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PROGRAM DIRECTORS' PERSPECTIVES ON MSIS OUTCOME EXPECTATIONS AND FUTURE DIRECTIONS

Heikki Topi
Bentley University, htopi@bentley.edu

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Heikki Topi
Department of Computer Information Systems
Bentley University
htopi@bentley.edu

Abstract

This paper reports the results of a summer 2014 survey of MSIS program directors. The results are intended to serve the MSIS revision process, but they will also provide insights regarding the current status and future direction of MSIS degree programs for faculty members and administrators interested in the state of graduate education in IS. The results are well-aligned with the recent popularity of graduate programs focused on data and analytics, but at the same time, they indicate that program directors still consider traditional core IS topics (such as systems analysis and design) to be very important. The revision process should carefully address the impact of the capabilities of the students entering the master's programs on program outcomes and the effects of popular highly focused program versions, such as those emphasizing analytics and security.

Keywords: student outcomes, graduate education, MSIS, model curriculum

I. INTRODUCTION

After a comprehensive initial review, ACM and AIS have jointly decided to launch a process to revise MSIS 2006 [Gorgone et al., 2006], the master's level curriculum recommendation for Information Systems. The co-chairs of the task force have been selected and at the time of writing this paper, the process of identifying the rest of the members of the task force is in progress. The joint task force will start its work in fall 2014, and the project will last for about two years.

This paper describes and discusses partial results of a survey that was conducted as a background data collection effort to provide the task force and the IS community as a whole with initial perspectives on the revision needs and the direction that the revision process should take. It was targeted to MSIS program directors and other administrators responsible for these programs. The survey was intended to cover a global audience, but because of the low non-U.S. response rates by the time of the conference deadline, this paper reports only the U.S. results.

After describing the background and the project context, the paper will briefly review the survey instrument and the data collection process. The main part of the paper focuses on an integrated summary and discussion of the survey results.

II. BACKGROUND AND PROJECT CONTEXT

The IS community has discussed the need for and the potential characteristics of an MSIS revision for several years [Topi et al., 2011; Topi et al., 2014; Yang, 2012]. In late 2013, AIS and ACM jointly decided, based on a recommendation of a review task force [Topi et al., 2013], to launch a process to conduct a comprehensive review and revision of the master's level curriculum recommendation in Information Systems. Two co-chairs (one representing AIS and the other ACM) will lead the project, and the task force will have three other members representing each organization. As described above, the full task force will be in place and launch the full project in fall 2014.

To provide the revision project a head start, a survey was conducted in spring/summer 2014 to learn about the perceptions of MSIS program directors regarding their use of MSIS 2006, the relative importance of various MSIS graduate capabilities, the required changes to MSIS 2006, and the general future direction of master's programs in IS. The survey was intended for both U.S. and global audiences, and the work to reach both groups continues. A low number of non-U.S. responses at the time of the conference deadline led to the decision to include only U.S. responses in this survey; global results will be reported later.

It is important to emphasize that the survey reported in this paper targeted only a small and selective, although a very important, target audience: the administrators (mostly program directors) responsible for existing MSIS and other master's level IS programs. The project's intent is to reach out to many other stakeholder groups during the revision process, including IS faculty at large, employers hiring MSIS graduates, current MSIS students and MSIS alumni.

III. AREAS OF INTEREST AND INSTRUMENT

The survey was designed to address four areas of interest:

- Use and role of MSIS 2006: with this set of questions, the intent was to gauge the respondents' perceptions regarding the ways in which MSIS 2006 was used to support and guide local curriculum development efforts and the importance of MSIS 2006.
- Graduate capabilities: Using the distinction specified in IS 2010 [Topi et al., 2010], the survey explored the respondents' views regarding both the high-level capabilities and the IS specific knowledge and skills (both managerial and technical) that the MSIS graduates are expected to have.
- Suggested changes to the revised curriculum, and
- General long-term future direction of MSIS programs.

The use and role of MSIS 2006 was explored both quantitatively with 10 survey items developed specifically for this survey (see Table 1 below) and an open-ended question that asked for the respondents' views regarding the use of the previous curriculum.

Expected graduate capabilities were also analyzed both with quantitative instruments and open-ended questions. The high-level graduate capabilities that were analyzed with the first quantitative instrument (see Table 2 below) were adapted from IS 2010 (and had also later been used in [Mandviwalla et al., 2013]). They were categorized into high-level IS capabilities, foundational capabilities, and domain fundamentals. The items to rate the importance of technical and managerial knowledge and skills (Tables 3 and 4 below) were based on an earlier survey conducted in the context of the preliminary review of MSIS 2006 [Topi et al., 2013], extended with new items that had been highlighted as missing in the prior survey. The rating scaled used in this context was from 0 to 100; the respondents made their choice with a slide control.

The questions regarding suggested changes to the revised curriculum and the general long-term future direction of MSIS programs were open-ended, and they asked for a free-text qualitative response.

In addition, the survey included typical demographic questions regarding the respondents, programs and universities. The complete survey is available from the authors per request.

IV. DATA COLLECTION

As discussed above, the population for the study reported here consisted of directors of 115 U.S. master's programs in Information Systems or a related field (or other administrators responsible for the programs). The programs chosen for this study included a union of the programs identified in the preliminary review [Topi et al., 2013] and programs included in [Yang, 2012]. In the data collection process, both web resources and personal contacts with university officials were used to verify the identity of the director of each of the programs. Each individual survey recipient

received two personalized e-mails in two week intervals asking for a response. Using this process, we were able to collect 44 completed responses leading to a 38.3% response rate.

V. RESULTS

Respondents and represented programs

Of the total respondents, 34 (78%) were master's program directors, 8 (18%) department chairs, and 2 (4%) others. 23 (56%) of them represented doctorate-granting institutions, and 18 (44%) master's colleges or universities (3 did not indicate the institution type). 34 (78%) of the programs were in business schools and 5 (11%) in schools of information or informatics. Two were either fully or partially associated with a CS department. The programs that the respondents represented had on average 94 full-time and 60 part-time students. The program sizes did, however, vary significantly – the total number of students in the smallest program was 12 and the largest program 900. The respondents' average estimate for the percentage of pre-experience students was 36%, post-experience 47%, executive 14% and others 3%. The departments responsible for the programs had on average 9 full-time and 7 part-time faculty members.

It is also important to understand how familiar the respondents are with the MSIS 2006 model curriculum, given that many of the questions included in the survey referred to it. 12 (27%) of the respondents indicated that they are very familiar with the current MSIS model curriculum, 14 (32%) familiar, 15 (34%) somewhat familiar, one (2%) was remotely familiar and two (5%) were not aware of MSIS 2006 before this survey. The last two respondents were not asked to answer questions regarding MSIS 2006.

Use and Importance of MSIS 2006

The survey asked 10 specific questions regarding the respondents' views regarding MSIS 2006. These questions and the distribution of the answers are included in Table 1 (the questions were presented to the respondents in a random order).

Table 1. Respondents Views Regarding Use and Importance of MSIS 2006

Question	SD	D	SW	A	SA	Mean
MSIS 2006 was a source of ideas for our curriculum development work.	1	6	14	14	7	3.48
We used MSIS 2006 to support our master's level curriculum development work.	2	10	11	12	7	3.29
Our master's curriculum is directly based on MSIS 2006.	7	13	10	9	3	2.71
Significant elements of our master's curriculum were informed by MSIS 2006.	4	8	10	14	6	3.24
I found MSIS 2006 to be a valuable resource in our master's level curriculum development work.	1	8	13	12	8	3.43
MSIS 2006 constrained our thinking regarding our own master's level curriculum.	12	24	3	2	1	1.95
In general, MSIS 2006 has helped define the identity of master's degrees in IS.	0	8	15	12	7	3.43
We would have wanted to use MSIS 2006 in our master's level curriculum development work but	13	20	5	4	0	2.00
In general, MSIS 2006 has been helpful for the IS community.	1	2	12	20	7	3.71
Overall, the IS community has benefited from MSIS 2006.	0	3	13	18	8	3.74

SD = strongly disagree, D = disagree, SW = somewhat agree, A = agree, and SA = strongly agree

Based on this data, we can make three general observations:

- Overall, the respondents believe that the IS community has benefited from MSIS 2006. At least to a certain extent, the curriculum has helped to define the identity of master's degrees in IS.
- About 80% of the programs indicate that MSIS was a source of ideas for their own curriculum development work. Only a slightly lower percentage of the respondents at least somewhat agree with the statement that MSIS was a valuable resource for them.
- About half of the responding programs either agree or strongly agree with statements indicating a strong linkage between their master's curriculum and MSIS 2006. Only about a quarter of the schools indicate, however, that their program is **directly** based on the model curriculum.

Overall, many schools have used MSIS 2006 as a resource; most of them have used it as a source of inspiration and ideas, which they have then applied to their own context. This is, of course, fully compatible with the general philosophy underlying the model curriculum development.

The survey gave the respondents several opportunities to give qualitative feedback regarding various aspects of the MSIS degree. The purpose of the open-ended questions was to give the experienced faculty members providing the answers a chance to comment more broadly than the quantitative instruments allowed them to do and to ensure that the survey will take the process forward by addressing possible omissions.

The first of the open-ended questions asked the respondents to provide their views regarding the value of the MSIS 2006 curriculum recommendation. Overall, the responses indicated a high level of satisfaction with the document, at least initially, but many of the respondents confirmed that it is time for the MSIS curriculum to be updated. The general sentiment was that the interval for the updates should be closer to five than 10 years. In the same way as other model curricula, MSIS 2006 has served as a starting point for many internal curriculum development efforts and also as a validation mechanism in the context of local conversations and accreditation processes.

A more specific question regarding the ways in which MSIS 2006 has been used suggests that the curriculum has been used widely as a source of ideas and inspiration instead of a set of constraints. "Benchmark" and "yardstick" were often used to describe the role of the model curriculum. It appears that a common model is to form the core of the program based on a widely accepted curriculum recommendation and then use locally appropriate tracks to ensure that the program's local needs are met.

High-level capabilities

As discussed above, the survey separated high-level graduate capabilities from specific knowledge and skill learning objectives. The respondents were presented a list of high-level capabilities and they were asked to use a slider to indicate the relative importance of each of the items. Table 2 below summarizes the results.

Respondents identified the only high-level category associated with information resources (Understanding and Addressing Information Requirements) as the most important high-level capability. As some respondents indicated in the qualitative comments, this category should be clarified so that it specifically includes analytics-related capabilities. It is interesting that the two items identified as the two next most important ones are foundational skills (Analytical and Critical Thinking; Written and Oral Communication). After that, IT risk and security management follow, and only after those two, the other traditional core capabilities developed by an MSIS program are featured: process development, evaluation and sourcing of alternatives, and exploitation of business opportunities created by technology innovations. The respondents did not consider mathematical foundations particularly important, which is interesting given how important a strong mathematical background is in degree programs related to analytics.

TABLE 2. Relative Ratings of High-Level Graduate Capabilities				
	Min	**Max**	**Avg**	**SD**
Understanding and Addressing Information Requirements	30	100	85.3	15.1
Analytical and Critical Thinking, including Creativity and Ethical Analysis	8	100	82.1	21.4
Written and Oral Communication	20	100	80.3	21.3
Understanding, Managing, and Controlling IT Risks	20	100	79.1	20.6
Securing Data and Infrastructure	30	100	77.8	18.2
Improving Organizational Processes	19	100	75.5	24.6
Identifying and Evaluating Solution and Sourcing Alternatives	20	100	72.8	21.6
Exploiting Opportunities Created by Technology Innovations	18	100	72.7	21.7
Designing and Managing Enterprise Architecture	19	100	69.7	22.9
Evaluation of Business Performance	16	100	66.1	24.0
Leadership and Collaboration	11	100	64.5	24.0
Business Functions	8	100	60.3	22.6
General Models of Business	11	100	56.4	25.7
Negotiation	4	91	49.2	24.9
Mathematical Foundations	5	81	42.8	25.8

In addition to the quantitative responses, many participants answered the open-ended question regarding high-level capabilities that were missing from the instrument. These comments provide important material for the MSIS revision process when it considers the general goals that the new MSIS will set regarding the capabilities that the students should achieve. The most common set of new high-level capabilities identified in the qualitative comments was related to analytics. Given the recent very strong emphasis on analytics and big data [Watson, 2013] and the movement of graduate level IS programs in the direction of analytics, it is essential that this particular capability set is expressed separately from its uses (such as Evaluation of Business Performance) or components (Understanding and Addressing Information Requirements, Analytical and Critical Thinking, and Mathematical Foundations) In addition, it is clear that the current categories do not at all address the more advanced forms of analytics (such as predictive or prescriptive analytics) or the use of analytics results in decision making. One of the respondents provided a useful reminder regarding the role of IS as a practical, applied discipline. The capabilities that the students will be working towards are not purely conceptual; instead, they are meaningful only if they will lead to beneficial organizational changes. In the current capability set Ethics is presented together with Critical and Analytical Thinking; at least one respondent suggests that it should be included as an independent unit. Several respondents mentioned Project Management in this context; as we will discuss later, it is very important topic area, but it is more a specific skill than a high-level capability.

Technical Skills and Knowledge

Table 3 presents the quantitative results of the survey component on the importance of graduates' expected technical skills and knowledge.

The most interesting finding in these results is the dominance of traditional core IS topics and particularly data management in the results. Of the top 10 items six are related to data and information management; in addition, Systems Analysis and Design holds the first place. Cloud Computing and big data have made it close to the top, but still are not among the most important ones. Topics related to various types of application development are systematically ranked close to the bottom of the list. It was surprising that general problem solving skills using computational and algorithmic thinking were perceived to be relatively low in importance.

TABLE 3. Relative ratings of importance for technical skills and knowledge

	Min	Max	Avg	SD
Systems Analysis and Design	0	100	80.8	22.1
Business Intelligence (including data warehousing and data mining)	21	100	79.6	18.7
Data Analytics	8	100	76.2	21.0
SQL	7	100	73	25.5
Conceptual Data Modeling	0	100	69.6	24.1
Logical Database Design and Normalization	0	100	68.7	25.2
Cloud Computing	11	100	68.5	20.6
Technical Security Management	13	100	68.2	24.7
Big Data Technologies, including Hadoop	8	100	66.1	22.6
Configuration of Enterprise Systems	9	100	65.8	22.2
Database Administration	1	100	65.5	27.4
User Experience Design	1	100	63.1	26.9
Testing and Quality Assurance	10	100	61.7	23.7
Web Development (using tools such as HTML5, JavaScript, and PHP)	10	100	60.9	25.3
Mobile Application Development	9	100	60.2	26.6
Solving Problems Using Computational and Algorithmic Thinking	1	100	56.1	28.6
Application Development (using a language such as Java, C++ or C#)	0	100	55.3	30.3
Version Control	3	100	51.6	27.5

The respondents were also given an opportunity to express their opinions regarding potentially missing technical skills and knowledge areas. Based on the responses, it appears that the original list was relatively comprehensive. Specific suggestions for additions included cyber security (included in Technical Security Management), cloud computing and provisioning (included in the original list), and data visualization. Several respondents did, however, make the comment that many of the technical skills and knowledge items should be prerequisites for a master's program instead of specific learning objectives for the program itself. The items specifically identified to belong to this category were conceptual data modeling, logical database design and normalization, systems analysis and design, and application development. This observation points to an important question relevant for all master's programs and particularly important for ones in computing in general [Cassel et al., 2012] and Information Systems in specific [Topi et al., 2011]

Managerial Skills and Knowledge

Table 4 presents the quantitative results of the survey component on the importance of graduates' expected managerial skills and knowledge. Interestingly, the respondents perceived IT project management to be the single most important skill and knowledge area even when both technical and managerial skills and knowledge are included. It had by far the highest minimum evaluation and lowest standard deviation, too. The leadership or the top master's programs in IS clearly was unanimous about the importance of IT project management. IT strategy, business process modeling, IT governance, and security policy management round up the top five of the managerial skills and knowledge areas; IT strategy clearly rated to be more important than the other three. In contrast with their visible role in recent discussions, enterprise architecture, IT management frameworks, and IT sourcing and procurement hold three of the four lowest spots in

TABLE 4. Relative ratings of importance for managerial skills and knowledge				
	Min	**Max**	**Avg**	**SD**
Managing IT Projects	49	100	85.0	13.7
Development and Management of IT Strategy	30	100	79.5	19.3
Business Process Modeling	20	100	73.8	21.6
IT Governance	9	100	73.6	23.9
Security Policy Management	20	100	73.6	21.9
Managing IT Professionals	19	100	68.9	25.4
Enterprise Architecture Development	15	100	66.2	22.5
Ensuring Business Continuity	19	100	66.1	23.4
Application of IT Management Frameworks (ITIL, COBIT, etc.)	11	100	64.5	23.4
IT Sourcing and Procurement	10	100	62.8	25.6

the ratings, clearly below those evaluated to be the most important ones. It is noteworthy, however, that all items here received higher average ratings than the six lowest rated items on the technical skills and knowledge topics list.

In the same way as with the technical skills, the respondents were asked to comment on the selection of managerial skills and knowledge topics included in the quantitative survey and suggest missing items. Compared to the technical, there were slightly more topics suggested to be added to the list, most of them related to the fact that the survey focused on skills and knowledge in IS/IT management instead of general business. Thus, respondents pointed out the need to ensure that the curriculum ensures a sufficient coverage of business and organizational topics in addition to those related to IS/IT. Three specific suggestions related to the IS profession were Service Level Management, Team Management, and Accounting for MIS (e.g., for comparing project alternatives).

Suggested changes to be included in the revised MSIS curriculum

The respondents provided a wealth of suggestions when asked about the changes they wanted to see in the revised MSIS curriculum. Some of the items are, understandably, mutually conflicting, but the material is highly valuable for the review process because it identifies and emphasizes issues that need to be addressed. The topics included the following:

- There is a clear need to define the space in which the MSIS graduates will excel compared to the other computing disciplines. CS graduates are experts in designing and building systems and IT graduates focus on providing operational and maintenance support. What is the specific capability set that IS graduates should have? Do we have a joint understanding of the core of master's programs in IS? This topic has been discussed, for example, in recent articles in CAIS [Topi et al., 2011; Topi et al., 2014] but still, the curriculum revision process will have to start by making a specific case for the continued importance of the MSIS degree and its role in the context of other computing degree programs.
- One specific danger that a respondent identified was that a prescriptive model curriculum could lead to a set of cookie cutter programs that all resemble each other. It is essential to emphasize the role of the curriculum recommendations as a starting point, a source of inspiration and ideas, and documentation of best practices instead of a prescriptive model that needs to be followed as such.
- The respondents particularly emphasized the importance and role of applied, hands-on work with information technology, specifically work related to the development of systems. Without it, the students will not sufficiently understand the nature of systems development to become competent IT managers. The respondents also emphasized the fact that the purpose of hands-on work in a master's curriculum is not primarily to

train developers but to improve the graduates' deep understanding of technology and the complexities of development work.

- There were a number of comments regarding specific technical topics that should be included in the curriculum. Some of these have already been discussed above in the context of technical and managerial skills and competencies, including cloud architectures, data management and (business) analytics, project management, and SQL. The comments brought out others, too, including design thinking, enterprise systems, in-depth understanding of IT-related risks, mobile technology and infrastructure, software engineering, and using data to improve decision making. An important insightful comment was that understanding risks at a deep level requires that students acquire an integrated perspective of issues related to system configuration, network communication, enterprise architecture, and the cloud.
- A very important point was made by a respondent who emphasized the importance of continuous learning and the need to learn how to learn; an IS professional cannot succeed long-term if they don't have the skills to experiment with emerging technologies and quickly understand the benefits that can be gained from them.
- One respondent made a strong case for a specific set of non-technical topics, including a stronger and more comprehensive focus on application of ethical principles to managerial decision making, non-technical aspects of modern IS/IT management (including integration of IS models and practices with business models, and better financial capabilities and ability to demonstrate the value of IS. Another pointed out that the technical skills required for IS/IT work are becoming more varied and more diverse over time, which has an impact on the required agility of IS management skills.
- It is critically important to find a good balance between technical (CS-IT) and business / management skills [Simon et al., 2007]. One suggestion recommended that the curriculum specify the minimum number of business / management courses/topics in the program. This, of course, raises a question: could the number of business courses be zero and the program still be considered an MSIS program? Should the domain always be business? Some respondents specifically emphasized the importance of recognizing the fact that we are an applied business discipline. On the other hand, IS 2010 [Topi et al., 2010] at the undergraduate level emphasizes the importance of allowing for multiple and diverse domains – our disciplinary competencies can be applied to a number of disciplines. This is an issue that the revised MSIS has to address: is the domain of practice associated with these programs limited to business or are others acceptable?
- An issue identified by multiple respondents were the program tracks. Among this group, the consensus appeared to be that tracks are important as a mechanism that allows the students to gain an area of specialization and gives the programs opportunities to address local needs and differentiate themselves from other MSIS programs.
- One very important issue that was raised also in the context of this conversation were the *prerequisites* and the *required background* at the time when the students enter the program. There are two separate questions: 1) How much work experience and 2) what disciplinary background(s) should an MSIS program require? One of the challenges in articulating a joint identity for MSIS programs is that some of them are targeted for pre-experience students (those with 0-3 years of work experience) and others are intended for students with much more experience (at least 5-7 years). One respondent suggested that there could be two types of MS programs in IS: 1) a technology-focused curriculum for MS students with less than three years of work experience; 2) a project and technology management –focused curriculum for those with 5+ years of experience. As for the disciplinary background, it is vitally important to specify whether or not MSIS programs should expect the students to have an undergraduate background in IS technology (typically at least data management, systems analysis and design, and IT infrastructure) and/or core domain of practice topics (in most cases business subjects, including accounting, finance, marketing, and

operations management). Addressing this question is essential because the answer will have a clear impact on the competency level that the graduates will be able to achieve. If a ten-course master's program will have to cover foundational topics in IS, it simply cannot take the students very far in their technical understanding, particularly if the program wants to include a cohesive, integrated module in the domain of practice. The MSIS revision process should specifically address questions regarding the required technical background, background in the domain of practice, and work experience. [Topi et al., 2011] discussed this issue in relation to the recently released master's level curriculum in Software Engineering, expressing a concern regarding perceived and real challenge level differences between software engineering and IS curricula.

In total, the respondents provided valuable feedback that will be highly useful in guiding agenda setting for the MSIS revision process.

Future of master's level degree programs in IS

The final open-ended question in the survey addressed participants' perceptions regarding the future of master's level degree programs in Information Systems. The intent of this question was to gain a broader perspective than a discussion related specifically to the curriculum gives. An integrated summary of the respondents' views regarding the future of the MSIS degree follows:

- Several respondents discussed the ongoing dilemma related to the choice between a technical and managerial focus. Most of them were advocates for a more technical orientation, including one who specifically reported "increasing demand in graduates with better IT/CS professional (updated) skills in Network/Computer Security, Database Development and Maintenance, Data Mining, Cloud Computing, E-commerce, etc." and another whose list of current and future areas of focus included security, cloud-based applications, enterprise architecture, software engineering concepts (including testing, versioning, etc.), agile development and project management, communication skills, and working in teams. The increasing importance of system integration was also identified. Another respondent suggested that both employers and students will be likely to ask for hard skills. These same respondents did, however, bring up the need to integrate the technical knowledge (and an in-depth specialty) with domain (primarily business) knowledge. A related insight regarding the future was the ever-increasing rate of technical change that the graduates have to learn to deal with, thus emphasizing lifelong learning.
- One respondent made an interesting comment regarding the role of modeling in the curriculum, suggesting that the programs will move away from in-depth modeling towards a stronger focus on configuration, probably referring to the dramatic increase in the use of enterprise systems and other packaged solutions.
- Partially because of the emphasis on the technical skills, there continues to be a need to revise master's curricula frequently (one example included in the responses was a three-year revision cycle). This will, in turn, lead to the need to update the curriculum recommendations more frequently than the current ten-year cycle.
- Other respondents pointed out soft skills that are likely to increase in importance, including communication skills that were mentioned several times and at least once mentioned as the "number one" skill area.
- The role and importance of analytics was clearly visible also in this context, to the extent that the MSIS revision process will have to explicitly take a position regarding the question of whether programs in business analytics should be primarily considered extensions or types of MSIS or separate degrees. Given the institutional politics related to practical implementation approaches, the curriculum recommendation has, of course, no power regarding this issue but it is important to identify explicitly how the review process will address this issue.
- One respondent predicted that the number of on-line (distance) students is going to (continue to) increase. Many of these students are more mature professionals than

recent undergraduates. If this is, indeed, an ongoing trend, it will in many local contexts have a major impact on the characteristics of the program.

- It was also predicted that the importance of alignment and integration with industry needs will continue to increase. The connection with the industry is also very important for the curriculum recommendation processes.
- A very optimistic perspective was conveyed by a respondent whose student had viewed MS in MIS as the "new MBA." Whether or not this will happen in practice is an empirical question, but the sentiment underlying it is clear: so many essential elements of business depend on effective computing infrastructures, algorithms, and data storage platforms that the hallmark of MSIS programs, an in-depth integrated understanding of business and technology, should continue to increase in importance.
- Some respondents commented on the selection between the various MSIS program models discussed above (fifth-year, experienced professional, career changer). For example, one observer saw MSIS programs growing into an extension of an undergraduate MIS program (fifth-year model).
- Finally, also this question brought out questions regarding the identity of the MSIS degree and more specifically the identity crisis that the MSIS appears to be suffering from. The current MSIS review process and any subsequent similar processes should serve the process by articulating the intended MSIS identity clearly (see also [Sidorova and Harden, 2012]). Afterwards, it is essential that we as a community use the results of the revision process to communicate effectively what the MSIS is and how the graduates of an MSIS program can serve in various organizational roles.

VI. DISCUSSION

This MSIS program director survey clearly supports the decision to review and revise MSIS 2006. The faculty members responsible for graduate programs in IS believe that a curriculum recommendation can serve multiple useful roles, particularly if it is up to date. According to the respondents, model curricula are primarily used as a foundation and a source of ideas, not as a strict guideline.

This survey focused primarily on the expectations set for graduates, both in terms of their high-level capabilities and specific technical and managerial knowledge and skills. Both in the evaluation of high-level capabilities and technical skills, the importance of data and information management and analytics that builds on data management capabilities (including big data) was emphasized strongly. Analytical and critical thinking and communication capabilities were considered almost equally important as data management capabilities. As specific skills, the respondents considered project management and systems analysis and design particularly significant (together with the data management / analytics skills). Overall, what program directors consider core elements of a master's degree program in IS appear to be quite stable. Compared to MSIS 2006, the most significant finding is the importance of data management and analytics skills – MSIS 2006 had reduced the role of this area quite significantly in its coverage.

At the same time, the qualitative responses provided important insights regarding areas that technology development has brought to the center of the curriculum, including cloud architectures, design thinking, enterprise systems, in-depth understanding of IT-related risks, and mobile technology and infrastructure. The revision process will have to carefully consider the right balance between the traditional MSIS core topics and the concepts that reflect the radically transformed technology capabilities.

There are at least two important points that have to be considered when interpreting these results: first, program directors are only one of many important stakeholder groups. Particularly important will be to learn about the views of the employers who are hiring MSIS graduates, but also alumni and students will be excellent sources of information and insights. Getting a strong industry perspective is essential even if it didn't ultimately determine all major decisions. Second, the level of granularity of the survey was (intentionally) quite high. Therefore, many of the major questions regarding the more detailed type of capabilities were not addressed. For example,

"Systems Analysis and Design" as a knowledge and skill topic does not say anything about the types of knowledge and skills the students should gain within this topic area; general understanding of the topic area suggests that the focus should be shifting towards agile methods [Satzinger et al., 2007], but this particular survey did not provide any specific guidance regarding these important choices.

The survey identified three different possible program types with different expectations regarding program outcomes and learning objectives:

- Programs that follow a fifth-year model based on an undergraduate degree in Information Systems; these programs are typically offered to full-time students.
- Programs targeted to experienced professionals with both a technical undergraduate degree (CS, IS, engineering) and 5+ years of work experience
- Programs targeted to career changers with no prior background in information systems.

It is clear that the outcome expectations regarding graduate capabilities cannot be the same given the widely different starting capabilities of the students. The revised curriculum recommendation should explicitly address this issue.

Finally, the survey pointed out an issue that even a cursory review of program curricula reveals: any master's level curriculum revision will have to address the relationship between traditional general purpose MSIS programs and those strongly focused on a specific track, particularly in areas such as analytics or security. The latter have become very popular, potentially already dominating the general model.

VII. CONCLUSION

This paper reports the results of a survey targeted to MSIS program directors and intended to gain an understanding of this expert population's views of MSIS target graduate capabilities and changes that the upcoming revision of the MSIS model curriculum should implement. The survey results provide a rich set of suggestions for the revision process to consider, particularly emphasizing the role of data management and analytics. The revision will have to specifically address the question regarding students' capabilities at the time when they enter the program and their impact on realistic outcome expectations. In addition, the survey also supported the need to clarify the difference between traditional programs with a more general focus and those with track specializations in areas such as analytics or security.

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ABOUT THE AUTHOR

Heikki Topi is Professor of Computer Information Systems at Bentley University. His teaching interests cover a range of topics including advanced systems analysis and design, systems modeling, and data management. His current research focuses on human factors and usability issues in enterprise systems, information search and data management and the effects of time availability on human-computer interaction. His research has been published in journals such as *European Journal of Information Systems, JASIST, Information Processing & Management, International Journal of Human-Computer Studies, Journal of Database Management, Small Group Research*, *Communications of the AIS,* and others. He is co-author of two database management textbooks, *Modern Database Management* and *Essentials of Database Management*, with Jeff Hoffer and V. Ramesh. His co-edited volume *Information Systems and Information Technology* of CRC/Chapman & Hall’s *Computing Handbook* was recently published. He has been actively involved in national computing curriculum development and evaluation efforts (including IS 2002, CC2005 Overview Report, and as co-chair of the IS 2010 curriculum revision and current MSIS revision project). He is a member of the ACM Education Board and the Board of CSAB.