Master's of Science Programs in Information Systems: Match Between the Model Curriculum and Existing Programs

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ABSTRACT

In a rapidly changing Information Systems (IS) field, the marketability of students from IS programs is partly related to the responsiveness of the programs to changing market conditions. Thus, curriculum development and periodic fine-tuning plays a very important role. This paper is an attempt to evaluate the current status of Master's of Science programs in IS and to study their fit with the recently proposed MSIS 2000 model curriculum. We studied 86 Master's of Science programs in IS and mapped them onto the proposed curriculum structure. Matches and mismatches with the proposed model curriculum are reported in our results. The results indicate the fit to be somewhat mixed. We have also presented some implications for university administrators and faculty for using the findings of this study and also for further curriculum research.

Keywords: MS in IS programs; IS curriculum; information systems.

1. INTRODUCTION

Today managers need to understand how information systems/technology (IS/IT) is changing their business and must ensure that their organization develops and uses IS capability effectively. Consequently they spend a lot of time trying to understand the implications of new technology. As the importance of IS/IT in the business world increases so does the importance of the IS graduates and IS curriculum. The importance of proper education of IS graduates is becoming more critical in the current environment of severe shortages of IS/IT professionals in the market. There has been an increasing demand for IS graduates who can meet the changing needs of the current digital economy. With the applications of IS/IT in organizations changing at Internet speed, IS curriculum needs frequent updating to remain effective.

The number of schools, in the US, offering Master's programs in IS has grown considerably from 34, about 20 years ago (Nunamaker, 1981), to currently over 100. There have been some studies and some curriculum proposals for graduate IS programs during the last 20

years. In one of the earliest studies, Nunamaker (1981) proposed a conceptual model for IS programs. Thirty four schools met the requirements of the proposed model. Nunamaker et al. (1982) presented the detailed recommendations to the Association of Computing Machinery (ACM) curriculum committee. Towell and Lauer (1995) analyzed catalogs of 55 Master's programs in IS and reported some summary findings regarding the structure of the programs. Maier and Gambill (1997) analyzed the catalogs of 85 Master's programs in IS and reported their findings on the structure of the programs. Gorgone and Kanabar (1997) reported on their study of catalogs of 55 Master's programs in IS. Their summary findings are quite detailed and also very useful to schools in making necessary changes to their own programs. However, in a rapidly changing field, the data and the reports are now dated and hence no longer useful.

Gorgone et al. (2000) proposed a model curriculum and guidelines for MS degree programs in IS based on a two-year study. The study was sponsored by the ACM and Association for Information Systems (AIS). The model curriculum was designed around a set of five building blocks: IS Foundation, Business Foundation, IS Core, Integration, and Career Tracks (please see Appendix A for a summary of the proposed model curriculum). This model curriculum was designed to serve as a set of standards upon which individual schools can base their curriculum.

From our discussion of prior studies on graduate IS curriculum, we can conclude the following: unlike the periodic and detailed studies of undergraduate curriculum in IS (Davis et al., 1997; Longenecker and Feistein, 1991a; Longenecker and Feistein, 1991b; Longenecker et al., 1995; Nunamaker et al., 1982), curriculum research on the Master's programs in IS have been less frequent and less coordinated (Gorgone and Kanabar, 1997; Gorgone et al., 1998; Gorgone et al., 2000; Maier and Gambill, 1997; Nunamaker, 1981; Nunamaker et al., 1982; Towell and Lauer, 1995).

In a field that is rapidly changing, we believe that it is critical for the schools offering Master's programs in IS to periodically evaluate their offerings and make necessary changes to meet the market conditions. It is also important for curriculum proposal development efforts to analyze the fit between their proposed curriculum and the curriculum in existing graduate programs, and then refine the curriculum proposal development efforts. Only then the curriculum continues to be useful in a rapidly changing IS environment.

In this study, we intend to fill part of the gap in prior research on graduate IS curriculum. We compare the structure and content of existing MSIS programs with that specified in the latest model curriculum proposed by Gorgone et al. (2000) to identify how well the reality fits the proposed model. From the results of this study, the schools that currently offer MS programs in IS, and those that are contemplating developing new programs, can benefit by comparing their program with that of other schools, study the differences and similarities, and make appropriate and timely adjustments.

In the rest of this paper, we will first present the methodology we adopted in gathering data and compiling the results. Then we will compare our findings of the current status of Master's of Science programs in IS with the model curriculum proposed recently by Gorgone et al. (2000). Matches and mismatches will be reported and implications of our findings will be discussed. We will conclude the paper with some implications and some future directions for this type of research.

2. METHODOLOGY

Our main objective in this research was to evaluate all MS programs in information systems in the United States and compare it with the curriculum model proposed by Gorgone et al. (2000) to determine the fit. We first identified Business schools, Arts and Science schools, and Engineering schools that were offering MS programs in information systems. We used several sources on the World Wide Web to identify these schools -- petersons.com, gradschools.com, bschool.com, and also Web sites of some individual schools. After identifying the schools, we visited the school's Web sites and searched for information related to their IS programs. For each program, we collected the following information: (1) where the program is housed, (2) the degree offered, (3) the credit system (semester/quarter or other), (4) number of credit hours for capstone course (if any), (5) total number of credit hours for prerequisite/foundation courses, (6) total number of credit hours for IS core courses, (7) total number of credit hours for elective courses, and (8) a list of foundation, core, and elective courses, and credit hours for each course. For schools where information on the program was not available on the Web, we sent e-mail messages to the respective graduate office requesting them to send us a graduate catalog. After eliminating MBA programs in IS and other programs with a minor in IS, we were able to compile information on 86 different schools which offered MS programs in

IS (please see Appendix B for a complete list of schools we identified as having MS program in IS). Gorgone et al. (2000) had a list of 90 schools in their study. Out of those 90 schools, we did not include information on 16 schools as their program did not fit very well with the definition of MS IS program. However, our data included 12 schools that were not on their list.

3. RESULTS

From the data we collected, we identified 123 different courses that were listed under IS/business foundations, IS core, or IS elective courses in the programs at the schools we included in our study. Names of many of the courses listed in the model curriculum were common names in most programs. However, whenever there was some variation of the name used in some schools, the two authors discussed the particular names and, by using their best judgment, matched it with the appropriate course in the model curriculum.

Summary information about the 86 schools with master's program in IS are presented in Tables 1 and 2. Table 1 identifies different names used by these schools for their MS programs. MS IS and MS MIS were the most common names used by schools for their programs with only 14% of schools using MS CIS. Table 2 identifies the location of the master's program in the schools studied. About 70% of these programs were located in Business schools and the remaining 30% were either in Arts and Science (8%) or in separate IS/IT schools (22%). Out of the 60 Business schools offering the MS programs in IS, only 40 (67%) are accredited by the American Assembly of Collegiate Schools of Business (AACSB).

Table 1. Degree Names Offered

Degree Names	Frequency	Percentage
MS IS	37	43%
MS MIS	37	43%
MS CIS	12	14%
Total	**86**	**100%**

Table 2. Where is the Degree Housed?

Location	Frequency	Percentage
Business School	60	70%
Arts and Sciences	7	8%
Separate IT/IS School	19	22%
Total	**86**	**100%**

Table 3 compares the credit hours recommended by the model curriculum for the set of five building blocks with that of the 86 schools studied. These results point out how well the current Master's of Science programs in IS in the US fit with the proposed model curriculum structure. In the table, we have presented (1) the credit hours (semester hours) required by the model curriculum for each of the five categories and the totals with and without foundation requirements, (2) the summary statistics (the average and the range) for the five categories for the eighty six schools studied and for the total credit hour requirements with and without the foundation requirements, and (3) the frequency distributions for five categories and the two totals. The summary statistics were computed for only those schools that had some requirements in that category (and hence the differences in the sample sizes in different categories in Table 3).

The total number of hours required (with foundations requirements) on an average by the 86 schools studied (i.e., the average of 48.4 hrs) matched well with the proposed model (48+ hours) with individual programs ranging from 30 hours to 99 hours. It is surprising that about 50% of the programs do not meet the requirements of the model curriculum (i.e., 48+ hours). The situation is much better with the totals without the foundation requirements – average number of total hours of about 34 hours (with the model curriculum at 30+ hours) and only 6% of the schools not meeting the requirements of the model curriculum (i.e., 30+ hours). Looking at the individual categories, the credit hours requirements are being met reasonably well by the actual programs in most categories with the only exception being the IS foundations. The schools that were studied were lacking in IS foundations. The proposed curriculum model recommended 9 – 12 hours for IS foundation courses, but the current IS programs required an average of 6.5 hours with about 42% of the schools not requiring any IS foundation courses and only about 8% of the schools meeting the requirements specified by the model curriculum. As far as IS core was concerned, the proposed model recommended 15 hours of IS courses, but the schools that were studied had an average of 24.07 hours ranging from 12 to 49 hours. This may mean that many schools may be including some foundation courses as core courses. Only 12 out of 86 schools indicated having a capstone course for an average of 4 credit hours. One possible explanation could be that the schools that have integration course may have listed such a course as a core course. This information could not be gathered from the program description. If the total credit hours for IS foundation, IS core, and integration are compared

between the model curriculum and the current programs, there seems to be a very good match. Overall, the current IS programs seems to be meeting the credit hours requirements as proposed by the model curriculum.

Table 4 compares the required courses, under IS foundations, IS core, and integration, between the proposed model curriculum and existing programs. As we can see from the table, there is a very little match between the two. From our survey, we found many Master's of Science programs use business courses for foundation and very few schools use IS courses for foundation. 36% of the existing programs used programming course as IS foundation whereas only 17% of the schools used Fundamentals of IS as a foundation course. A majority of existing programs have Data Management (72%) and Analysis and Design (80%) courses, as part of their IS core. Only 41% of the current MS programs have Data Communications and Networking as part of their core and a 34% Project and Change management. These four courses were the top four IS core courses among the 86 programs that were surveyed. The IT Policy and Strategy course was offered as part of IS core among only 13% of the schools. As we can see from the results in Table 4, on

Table 3. Credit Hours (Semester) Required -- Model versus Actual

Area	Model (Hours)	Actual [n=86] (Hours)				
		Summary				
		1. Average	Range	2. Credits	Frequency	(%)
2.1.1.1.1 IS Foundations	9 – 12	6.5	0 – 21	0	36	(42)
				1 – 3	19	(22)
		(Computed for n = 50)		4 – 9	24	(28)
				10 – 21	7	(8)
Business Foundations	9	14.1	0 – 33	0	22	(26)
				1 – 3	9	(10)
		(Computed for n = 64)		4 – 9	14	(16)
				10 – 15	15	(18)
				16 – 21	13	(15)
				≥ 22	13	(15)
IS Core	15	24.3	12 – 49	≤ 15	12	(14)
				16 – 21	33	(38)
				22 – 27	16	(19)
				28 – 33	11	(13)
				34 – 39	11	(13)
				≥ 40	3	(3)
Integration	3	4	0 – 9	0	74	(86)
				1 – 3	7	(8)
		(Computed for n = 12)		≥ 4	5	(6)
Career Electives	12+	11.9	0 – 21	0	15	(18)
				1 – 3	3	(3)
		(Computed for n = 71)		4 – 9	26	(30)
				10 – 15	30	(35)
				16 – 21	12	(14)
2.1.1.1.2 Total Hours (Without Foundations) 2.1.1.1.3	30+	34.1	18 - 64	≤ 27	5	(6)
				28 – 33	43	(50)
				34 – 39	30	(35)
				≥ 40	8	(9)
2.1.1.1.4 Total Hours (With Foundations) 2.1.1.1.5	48+	48.4	30 – 99	≤ 39	26	(30)
				40 – 45	16	(19)
				46 – 51	13	(15)
				52 – 57	14	(16)
				58 – 69	14	(16)
				≥ 70	3	(3)

Note: The summary statistics are reported only for those schools with some requirements in that category (and hence the differences in sample sizes). Percentages are rounded.

an average, those schools offering the courses in their program do seem to provide adequate coverage in terms of credit hours (the averages ranging from 2.85 to 4.40 semester hours).

In summary, the fit between the proposed model curriculum and the existing Master's of Science in IS program appears to be mixed – the IS programs appear to be meeting the overall credit hours requirements but the discrepancy in the actual required courses seems to be substantial.

Table 4. Required Courses (match with Model curriculum)

Area	Courses	Percentage of Programs Requiring (Average Hours)
IS Foundations	Fundamentals of IS	**17% (2.90)**
	IT Hardware and Software	**9% (3.00)**
	Programming, Data and Object Structures	**36% (4.40)**
IS Core	Data Management	**72% (3.05)**
	Analysis, Modeling, and Design	**80% (3.88)**
	Data Communications and Networking	**41% (3.07)**
	Project and Change Management	**34% (2.85)**
	IT Policy and Strategy	**13% (3.00)**
Integration		**14% (4.00)***

*** The numbers in the parentheses are the average number of semester hours**

4. IMPLICATIONS

Any curriculum proposal, whether graduate or undergraduate, is considered useful if it is followed by a majority of the schools offering the programs. In a rapidly changing field, such as IS, the schools offering the programs in IS have a significant responsibility of keeping the curriculum in the programs current and market relevant and any proposed curriculum model should assist the schools in doing that. Thus the fit between proposed model(s) and structure and content of existing programs becomes a critical measure of how well the model is assisting the schools. In our research we have reported some findings regarding MS programs in IS that indicate the fit to be somewhat mixed. The results have implications for schools and also for curriculum model development.

The schools that currently offer MS programs can compare the structure and content of their program with the model and also with findings about other schools and identify similarities and differences. Specifically, findings reported in Tables 3 and 4 would help schools in a clear understanding of similarities and differences. Then they can examine the differences to see whether they make sense in their context and if it is necessary to modify their curriculum to better meet the market conditions. It is important to note that some curriculum requirements in schools may very well be (local) context specific and hence some differences in curriculum are to be expected. However, too much context specific course work could make their degrees less generalizable thus limiting the marketability of the graduates outside the local area. A similar analysis would be useful for schools that are considering new master's programs in IS in order for them to design a curriculum that meets the needs of their potential graduates.

The findings may also provide ammunition for faculty and administrators in convincing others involved in the program to make changes. These changes could be due to the credit hour requirements or changes involving inclusion/exclusion of specific courses. For example, a school that has a heavier requirement in terms of credit hours could lose its customers to its competition that may have a lighter requirement. The results of the study will help the former school to make a proper

justification for refocusing their program.

5. AREAS FOR FUTURE RESEARCH

As we noted earlier, it is important for researchers to assess the fit on a periodic basis and make adjustments to proposed models. Otherwise, the models become dated and will be less and less relevant in the marketplace. In addition, it is also important to disseminate the research results in a timely manner as otherwise the results are likely to become obsolete, particularly in a rapidly changing field like IS.

As a first step, it is important for researchers to study the differences in the required course structure between the model and existing programs. It is important to know whether the programs have mechanisms in place to insure the students in the program get the required IS foundations before they get into more advanced courses in the IS core.

It is also important to replicate this type of study on a periodic basis so that newer programs will have a chance of being considered in the study. This will make the results current and will help all the schools stay current in their curriculum development efforts.

6. CONCLUSIONS

In a rapidly changing field like IS, it is important that curriculum development be dynamic in order for curriculum models to be useful for schools to fine tune their IS programs. It is also important for curriculum developers to understand how well the proposed curriculum models fit reality (i.e., structure and content of existing programs), understand the deviations from the model, and redesign new curriculum guidelines to suit the changing needs of the marketplace. This study is a first step in assessing the fit between the latest model curriculum and existing Master's of Science programs in IS. The results regarding the fit are mixed – the credit hour requirements seems to be met by a majority of the existing programs but there is considerable deviation in the required courses. The results of this study are useful for schools in designing or redesigning their IS programs. More timely research is needed to get a better understanding of the deviation uncovered in this study and to assess whether any changes to the guidelines are necessary. In addition, it is also important that research results be disseminated in a timely manner to assist schools with their efforts to keep their IS curriculum current and market relevant.

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Appendix A

Model Curriculum

IS Foundations	Fundamentals of IS	Pre-/Co- requisites
	IT Hardware and Software	
	Programming, Data and Object Structures	9 – 12 Units
Business Foundations	Financial Accounting	Pre-/Co- requisites
	Marketing	
	Organizational Behavior	9 Units
IS Core	Data Management	Required
	Analysis, Modeling and Design	15 Units
	Data Communication and Networking	
	Project & Change Management	
	IT Policy and Strategy	
	1.1.1.1.1 Integration	3 Units
Career Elective		12 Units

Appendix B

List of US Schools with Masters of Science Programs in Information Systems

Auburn University
Baylor University (Texas)
Benedictine University (Illinois)
Bentley College
Boise State University (Idaho)
Boston University
Brigham Young University
Brooklyn College (NY)
California State University, LA
California State University, Sacramento
Case Western Reserve University
Central Michigan University
City University of New York
Claremont Graduate University
Colorado State University
Creighton University
DePaul University
Drexel University
Duquesne University
Eastern Michigan University
Ferris State University
Florida Gulf Coast University
Florida International University
Florida State University
Friends University
George Mason University
Georgia College and State University
Georgia State University
Golden Gate University
Hawaii Pacific University
Illinois Benedictine College
Indiana University
John Hopkins University
Kean College (New Jersey)
Keller Graduate School of Management
Kennesaw State University
Knowledge Systems Institute (IL)
Lawrence Technological University
Loyola University, Chicago
Marist College
Mary Wood University (PA)
Middle Tennessee State University
Mississippi State University
New Jersey Institute of Technology
New York University (Stern)
Northern Illinois University
Nova Southeastern University
Pace University
Penn State Great Valley
Penn State Harrisburg
Regis University
Robert Morris College
Roosevelt University
Seattle Pacific University
Southwest Missouri State University
Stevens Institute of Technology
Strayer College (Washington D.C.)
Texas A&M International University
Texas A&M University
Texas Tech University
University of Arizona
University of Arkansas
University of Baltimore
University of Colorado at Denver
University of Denver
University of Detroit Mercy (Michigan)
University of Illinois at Springfield
University of Illinois of Chicago
University of Maryland
University of Maryland, Baltimore
University of Memphis
University of Miami
University of Missouri, St. Louis
University of North Texas
University of Pittsburgh
University of South Alabama
University of South Florida
University of Texas, Arlington
University of Texas, Dallas
University of Virginia
University of Wisconsin (Madison)
University of Wisconsin (Milwaukee)
University of Wisconsin, Oshkosh
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