sys.	3.11	7
Computers—Large, Personal, Network	3.06	8
Concepts & Characteristics of DB	3.01	9
Leadership, Mgmt, and Motivation in Tech Age	2.99	10
Transaction Processing Cycle	2.98	11
Safeguarding Information Systems	2.97	12
Applying Telecommunications to Business	2.93	13
Characteristics Data & Info	2.90	14
Using Info Sys. as Strategic Weapon	2.85	15

Computerworld used in their annual rankings were selected from the alumni database. Four hundred twenty-six questionnaires were sent to the combined groups. One hundred forty-one questionnaires were returned. A 33.1% return rate for the combined groups was achieved. Business program graduates returned 42.5% of their questionnaires and the information systems managers returned 15.4% of their questionnaires. This was a rather low return from the professional infor-

mation systems managers, and some industry categories had so few respondents that certain rigorous statistical comparisons were precluded, so the data received from them were used more as a validating process rather than as a valid statistical analysis. The make up of the respondents is shown in Table 2.

ANALYSIS

The following computations were performed for each sub-topic area:

- 1) the mean (average) "depth of knowledge" level (See Table 1) and,
- 2) descending rank order from highest to lowest mean "depth of knowledge" level. (See Tables 3 & 4 for the top 15 sub-topics, and Tables 5 & 6 for the bottom 15 sub-topics)

Separate analyses were made for the two respondent groups: *business program graduates* and *information systems managers*. These data were based on a scale of 0 to 5. A 5 would suggest "skilled use," a 0 would suggest "not important". A summary of the results are presented in Table 7.

RESULTS

Results from the study can be summarized as follows:

- 1) The business management program graduates ranked "Application Software—word processing, spreadsheets, databases, etc." at the highest level of skill.
- 2) The business management program graduates ranked "Systems Software—DOS, OS/2, Unix, Windows, Macintosh System 7, etc." as the second most needed skill.
- 3) The business management program graduates ranked "Office Automation Systems" and "End User Computing Tools" (which includes software for project management, graphics, decision aids, desk-top publishing, E-mail, etc.) as almost identical in third and fourth place.
- 4) Similarly, the validation factor was evident with "Application Software" and "End User Computing Tools" as they were ranked two and three by the professional information systems managers. The professional managers ranked "Definition of an Information System" as their highest concern. Furthermore, the IS managers identified "Characteristics of Data and Information" fourth in their rankings.

The results presented in Tables 3 and 4, show substantial agreement within both groups of respondents. Business management program graduates should have software application skills in several different categories. In their respective **top fifteen topics** lists (Tables 3 & 4) **business program graduates and information systems managers** agreed on nine topics. These topics average scores were between 2.83 and 4.32, i.e. (between "comprehension" and approaching "skilled use" on the questionnaires 5-point scale).

The nine topics that **both** the business program graduates and the information systems

managers agreed were upon:

- a. Application Software—ex: word processing, spreadsheets, databases, etc.
- b. Systems Software—ex: DOS, OS/2, UNIX, Windows, Macintosh Systems 7, etc.
- c. Office Automation Systems—ex: desk-top publishing, E-mail, etc.
- d. End User Computing Tools—ex: project management, graphics, decision aids
- e. Use of Information Systems for Competitive Advantage
- f. Cost Justification/Feasibility of Information Systems
- g. Concepts and Characteristics of Databases
- h. Leadership, Management, and Motivation in a Technological Age
- i. Characteristics of Data and Information

The six topics on which they *differed* would tend to reflect the emphasis of the work encountered in each sample group. The six unique topics listed by business program graduates in their top fifteen include:

- a. Decision Making with Technology
- b. Computers—ex: large, personal and network computing
- c. Transaction Processing Cycle—ex: data entry, processing, updating, reporting
- d. Safeguarding Information Systems—ex: viruses, disaster preparedness
- e. Using Information Systems as a Strategic Weapon.
- f. Applying Telecommunications to Business Problems

Information System Managers six unique topics that are closely related to systems work rather than to business applications:

- a. Definition of Information Systems
- b. Business Process Reengineering
- c. Components of a System
- d. Information Technology Trends—ex: client/server, multimedia, virtual reality, etc.
- e. Programming Languages—ex: BASIC, COBOL, Pascal, C++, 4 GL's, etc.
- f. End User Development of Systems; Advantages and Risks

The topics that constitute the middle fifty percent of the rankings have average "depth of knowledge level" scores generally in the 2.4 to 2.8 range. This suggests that business students should have a literacy or a comprehension level of these topics. Detailed understanding and skilled use are not as important as they are with the software application and decision

Table 4: Top 15 Topics of Information Systems Managers

For actual wording of topic—See Table 1		IS Managers	
TOPIC	Mean	Rank	
Definition Info Sys.	3.52	1	
Application Software	3.39	2	
End User Computing Tools	3.26	3	
Characteristics Data & Info	3.22	4	
Concepts & Characteristics of DB	3.13	5	
Business Process Reengineering	3.13	6	
Components of System	3.09	7	
Use Info Sys. for Competitive Advantage	3.04	8	
Information Technology Trends	3.00	9	
Leadership, Mgmt, and Motivation in Tech Age	2.91	10	
Programming Languages	2.91	11	
Cost Justification-Feasibility Info Sys.	2.87	12	
End User Development of Systems	2.87	13	
Systems Software	2.87	14	
Office Automation Systems	2.83	15	

Table 5: Bottom 15 Topics of Business Program Graduates

For actual wording of topic—See Table 1.		Business Program Graduates	
TOPIC	Mean	Rank	
Ergonomic & Health Issues	2.21	48	
Systems Development Tools	2.17	49	
Multinational Issues & Strategies	2.12	50	
Event Driven Analysis	2.10	51	
Object Oriented Analysis	2.10	52	
Inside the Computer	2.02	53	
Prototyping	2.00	54	
Advantages-Disadvantages Structured Sys. Dev.	1.97	55	
Critical Issues Global Info Sys.	1.97	56	
Traditional Systems Development Life Cyc.	1.96	57	
Strategies for Managing International Info Sys.	1.93	58	
Expert Systems in Business	1.82	59	
Programming Languages	1.79	60	
Applications of Artificial Intelligence	1.73	61	
Expert Sys.. Characteristics & Development	1.70	62	

making skills of information systems that are ranked in the "top fifteen" topics.

There was agreement on nine topics from both groups of respondents concerning the **bottom or least important 15 topics**. (See Tables 5 & 6) These nine topics were:

- a. Ergonomic and Health Issues
- b. Multinational Issues and Strategies
- c. Event Driven Analysis
- d. Inside the Computer
- e. Critical Issues for Global Information Systems
- f. Strategies for Managing International

Information Systems

- g. Expert Systems in Business
- h. Applications of Artificial Intelligence—ex: robotics, expert systems, natural languages

The other topics listed in the bottom 15 for both groups of respondents are shown in Tables 5 & 6.

One *notable exception* that emerged from this comparison of the top and bottom 15 topics was Programming Languages—ex: BASIC, COBOL, Pascal, C++, 4 GL's, etc. was ranked number 60 out of 62 possibilities by

Table 6: Bottom 15 Topics of Information System Managers

TOPIC	IS Managers	
	Mean	Rank
Electronic Data Interchange	2.30	48
Data Communications	2.30	49
Managing End User Computing	2.27	50
Org. Design & Info Sys.	2.26	51
Expert Systems in Business	2.26	52
Information Superhighway	2.22	53
Event Driven Analysis	2.17	54
Input-Processing-Output-Storage Tech	2.09	55
Applications of Artificial Intelligence	2.09	56
Expert Sys. Characteristics & Development	2.04	57
Multinational Issues & Strategies	2.00	58
Critical Issues Global Info Sys.	2.00	59
Inside the Computer	1.87	60
Ergonomic & Health Issues	1.87	61
Strategies for Managing International Info Sys.	1.83	62

Table 7: Comparison of Topic Rankings Between Business Program Graduates, and IS Managers

TOPIC	Business Program Graduates		IS Managers	
	Mean	Rank	Mean	Rank
Application Software	4.32	1	3.39	2
Systems Software	3.54	2	2.87	14
Office Automation Systems	3.36	3	2.83	15
End User Computing Tools	3.35	4	3.26	3
Decision Making with Technology	3.30	5	2.78	19
Use Info Sys for Competitive Advantage	3.24	6	3.04	8
Cost Justification-Feasibility Info Sys	3.11	7	2.87	12
Computers—Large, Personal, Network	3.06	8	2.61	28
Concepts & Characteristics of DB	3.01	9	3.13	5
Leadership, Mgmt, and Motivation in Tech Age	2.99	10	2.91	10
Transaction Processing Cycle	2.98	11	2.61	27
Safeguard Info Systems	2.97	12	2.61	29
Applying Telecommunications to Business	2.93	13	2.44	40
Characteristics Data & Info	2.90	14	3.22	4
Using Info Sys as Strategic Weapon	2.85	15	2.78	20
Electronic Data Interchange	2.82	16	2.30	48
Strategic Uses of Telecommunications	2.80	17	2.48	39
Information Technology Trends	2.80	18	3.00	9
Definition Info Sys	2.79	19	3.52	1
Database Mgmt Large Systems & Micros	2.77	20	2.61	30
Resources for End User Computing	2.73	21	2.30	47
Networking Alternatives	2.70	22	2.39	46
Reporting Alternatives	2.70	23	2.57	34
Security-Computer Crime-Privacy	2.68	24	2.65	25
Org Behavior-Culture, etc.	2.67	25	2.83	16
Work Group Computing	2.66	26	2.61	31
Characteristics of Decision Support Syst	2.65	27	2.78	24
Data Models-Structures	2.65	28	2.74	22

the business program graduates. It was ranked number 11 in importance by the professional information systems managers. This is a major difference of opinion concerning the value of including programming languages as part of a course for business program graduates.

RECOMMENDED INFORMATION SYSTEMS COURSE CONTENT

- 1) Include and emphasize the nine topics of common agreement by both groups of respondents. This would especially emphasize hands-on software application tools. (See Tables 3 & 4)
- 2) Include instruction on the six unique topics that were different in each group's rankings. Much of this would be conceptual course content with business orientation and applications where possible.
- 3) Other course content should be chosen from higher ranked topics listed in Table 7 as time allows in the course.
- 4) Programming languages typically would not be included as a part of instruction for business program graduates. Overwhelming negative responses from this group would suggest it is perceived as having little value for most business management people on the job and educational efforts would be better directed at topics that ranked in the higher end of the scale. However, for those who will spend considerable time with emphasis in information systems programming would be desirable.
- 5) Topics that were unanimously in the bottom 15 topics would not be a major part of the course content. Many of these topics are related to systems development activities that traditionally have been included in a course of this nature. (See Tables 5 & 6.)

CONCLUSIONS

The purpose of this study was to seek the input of information systems managers and business program graduates who are now in the workplace, regarding the most important topics that should be part of the knowledge and skill base of undergraduate business management students. While there are some exceptions as noted, in the majority of instances there is considerable consistency between the two respondent groups regarding the topics that are ranked in the top fifteen and the bottom fifteen from the set of sixty two topics. The results have immediate implications for business or management educators who are responsible for undergraduate information

Table 7 (continued)

TOPIC	Business Program Graduates		IS Managers	
	Mean	Rank	Mean	Rank
Transaction Processing Applications	2.65	29	2.61	32
Communications Media & Devices	2.65	30	2.41	45
Data Communications	2.65	31	2.30	49
Input-Processing-Output-Storage Tech	2.65	32	2.09	55
File Processing Systems	2.64	33	2.57	33
Managing End User Computing	2.64	34	2.27	50
Components of System	2.63	35	3.09	7
Types Functional Mgmt Reporting Systems	2.62	36	2.65	26
Ethical & Societal Dimensions of Info Te	2.62	37	2.52	38
Executive Info Sys Characteristics	2.59	38	2.74	23
Information Superhighway	2.57	39	2.22	53
Careers in Information Systems	2.56	40	2.80	18
Organization as a System	2.51	41	2.55	35
Group Decision Support Systems	2.51	42	2.52	36
Information Centers	2.48	43	2.44	41
Org Design & Info Sys	2.48	44	2.26	51
Physiological-Psychological Factors	2.42	45	2.44	42
Business Process Reengineering	2.31	46	3.13	6
End User Development of Systems	2.28	47	2.87	13
Ergonomic & Health Issues	2.21	48	1.87	61
Systems Development Tools	2.17	49	2.52	37
Multinational Issues & Strategies	2.12	50	2.00	58
Event Driven Analysis	2.10	51	2.17	54
Object Oriented Analysis	2.10	52	2.44	44
Inside the Computer	2.02	53	1.87	60
Prototyping	2.00	54	2.83	17
Advantages-Disadvantages Structured Syst Dev	1.97	55	2.44	43
Critical Issues Global Info Sys	1.97	56	2.00	59
Traditional Systems Development Life Cyc	1.96	57	2.78	21
Strategies for Managing International Info Sys	1.93	58	1.83	62
Expert Systems in Business	1.82	59	2.26	52
Programming Languages	1.79	60	2.91	11
Applications of Artificial Intelligence	1.73	61	2.09	56
Expert Sys Characteristics & Development	1.70	62	2.04	57

system curriculum development and course design.

The results strongly suggest that information systems curricula designed for undergraduate business students should provide detailed understanding or skilled use of business related computer application software. Such application software is interpreted to mean spreadsheets, database, word processing, and operating systems including Windows. Other application software should include graphics, project management, and other decision support aids. No attempt was made to determine brand names of software. Each educational institution will need to make its own decisions. Considerable discussion could focus on popular software application packages with little

agreement. Educators should be wise and current in their choices. In addition, students need to have experiences learning how the computer can be applied to other business areas, i.e. decision making, data base usage, competitive advantage, and strategic uses. At the present time, the study suggests little emphasis should be given to systems development tools and methodology, programming languages, and applications of artificial intelligence.

Thirty-four respondents wrote comments concerning skills they thought were most useful for a well-prepared student. Most comments centered on the main ideas of "hands on experience" with software, with some "solid understanding" of the potential uses of infor-

mation systems in various business environments.

These findings provide the basic direction for a required course that would be purposeful and meaningful for business management undergraduate students. These findings also would meet the AACSB requirements. While a mostly conceptual approach satisfies the AACSB requirements, it is evident from both of the surveyed groups that more instruction and preparation is needed in what is called in the study "Application Software," "Systems Software," "Office Automation Systems," and "End User Computing Tools."

Some other factors that affect this type of curriculum decision for a specific IS course for undergraduate business students include:

- 1) Constituency of the course: Junior/Senior level students who have had several business courses may benefit from additional conceptual integration. If the course is required at the Freshmen/Sophomore level students may be better served with extra emphasis on software application tools.
- 2) Prerequisites expected of students: Some schools may recruit students with a high degree of skill in computer application software. Other schools may preface the IS course with hands-on application software course focusing on appropriate business oriented software.
- 3) School philosophy: Some schools may emphasize more of a liberal arts approach and not focus on developing specific technical skills.
- 4) Availability of technology: While many students now have their own computer, it still seems most schools will continue to need to provide substantial information technology resources to support the recommendations found in this study.

Our approach to these findings at Brigham Young University has been to land in the middle of the road. Introductory prerequisite courses in word processing and spreadsheets are prerequisite to taking the required undergraduate business information systems course. Additional emphasis applying application software is now required in the information systems course. With the recent impact of the Internet, it is also included as a significant part of the instruction material in the course. The remainder of the course will emphasize especially those topics in the "top fifteen" and other selected topics that were rated high by business management graduates. 

REFERENCES

- [1] Yasin, M. M., R. F. Green and Marwan Wafa. "An Assessment Of Computer Education In The Business School: A Jungle Within A Jungle," *Journal Of Research On Computing In Education*, Winter, 1989, pp. 229-240.
- [2] Behling, Robert. "Course Content In The Introductory MIS Course: A Curriculum Survey," *Interface*, Spring, 1989, pp. 12-17.
- [3] Kim, Chung S. and Nancy K. Keith. "Computer Literacy Topics: A Comparison Of Views With A Business School," *Journal of Information Systems Education*, Summer, 1994, pp. 55-59.
- [4] Longenecker, Herbert E. Jr. and David L. Feinstein (eds.). "IS '90: The DPMA Model Curriculum For Information Systems for 4 Year Undergraduates," published by Data Processing Management Association, Park Ridge, 1991.
- [5] ISECON '94. Information Systems Education Conference, "IS Education For Today And For The Next Millennium." Proceedings of Workshop, Development and Review of IS'95—A Joint Curriculum of DPMA, ICIS/AIS and ACM for Four Year IS Programs, October, 1994.
- [6] Longenecker, Herbert E. Jr. "IS '90: The DPMA Model Curriculum," Data Processing Management Association. "Information Systems: The DPMA Two Year Model Curriculum For IS Professionals, IS '94."
- [7] Stewart, J.R. "Educator/Practitioner Recommendations For Computer Usage In An Under-Graduate Accounting Information Systems Course," *Journal of Computer Information Systems*, p. 3, Winter 1993-1994.
- [8] Quarstein, V.A., H.V. Ramakrishna and B.S. Vijayaraman. "Information Technology Knowledge And Skills For MBAs: Non-MIS Faculty's Perspective," *Journal of Education for Business*, pp. 204-210, March/April 1994.
- [9] Vijayaraman, B.S., H.V. Ramakrishna and V.A. Quarstein. "MIS Faculty's Perspective On The Structure And Content of Information Technology Courses In MBA Programs," *Journal of Computer Information Systems*, p. 72, Spring, 1994.
- [10] Amini, M.S. "Factors Affecting The Perception Of Computing Literacy Among Business Majors," *Journal of Education for Business*, pp. 79-82, November/December 1993.
- [11] Hawes, D.K. "Information Literacy And The Business Schools," *Journal of Education for Business*, pp. 54-61, September/October 1994.
- [12] Kim, C.S and D. Peterson. "The Introductory Computer Course: Business Majors' Perceived Importance Of Topics," *Journal of Education for Business*, pp. 361-365, July/August 1992.
- [13] Delone, W.H. and G.E. Biles. "Integration Of Computers And Information Systems Into The Business School Curriculum: A Case Study," *Journal of Education for Business*, pp.111-115, November/December 1991.
- [14] Haworth, D.A. and F.J. Van Wetering. "Determining Underlying Corporate Viewpoints On Information Systems Education Curricula," *Journal of Education for Business*, pp. 292-295, May/June 1994.
- [15] Lynch, R.M., J.R. Steward and S. Teglovic, Jr. "Application Software Packages And Their Use In Instruction 1989, 1991, 1993," *Journal of Computer Information Systems*, p. 31, Spring 1995.
- [16] Jiang (1994s), J.J., I.E. Udeh, A. Hayajneh. "Employers' Expectation Of incoming Business Graduates: From Recruiters' Views," *Journal of Computer Information Systems*, p. 60, Summer 1994.
- [17] Jiang (1994f), J.J. "Requisite Skills For New Business Graduates: Recruiters' View," *Journal of Computer Information Systems*, p.28, Fall 1994.
- [18] Kroenke, David and Richard Hatch. *Management Information Systems*. 3rd Edition. Mitchell McGraw-Hill, Inc., 1994.
- [19] Laudon, Kenneth C. and Jane P. Laudon. *Management Information Systems*. Macmillan College Publishing Company, Inc. 1994.
- [20] McKeown, Patrick G. and Robert A. Leitch. *Managing with Computers*. Harcourt Brace Jovanovich, Inc., 1993.
- [21] McLeod, Raymond Jr. *Management Information Systems*. 5th Edition, Macmillan Publishing Company, 1993.
- [22] O'Brien, James A. *Management Information Systems*. 2nd Edition, Richard D. Irwin, Inc., 1993
- [23] Parker, Charles and Thomas Case. *Management Information Systems*. 2nd Edition, Mitchell McGraw-Hill, Inc., 1993
- [24] Reynolds, George W. *Information Systems for Managers*. 2nd Edition. West Publishing Company, 1992.
- [25] Stair, Ralph M. *Principles of Information Systems*. Boyd and Fraser Publishing Company, 1992.
- [26] Zwass, Vladimir. *Management Information Systems*. Wm. C. Brown Publishers, 1992
- [27] Longenecker Herbert E. Jr., Feinstein, David L., Couger, J. Daniel, Davis, Gordon G., Gorgone, John T. "Information Systems '95: A Summary Of The Collaborative IS Curriculum Specification Of The Joint DPMA, ACM, AIS Task Force," *Journal of Information Systems Education*, Winter 1994-95, pp. 174-186.
- [28] Data Processing Management Association. "Information Systems: The DPMA Two Year Model Curriculum For IS Professionals, IS '94", pp. 11-12.
- [29] *Computerworld*. "The Premier 100—The Most Effective Users Of Information Systems", *Computerworld*, Vol 5, No. 1, (October 31, 1992); "The Premier 100—The Most Effective Users of Information Systems", *Computerworld*, Vol 6, No. 1, (October 31, 1993).
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