
Information Resources Management Education: IS Managers' and Educators' Views

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This paper reports the findings of a survey designed to discover the degree to which various IRM topics are considered important in an undergraduate and graduate courses in IRM. Ninety IS managers and sixty three MIS educators participated in the survey. Managers and educators agreed on the importance of topics related to planning and organization for coverage at both course levels. In addition, topics related to systems development and control were important at the undergraduate level, while topics related to IS staffing, and financing were important at the graduate level.

Information resources management (IRM) has been gradually evolving during the last decade as a sub-field within the discipline of management information systems (MIS). This new area of study has been recognized by both information systems (IS) managers and management information systems educators as making significant contributions towards the managing of information services and technologies as corporate assets. Although no universal definition exists of this emerging sub-field it has, however, evolved under the premise that information and information related technologies are vital organizational resources, and deserve to be managed as skillfully as other factors of production such as

capital, land, and labor (Horton, 1977; Connell, 1981; Stonecash, 1981; Marchand and Horton, 1986; Otten, 1984; Guimaraes, 1988; Farka-Conn, 1989; Trauth, 1989; McLeod, 1990).

Managers have responded to IRM by developing executive education programs on information technology (McNurlin, 1989), and by increasingly using the services of consulting firms specializing in IRM (Bryce, 1989). Academic institutions have responded by developing and offering courses in IRM (Lee, 1988).

Because IRM is still at an early stage of development, there is not a clear understanding of the various areas that comprise it (Smith and Medley, 1987; O'Brien and Morgan, 1991), and

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the relative importance of each. This study reports the results of a survey of information systems managers and management information systems educators conducted to discover the degree to which various IRM topics and categories of topics are considered important for coverage in an undergraduate and a graduate course in IRM.

The purpose of the study is threefold:

(1) Identify the important topics in IRM in the 1990s as reported by IS managers and MIS educators.

(2) Identify the relative importances of categories of topics in IRM as they relate to an undergraduate and a graduate level course in IRM, as perceived by IS managers and MIS educators.

(3) Determine the relative importances of IRM topics as they relate to an undergraduate and a graduate level course in IRM, as perceived by IS managers and MIS educators.

In addition to focusing on these three goals, we compare the results of this study with other works done in the MIS field. Existing guidelines for the teaching of IRM will be examined, as well as ways to improve the contents of courses in IRM.

The information in this paper will aid MIS educators and IS managers in improving the focus of IRM's goals. Academicians will benefit since it will provide the importance ranking of topics and main topic categories in this sub-field. This information is valuable in the development of outlines for new courses in information resources management, and in prioritizing each topic. Furthermore, it will provide a baseline for educators to assess the status and direction of current IRM courses in their institutions. Finally, this study will provide firms with a basis for recognizing critical IRM issues, guiding their managers to successfully compete in the future.

Methodology

The study was conducted in two phases. The first phase involved the construction of a list of IRM topics. The second phase gathered topic

ranking information by sampling MIS educators and IS managers using mail survey questionnaire.

The preliminary list of IRM topics was derived from a search of the current literature in IRM. The list of topics was validated by a team of six managers and four educators knowledgeable in the MIS field. Forty-six topics thought to distinguish IRM within the MIS discipline were finally selected and made up the questionnaire. An explanation of each topic was included to insure common meaning. These topics were grouped in nine categories. Table 2 and 3 present the list of the nine categories and the topics in each category. Participants were asked to rate each topic according to their perception of its future importance in an IRM course at the undergraduate and graduate levels of study. Their evaluation were made on an asymmetrical, five-point Likert scale using the following qualitative judgement and corresponding values:

- 1 = Not important
- 2 = Somewhat important
- 3 = Important
- 4 = Very important
- 5 = Extremely important

The survey questionnaires were mailed to 180 IS managers and 140 MIS educators. The participants were randomly selected from the membership list of the Information Resources Management Association (IRMA). Of the 320 questionnaires mailed, 153 (48%) were completed and returned. Of the questionnaires returned, 90 (59%) were from IS managers and 63 (41%) were from MIS educators. Table 1 presents information regarding frequency distribution of the job positions held by the respondents.

The principal method used to identify and prioritize the nine categories and the topics was the ranking by mean scores. The topics were ranked by their means, with the topic with the highest mean being ranked first and the lowest being ranked forty-sixth. Table 2 contains the importance rankings of mean responses to IRM categories and topics for an undergraduate IRM course, by the information systems managers and man-

IS Managers	Number	Percent
Data Base Administrators	9	10.0
Director of MIS	22	24.5
MIS Managers	20	22.2
MIS Consultants	4	4.4
CIO/President/Owner	10	11.1
Others (Project Managers, Systems Analysts, Programmers)	25	27.8
Total	90	100.0
MIS Educators	Number	Percent
Assistant Professor	22	34.9
Associate Professor	12	19.0
Full Professor	21	33.4
Others (Chairs,Instructors, Lecturers)	8	12.7
Total	63	100.0

Table 1: Distribution of Job Positions of Information Systems Managers and Management Information Systems Educators

agement information systems educators. Table 3 presents the importance rankings of mean responses to IRM categories and topics for an graduate IRM course, by the information systems managers and management information systems educators.

Analysis

The following section examines the results of this study in terms of the degree and direction of the importance of categories and topics within and between the undergraduate and graduate levels.

At the undergraduate level, substantial differences in perceptions were detected in the way information systems managers and management information systems educators ranked the nine categories of topics (see Table 2). The Spearman rank correlation coefficient (rho value) between the groups of managers and educators was 0.525 which shows that a moderate degree of agreement existed between the two groups' perceptions regarding the importance of the various IRM categories. This lack of strong agreement is reflected for example, by the ranking of *management of systems development and control and evaluation of information systems* perceived by the managers as

the two most important categories, while educators ranked them fourth and sixth, respectively. The difference may be due to the fact that managers are constantly developing and managing information systems, and being evaluated on how effectively they manage given resources. Educators, understandably so, are not concerned with such practical topics since their jobs do not directly depend on the use of information resources. Also, the categories *organization and acquisition of IS physical resources* were ranked fifth and fourth in importance by the managers, but first and second by the educators. The categories on which they agreed were *planning*, ranked third in importance, and *management of research development* ranked least important.

The information systems managers and management information systems educators were in a much closer agreement regarding the importance ranking of categories for an graduate course in IRM (see Table 3). The rho value between the groups of managers and educators was 0.8333 which reveals that a very high degree of concordance existed between these two groups. The only major discrepancy found was in the ranking of the category *financing of information systems*. Managers ranked it second in importance, whereas educators ranked it fifth. A plausible explanation is that managers are dealing with financial matters

CATEGORIES AND TOPICS FOR AN IRM COURSE						
	Managers			Educators		
	Rank	Mean	S.D.	Rank	Mean	S.D.
PLANNING	3	3.20	.76	3	3.24	.78
1 Strategic value of information and knowledge	7	3.44	1.08	6	3.46	1.14
2 Corporate planning of information systems	13	3.25	1.07	8	3.38	.92
3 Information capacity planning	33	2.92	1.00	29.5	2.90	.96
ORGANIZATION	5	3.00	.71	1	3.32	.71 *
4 Organizational design of information systems	19	3.22	.96	11	3.33	.91
5 Internal structure of information systems	28	3.06	.91	18	3.25	.95
6 IS relationship with other organizational functions	12	3.27	1.07	1	3.77	.91 *
7 Organizational impacts of information systems	23	3.17	1.20	03	3.57	1.02 *
8 Managing information systems by committee	46	2.27	.92	40	2.65	1.01 *
STAFFING/DIRECTING IS HUMAN RESOURCES	8	2.75	.72	5	3.09	.83 *
9 Chief information officer/ other IS managers	42	2.60	1.00	19.5	3.22	1.00 *
10 Training of information systems staff	30	2.97	1.06	21	3.17	1.15
11 Human resources management	43	2.53	.86	31.5	2.87	0.95 *
12 Management of knowledge workers	40	2.63	.93	29.5	2.90	1.16
13 Executive involvement and support	29	3.05	1.17	9	3.35	1.10
ACQUISITION IS PHYSICAL RESOURCES	4	3.13	.77	2	3.27	.82
14 Acquisition of hardware	26	3.07	.95	25.5	3.03	.98
15 Acquisition of software	21	3.18	.91	17	3.26	.98
16 Acquisition of information	24	3.14	.91	5	3.46	1.00
MANAGEMENT OF SYSTEMS DEVELOPMENT	1	3.43	.67	4	3.22	.79
17 Feasibility and justification	16	3.23	.97	19.5	3.22	.99
18 Concept formulation and validation	18	3.22	.96	24	3.09	1.09
19 Systems life cycle process	4	3.66	.95	13.5	3.30	1.13 *
20 Information requirement	2	3.80	.87	2	3.63	1.08
21 Prototyping	16	3.23	1.09	22	3.11	1.01
22 Integration of systems	6	3.51	1.05	10	3.34	.97
23 Existing systems restructuring	14	3.25	1.03	33	2.87	1.04 *
24 Project management	5	3.51	.98	23	3.11	1.07 *
25 Configuration management	20	3.21	1.02	28	2.93	1.17
26 Systems implementation	3	3.71	1.04	16	3.27	1.02 *
MANAGEMENT OF INFORMATION TECHNOLOGY	6	2.97	.72	7	2.90	.81
27 Management of computer centers	39	2.68	.97	44	2.44	1.05
28 Management of information centers	38	2.71	.95	36	2.80	1.06
29 Management of data resources	9	3.37	.94	15	3.29	1.07
30 Management of knowledge bases	32	2.95	.99	27	2.96	1.15
31 Management of office automation	35	2.90	1.02	43	2.60	1.07
32 Management of factory automation/robotics	41	2.60	1.05	46	2.24	1.00 *
33 Management of distributed systems	27	3.06	.88	25.5	3.03	.98
34 Management of end-user computing	22	3.17	.91	12	3.31	.99
35 Integration of information technologies	8	3.43	.97	7	3.38	1.15
CONTROL AND EVALUATION OF INFORMATION SYSTEMS	2	3.35	.85	6	3.03	.84 *
36 Quality control	10	3.35	1.03	31.5	2.87	.99 *
37 Audit	36	2.86	1.17	38	2.74	1.09
38 Quality assurance	11	3.30	1.11	35	2.84	1.08 *
39 Maintenance	25	3.10	1.09	34	2.85	1.06
40 Evaluation of IS performance	15.5	3.23	1.00	13.5	3.30	.90
41 Security	1	3.81	.98	4	3.49	1.06
MANAGEMENT OF RESEARCH DEVELOPMENT	9	2.57	.92	8	2.56	1.00
42 New Technologies	37	2.75	1.13	39	2.69	1.15
43 Technological forecasting	44	2.47	1.02	42	2.62	1.09
44 Research and development of IS service topic	45	2.45	1.01	45	2.37	1.09
FINANCING OF INFORMATION SYSTEMS	7	2.93	.92	8	2.69	.88
45 Budgeting	34	2.91	1.02	41	2.62	.91
46 Accountability of IS	31	2.96	1.04	37	2.75	.95

Scale: 1= not important 3= important 5= extremely important
Ranking: 1= most important 46= least important
* = significance at the 0.05 level or better

Table 2: Rankings of Mean Responses to Categories and Topics in Information Resources Management by Information Systems Managers, and Management Information Systems Educators at the Undergraduate Level of Study

CATEGORIES AND TOPICS FOR AN IRM COURSE

	Managers			Educators		
	Rank	Mean	S.D.	Rank	Mean	S.D.
PLANNING	1	4.01	.63	1	4.15	.62
1 Strategic value of information and knowledge	2	4.29	.82	1	4.57	.67 *
2 Corporate planning of information systems	1	4.34	.72	2	4.45	.69
3 Information capacity planning	32.5	3.39	1.09	27.5	3.41	1.10
ORGANIZATION	3	3.75	.65	2	3.86	.68
4 Organizational design of information systems	7	3.98	.86	6	4.04	.86
5 Internal structure of information systems	22.5	3.52	1.00	25	3.49	.97
6 IS relationship with other organizational functions	3	4.14	.85	4	4.11	.86
7 Organizational impacts of information systems	6	4.01	1.01	3	4.31	.84
8 Managing information systems by committee	43	3.10	1.15	36	3.26	1.15
STAFFING/DIRECTING IS HUMAN RESOURCES	4	3.58	.80	3	3.71	.76
9 Chief information officer/ other IS managers	28.5	3.46	1.04	9	3.95	.93 *
10 Training of information systems staff	14	3.75	1.09	16	3.65	1.07
11 Human resources management	42	3.13	1.05	29	3.40	.95
12 Management of knowledge workers	27	3.47	1.04	20	3.58	1.03
13 Executive involvement and support	4	4.11	1.02	8	3.96	.98
ACQUISITION IS PHYSICAL RESOURCES	6	3.55	.90	4	3.70	.74
14 Acquisition of hardware	34	3.38	1.09	33	3.36	.93
15 Acquisition of software	25	3.50	1.08	18	3.63	.87
16 Acquisition of information	12.5	3.75	.97	7	4.03	.90
MANAGEMENT OF SYSTEMS DEVELOPMENT	7	3.46	.81	6	3.46	.74
17 Feasibility and justification	22.5	3.52	1.08	23.5	3.50	1.01
18 Concept formulation and validation	31	3.42	1.05	27.5	3.41	1.19
19 Systems life cycle process	26	3.49	1.10	31	3.37	1.08
20 Information requirement	17	3.63	1.21	12	3.83	1.05
21 Prototyping	39	3.19	1.12	34	3.33	1.08
22 Integration of systems	15	3.73	1.04	12	3.83	.95
23 Existing systems restructuring	37	3.27	1.20	41	3.10	1.02
24 Project management	11	3.77	1.09	23.5	3.50	1.07
25 Configuration management	36	3.31	1.12	42	3.01	1.06
26 Systems implementation	35	3.35	1.25	30	3.40	1.10
MANAGEMENT OF INFO. TECHNOLOGY	9	3.40	.76	9	3.37	.80
27 Management of computer centers	38	3.21	1.03	44	2.93	1.15
28 Management of information centers	40	3.19	1.01	32	3.19	1.07
29 Management of data resources	16	3.66	1.05	15	3.73	.98
30 Management of knowledge bases	32.5	3.39	1.09	19	3.60	1.03
31 Management of office automation	44	3.07	1.03	45	2.84	1.15
32 Management of factory automation/robotics	46	3.00	1.09	46	2.70	1.23
33 Management of distributed systems	20.5	3.53	.98	22	3.54	.95
34 Management of end-user computing	19	3.56	1.02	14	3.78	1.01
35 Integration of information technologies	9	3.96	1.00	5	4.10	1.02
CONTROL AND EVALUATION OF INFORMATION SYSTEMS	5	3.56	.84	7	3.40	.81
36 Quality control	20.5	3.53	1.05	35	3.32	1.13
37 Audit	30	3.44	1.11	40	3.13	1.16
38 Quality assurance	24	3.51	1.07	37	3.24	1.07
39 Maintenance	45	3.03	1.20	43	2.98	1.03
40 Evaluation of IS performance	2.5	3.75	1.01	10	3.85	.99
41 Security	5	4.05	1.09	12	3.83	1.08
MANAGEMENT OF RESEARCH DEVELOPMENT	8	3.41	.90	8	3.39	1.03
42 New Technologies	18	3.59	.97	21	3.56	1.17
43 Technological forecasting	28.5	3.46	1.08	26	3.43	1.26
44 Research and development of IS service topics	41	3.18	1.15	39	3.18	1.14
FINANCING OF INFORMATION SYSTEMS	2	3.95	.83	5	3.50	.97 *
45 Budgeting	8	3.97	.86	32	3.36	.99 *
46 Accountability of IS	10	3.93	.88	17	3.65	1.10

Scale: 1= not important 3= important 5= extremely important

Ranking: 1= most important 46= least important

* = significance at the 0.05 level or better

Table 3: Mean Rankings of Categories and Topics in Information Resources Management by Information Systems Managers, and Management Information Systems Educators at the Graduate Level of Study

and responsibilities on a daily basis, and full-time educators are not. Three categories; *planning*, *management of research development*, and *management of information technologies* received the same ranking by both groups. There is also a general consensus on the ranking of the remaining categories.

A comparison of the importance ranking of the categories between the undergraduate and graduate levels shows some similarities and differences. At both levels the category of *planning* was ranked very high in importance, and the category of *management of research development* was ranked very low. The importance of the category *management of systems development* was ranked very high at the undergraduate level, but very low at the graduate level. The categories of *staffing/directing information systems human resources* and *financing of information systems* were ranked low at the undergraduate, but high at the graduate level.

The importance ranking of individual topics also revealed similarities and differences in both groups' perceptions, within and between the undergraduate and the graduate levels. Table 4

lists the 15 top-ranked IRM topics at the undergraduate and at the graduate level by the combined group of managers and educators, by the managers and by the educators.

At the undergraduate level the combined group's ranking clearly revealed the importance of topics within the category *management of systems development*. Three out of the five top-ranked topics belonged to this topic category, namely *information requirements*, *systems implementation*, and *systems life cycle process*. Managers and educators generally agreed about the importance of such topics as *information requirements*, *security*, *integration of systems*, *strategic value of information and knowledge*, and *integration of information technologies*. However, major differences in opinions existed regarding the importance of other topics. For example, *system implementation*, *system life cycle process*, and *project management* were ranked much higher by managers than by the educators. The topics *IS relationship with other organizational functions*, and *organizational impacts of IS*, which belong to the category of *organization*, were

TOPICS	UNDERGRADUATE			GRADUATE		
	Both	Mgrs	Educ	Both	Mgrs	Educ
1 Strategic value of information and knowledge	7	7	6	2	-2	1
2 Corporate planning of information and knowledge	12	13	8	1	1	2
4 Organizational design of information systems	14	19	11	7.5	7	6
6 IS relationship with other organizational functions	5	12	1	4	3	4
7 Organizational impacts of IS	9	23	3	3	6	3
10 Training of information systems staff	15	14	16			
13 Executive involvement and support				5	4	8
16 Acquisition of information	15	24	5	9	12.5	7
19 Systems life cycle process	4	4	13.5			
20 Information requirements	1	2	2	13	17	12
22 Integration of systems	6	6	10	12	15	12
26 Systems implementation	3	3	16			
24 Project management	11	5	23			
29 Management of data resources	10	9	15	14	16	15
34 Management of end-user computing	13	22	12			
35 Integration of information technologies	8	8	7	6	9	5
41 Security	2	1	4	7.5	5	12
40 Evaluation of IS performance				11	12.5	10
46 Accountability of IS				10	10	17
Mgrs= Information Systems managers			Educ= Management Information Systems educators			

Table 4: Rankings of the Fifteen Top Information Resources Management Topics by the Information Systems Managers, Management Information Systems Educators and the Combined Group at the Undergraduate and Graduate Levels of Study

highly regarded by educators but not by the managers. This would explain the reason for the difference between the two groups' ranking of the category *organization*.

At the graduate level there seems to be no major conflict of opinions between the information systems managers and the management information systems educators. The only noticeable difference was in the ranking of the topics *security*, and *accountability of information systems*, to which the managers gave more importance than did the educators. The similarity in rankings of the topics at the graduate level confirms the results obtained in the rankings of the categories at this same level.

An examination of the fifteen top undergraduate and graduate IRM topics exposes certain consensus and divergences. First of all, it is interesting to observe that the thirteen topics ranked among the top fifteen at the undergraduate level were also ranked among the top fifteen at the graduate level. This finding is significant because those thirteen topics may be the clue to discover the true and distinguishable core of information resources management. The issue of *corporate planning of information and knowledge* was considered of utmost importance at the graduate level, but not so at the undergraduate level. The issue *information requirements* was considered very important at the undergraduate level, but not so at the graduate level. The issues *IS relationship with other organizational functions*, *integration of information technologies*, and *management of data resources* had similar rankings at both levels. The degree of agreement and divergence between the undergraduate and the graduate rankings give an indication of which topics to emphasize at each level in an IRM course.

Relationship of this Finding to the Findings of Other Researchers

Although the literature reports no previous surveys of IRM topics, several studies have been

conducted regarding the relative importances of various issues within the broad area of Management Information Systems (Dickson, Leitheiser et. al., 1983; Hartog and Herbert, 1985; Brancheu and Wetherbe, 1986). The Dickson, Leitheiser et. al., study was conducted in 1983 (hereafter referred as the "1983" study) by the Society for Information Management in a joint effort with the University of Minnesota. A three-round Delphi method was used to survey the association's members in order to formulate issues germane to information systems and to reach a consensus on their importance.

Hartog and Herbert conducted a two-round Delphi study in 1985 (hereafter referred as the "1985" study). Opinion were obtained from management information systems managers in more than 100 St. Louis-area companies. Issues focused entirely on corporate concerns. Professional development issues, or research sub-topics of more concern to the academic community were not included.

A second study was initiated by the Society for Information Management and the University of Minnesota. The purpose of the study was to reevaluate the key issues of the 1983 study. This study was conducted in 1986 (hereafter referred as the "1986" study) and consisted of a five-part Delphi survey of 78 chief information systems executives and 12 corporate general managers.

By way of comparison, the present study reports on the degree of importance of forty-six topics in the area of study of information resources management by ninety information systems managers. Unfortunately, the results of these studies are not easily or directly comparable with the results of the present survey (hereafter referred as the "1990" study), because of differences in methods, issue definitions and field coverage. However, despite methodological differences, it is still possible to look at the major similarities and differences in the research findings.

Table 5 compares the four studies in terms of the percentile rankings of the importances of the various topics. Similarities in the rankings of certain topics is observed in all the studies. For example, the topic of *planning* was ranked in the

top six percent in all four studies. Undoubtedly this topic continues to be a key concept in the discipline of management information systems. The topic *strategic value of information* was not included for evaluation in the 1983 and 1985 studies, but it was ranked in the top ten percent in the 1986 study as well as in the 1990 study (graduate level). This is an emerging topic whose trend is worth watching in the future. Information and information systems are now considered to be major competitive and strategic tools by most successful corporations. One can speculate that this issue will become increasingly important. In terms of importance, the topic *evaluation of information systems performance* was ranked above the thirty-fifth percentile in the 1983, 1986 and 1990 studies. It appears that measurement of performance continues to be a problem for information systems managers as organizations invest more and more money in information systems. One major reason may be that few concrete measures exist for evaluating information technology investment.

When comparing the percentile rankings of the topics in each study against the others, two studies exhibited the largest number of close agreements: the 1986 study and the 1990 study (graduate level). Out of twenty topics in common between the two studies, eight of them showed very close rankings: *strategic value of information and knowledge*, *corporate planning of information systems*, *organizational design of information systems*, *information systems relationship with other organizational functions*, *organizational impacts of Information Systems*, *systems life cycle process*, *management of data resources*, and *evaluation of Information Systems performance*.

The topic *human resources management* appears to have consistently declined in importance. In the 1983 and 1986 studies it was ranked between the 40th and 50th percentile. In the 1990 study its importance dropped to the bottom 10th percentile. A plausible explanation may be that substantial progress has been made toward resolving this issue. Abundant research and writing on this subject, and the present low turnover rates for

information systems professional, may have contributed to a vanishing of concerns.

There are also some differences in the percentile rankings of topics in terms of their importances among the four research studies.

The topic of *security* decreased in importance in the 1983 and 1986 studies with a percentile ranking in the seventies. However, in the 1990 study it was ranked very important at both the undergraduate and graduate levels with a combined seventh percentile rank. This topic is one of the surprises of this comparison. Perhaps, as more elaborate and expensive technologies emerge, and as more users have easy access to information systems, the need to protect sensitive data becomes a crucial concern.

The topic *integration of information technologies* also decreased in importance in the 1986, and 1985 studies. In the 1990 study it gained considerable importance. It is speculated that as diverse technologies rapidly change or emerge, it becomes difficult to overcome the spectrum of technical, organizational and managerial issues associated with trying to bring differing technologies under one set of rules. The topic *management of end-user computing* was ranked in the top twenty-five percent in the 1983, 1986 and 1985 studies. In the 1990 study its importance dropped to a rank in the fortieth percentile. This topic may be losing ground as an issue of concern perhaps because of the abundant literature and extensive research available in this area and the fact that managers are becoming familiar with the intricacies of it.

Relationship of Present Study to Existing Teaching Guidelines in IRM

Since the 1960's the Data Processing Management Association (DPMA) and the Association of Computing Machinery (ACM) have provided continuous support for schools developing or redesigning their management information systems curricula. The recommendations of these two associations are considered standard curriculum guidelines in schools offering undergraduate

TOPICS	1983	1985	1986	1990	
				U	G
PLANNING					
Strategic value of information and knowledge	NR	NR	8	16	5
Corporate planning of Information Systems(IS)	6	5	4	29	3
Information capacity planning	NR	NR	NR	72	70
ORGANIZATION					
Organizational design of information systems	37	10	20	42	16
Internal structure of information systems	NR	NR	NR	61	49
IS relationship with other org. functions	32	NR	12	27	7
Organizational impacts of information systems	79	NR	16	50	13
Managing information systems by committees	NR	NR	NR	100	94
STAFFING/DIRECTING IS HUMAN RESOURCES					
Chief information officer/other IS managers	NR	NR	NR	92	62
Training of information systems staff	NR	8	NR	66	31
Human resources management	43	NR	47	94	92
Management of knowledge workers	NR	NR	NR	87	59
Executive involvement and support	NR	38	NR	63	87
ACQUISITION IS PHYSICAL RESOURCES					
Acquisition of hardware	NR	NR	NR	57	74
Acquisition of software	NR	NR	NR	46	55
Acquisition of information	NR	NR	NR	53	28
MANAGEMENT OF SYSTEMS DEVELOPMENT					
Feasibility and justification	NR	NR	NR	35	49
Concept formulation and validation	NR	NR	NR	40	68
System life cycle process	21	15	50	9	57
Information requirements	NR	NR	NR	5	37
Prototyping	NR	NR	NR	35	85
Integration of systems	NR	NR	NR	14	33
Existing systems restructuring	NR	NR	NR	31	81
Project management	NR	NR	NR	11	24
Configuration management	NR	NR	NR	44	79
Systems implementation	NR	NR	NR	7	77
MANAGEMENT OF INFORMATION TECHNOLOGIES					
Management of computer centers	NR	NR	NR	85	83
Management of information centers	NR	58	NR	83	87
Management of data resources	48	19	27	20	35
Management of knowledge bases	NR	NR	NR	70	71
Management of office automation	64	53	81	76	96
Management of factory automation/robotics	NR	NR	17	90	100
Management of distributed systems	NR	NR	NR	59	44
Management of end-user computing	11	24	23	48	42
Integration of information technologies	16	34	39	19	7
Security	74	29	70	3	11
CONTROL AND EVALUATION OF IS					
Quality control	NR	NR	85	22	45
Audit	NR	NR	NR	79	66
Quality assurance	NR	43	NR	24	53
Maintenance	NR	NR	NR	55	98
Evaluation of IS performance	27	67	35	35	28
MANAGEMENT OF RESEARCH DEVELOPMENT					
New technologies	NR	NR	NR	81	40
Technological forecasting	NR	NR	NR	96	62
Research and develop. of info. services topic	NR	NR	NR	98	90
FINANCING OF INFORMATION SYSTEMS					
Budgeting	35	NR	77	74	18
Accountability of IS	NR	NR	NR	68	22

U= Undergraduate level (information systems managers)
G= Graduate level (information systems managers)
NR= indicates topics not ranked by the study.

Table 5: Percentile Rankings of Topics in Terms of Importance -A Comparison of Research Studies

and graduate programs in computer information systems and management information systems. The present curriculum guidelines developed by the DPMA and the ACM associations cover this emerging and fast changing sub-field of information resources management in an inadequate, and partial fashion. The DPMA association however, is in the process of updating its model curriculum.

The ACM recommendations for undergraduate and graduate programs on Information Systems (Nunamaker, Couger, and Gordon, 1982) do not make any reference to a specific course in IRM, although one can argue that some of its components are loosely covered in other courses. This lack of coverage is in part due to the fact that in 1982 when the last formal revision of the guidelines took place, IRM did not have the significance that it has reached today.

The latest official guideline of the DPMA, suggests an elective course in IRM (CIS -18), titled Information Resource Planning and Management (Data Processing Management Association, 1986). This course is designed to cover concepts about the constraints, and the methods appropriate to computer information systems planning within the corporate environment. It also deals with implications of running a computer information system department, including technical and managerial components. Although the course contents represent one of the best efforts to promote and guide the teaching of IRM, there are two major shortcomings. First, the course content is substantially outdated due to the important new development in the field within the last five years (i.e. increased importance of the information systems executive, end-user computing, information centers, new hardware and software technologies). Second, the topics proposed for coverage overemphasize all levels of organizational planning (as the title indicates), at the expense of other equally important organizational activities necessary to gain a well rounded knowledge about the management of information resources.

Some of the limitations of this course are being evaluated as the DPMA nears the completion of a model curriculum for the 1990s. In a draft document of this model, the CIS 18 course no

longer exists. Concepts advocated are now covered in a new course titled *Management of Information Systems/IS-9* (The DPMA Model Curriculum for a Four Year Undergraduate Degree, 1990). Although this course does not carry the "Information Resources Management" title in it, it is more relevant than the CIS-18 and in line with the objectives of IRM. Furthermore this is a core course as opposed to an elective, which CIS-18 is. It is interesting to observe that many of the topics suggested for this course were independently found in our study to be important to both educators and managers at the undergraduate level of study. These topics include among others; security, systems implementation, management of end-user computing, strategic value of information, organizational impact of the IS function, and project management. Likewise, the other topics found in this study to be important also deserve special attention in any course in IRM.

Summary and Conclusions

This article presents the results of a survey designed to discover the degree to which various IRM topics and categories of topics are considered important in an undergraduate and graduate courses in IRM. It is encouraging to learn that practitioners and academicians agreed on the ranking of many of the categories and topics, although in some instances a divergence in opinion was also evident. The consensus between the two groups was more evident at the graduate level than at the undergraduate level. In general, managers and educators agree on the importance of topics related to the categories of planning and organization for coverage in both undergraduate and graduate courses in IRM. Such topics include corporate planning of information systems, and the relationship of the information systems function with other organizational functions. In addition, they feel that topics related to development and control of information systems, such as information requirements definition, security, and systems implementation, should be emphasized at the undergraduate level. At the graduate level topics pertaining to the areas of staffing, management of

information technologies, research development, and financing of information systems are also of considerable importance and should be discussed in the classroom. Clearly, at the graduate level a broader coverage of topics is desired; ranging from the strategic value of information and knowledge, executive involvement and support, to accountability of information systems, and evaluation of information systems performance.

It is important for professionals directing information resources management curriculum development to be aware of the similarities and differences in the points of views held by the groups of information systems managers and their counterparts in academia. The educators teaching IRM concepts should pay particular attention to the areas where they strongly disagree with the managers. It is the academicians' responsibility as transmitter of the "the whole truth" to offer their students the views of both groups. In addition, this strategy will be beneficial in fostering classroom discussion and exchanging of ideas on conflicting topics among students, especially at the undergraduate level where major discrepancies between both groups were observed.

Additional information exchange in this area may be possible through conferences or symposium discussions where managers and educators can exchange ideas and methods and to focus more clearly on defining group differences regarding those topics where they disagreed the most. In such a setting both groups can interactively evaluate each groups' point of views. While there may be legitimate and long-lasting differences, explanation for the disagreements will hopefully lead to mutual understanding between the two groups.

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