

RECRUITERS' PERSPECTIVES ON THE DEMAND FOR IS SKILLS: IMPLICATIONS FOR DOCTORAL PROGRAMS

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Introduction

Seven years have passed since the publication of Freedman et al.'s (2000) study of the supply and demand of information systems (IS) doctorates. In the mid-to-late 1990's we witnessed an unprecedented and seemingly endless rise in IS enrollments, largely driven by industry demand for graduates of undergraduate and graduate IS programs. At that time, a shortage of IS faculty strained programs, inhibited innovation, and adversely affected research productivity (Freeman et al. 2000). For example, the 1998-1999 Association for Information Systems and International Conference on Information Systems (AIS/ICIS) placement system had 247 registered tenure-track IS faculty positions compared to 105 applicants who had or would have doctoral degrees in IS. In 2000, it appeared that the demand for IS faculty would continue to be strong, particularly in the near and medium term. However, Freeman et al. observed "Of course, changes in the economy, priorities of universities and businesses, substitutes for IS courses, and student course choices as well as developments in technology could greatly affect those numbers."

Following the so-called dot.com bust, economic downturn, and post Y2K, as well as other factors, this observation unfortunately was born out. According to the AIS/ICIS placement system, from May 2005 through July 2007, there have been 538 applicants for 139 posted university positions. During the first half of this decade, IS enrollments fell as precipitously as they had risen, often leading to the downsizing of IS departments or, in some cases, mergers with other business-technology areas, e.g., operations and decision sciences.

Today, there is growing anecdotal evidence as well as reports of growing demand for graduates with IS skills. Many schools have witnessed growth in the number of recruiters wishing to hire students with IS skills. Therefore, there are signs that some of the decline in IS enrolments are likely to be arrested. More importantly, after nearly three to four years of very limited hiring, schools are beginning to revive their hiring efforts for IS academics. Though the demand for IS academics is not as robust as is the demand for academics in some of the other disciplines, the 2006-07 academic year has seen more schools in the market for hiring IS academics. A few schools have begun to make incremental or significant revisions to their curricula in order to position their offerings more in line with the industry demand for IS skills.

Our view is that systematic assessments of the nature of industry demand for IS skills and an evaluation of their implications for IS programmatic offerings are important activities if we are to make predictions about how and why future demand for IS academics is likely to occur. Further, by understanding the nature of programmatic offerings that will meet the evolving IS demand, we will be in a better position to judge how to prepare doctoral students for future academic opportunities. Though the IS community has sought to define model curricula, we seek to examine whether the curricula address the richness and diversity of industry demand for IS skills. By incorporating assessments of the industry demand for IS skills, we address the following question: *Is the nature of our undergraduate and graduate curricula guidelines meeting the needs of key industry hiring segments?* While IS 2002 (Gorgone et al. 2003) and MSIS 2006 (Gorgone et al. 2006) Model Curriculum offer comprehensive guidelines for the design of undergraduate and graduate IS degree programs, respectively, it may be that a more segmented approach to design is warranted through the identification of IS skills and knowledge needed by various industry segments/clusters. Thus, our objective in this paper is to examine industry cluster specific skills and knowledge and, in turn, offer suggestions regarding the design of IS doctoral programs. Our fundamental premise is that IS graduates should match industry cluster-specific job roles in order to succeed in the labor market (Nance 2000; Lee et al. 2002). As such, IS doctoral programs may need to prepare students – in terms of both teaching and research – for a potentially more diverse hiring market in order for them to succeed.

In the following, in order to address the above question, we first define different industry hiring clusters with specific job profiles for IS graduates. We then describe our data collection effort that involved a series of semi-structured interviews with recruiters representing each hiring cluster. Based on the results of these interviews, we offer suggestions regarding IS curricula. These suggestions may have implications for the future direction of the entire IS field (Larsen, Levine 2005), faculty development, and IS doctoral programs. We conclude with a discussion of implications for IS doctoral education.

Methodology

Developing Hiring Clusters

We started by defining industry hiring clusters for IS graduates. In forming the clusters, we deviated from traditional sector differentiations. According to traditional sector classifications, for instance, fast moving consumer goods (FMCG) companies and automotive companies belong to different sectors. However, their respective IS departments fulfill similar tasks and basically the same function of providing internal service provision as support activities to primary activities in the value chain (Porter 1985). Hence, we would group companies from both the FMCG and the automotive sector in the same cluster.

In order to focus on IS graduates and their respective job/skill requirements, we concentrate on the different perspectives on the IS field (Gallupe 2000) and differentiate the industry hiring clusters based on the most relevant IS job profiles. This leads us to propose three industry hiring clusters classified according to the function IS fulfills in the respective clusters. Specifically, the three clusters included here are companies that:

Cluster 1: Provide IS services to external customers (IT Products and Services firms),

Cluster 2: Use IS as supportive function (IS professionals in business firms), or

Cluster 3: Emphasize IS in business and strategy management (IT-savvy business executives).

Companies that *provide IS services to external customers* (Cluster 1) either provide an IS-based product, as IT hardware and software vendors do, or provide an IS-based consulting service to external customers.

Companies that *use IS as supportive function* (Cluster 2) comprise both the above mentioned FMCG and the automotive companies. They reach out to all industry sectors whose primary business is not directly IS related. Those companies use the IS function to support their primary business both from an infrastructure and from a service point of view.

Finally, in *companies that emphasize IS in business and strategy management* (Cluster 3), business knowledge tends to dominate over IS/technology knowledge. These companies emphasize the analysis and adaptation of IS activities in the value chains and IS strategies of their clients and are reflective of many consulting firms.

Figure 1 summarizes the differentiation of the three clusters according to Porter's value chain.

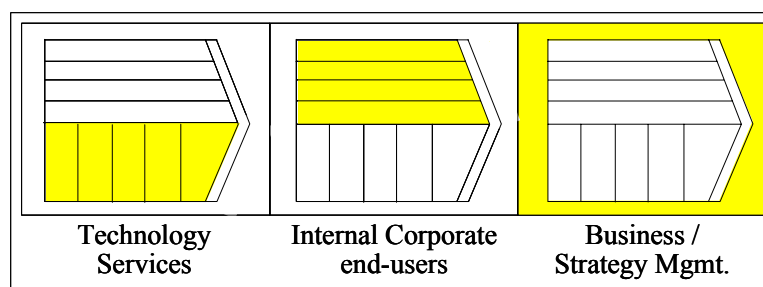


Figure 1: IS Hiring Clusters According to the Corporate Perspective on IS Function

Selecting Cluster Companies for Interviews

We identified large and leading companies that could represent the hiring activities of each cluster. Companies selected for subsequent interviews were chosen based on university-company recruiting relationships.

The companies included in the sample for each cluster are listed in Table 1.

Table 1: Sample Companies According to Cluster

1: Technology Services	2: Internal corporate end-users	3: Business / Strategy Management
Microsoft	3M	A.T. Kearney
Oracle	Siemens COM	Ernst & Young
	Eli Lilly & Co	PricewaterhouseCoopers
	Ford Motor	Accenture
	Dow Chemicals	
	General Motors	

Data Collection

In preparation for data collection, we designed an interview guide to capture the current policies of hiring companies concerning roles that include IS knowledge. Due to the time lags involved in transferring job roles into requirements and finally into curricula changes, the guide also addressed projections of job roles, focusing on future IS skills required in that context. The interview guide aimed to match current IS education and corporate requirements and tried to identify shortages in human resource development with regard to IS knowledge-intensive jobs.

Specifically, the following questions guided the interviews with company representatives:

1. What are the key roles/job descriptions where IS knowledge makes a difference?
2. What kinds of near-term skills are needed?
3. What kinds of longer term/projected skills will be needed?
4. How well do you believe schools are delivering these needed skills in their bachelors and masters programs? Specifically, are IS programs deficient in any areas?
5. Are there current or projected shortages in either roles or skills?

Using the structured interview guide, we conducted interviews with the companies selected in each of the three clusters (Table 1). The interviews took place between June and July 2007, either via telephone or in face-to-face settings. The interviewees all held management functions in their respective company, including managers with positions reaching from general management to sales and R&D management.

In total, we conducted twelve company interviews in the US and Germany. The interviews were transcribed and provided to the interviewees for cross-checking.

Data Analysis

In a first round of analysis, we reviewed the interview transcripts for recurring statements regarding job roles and associated skill descriptions. In a second round, we defined the job roles and skill requirements from the recurring emergences in the interviews. We investigated to what extent similar job roles were correlated to similar skill requirements to strengthen the derivation (Mann 2002). In a third round of analysis, we compared the job roles and descriptions among the clusters to identify discrepancies among clusters and cluster-specific emphases.

Results

In the following, we summarize the key themes that emerged from our interviews with company representatives from each of the three industry clusters. Relative to our interview guide, company representatives did not, by and large, distinguish between near and long term skills (see Table 2). Following these summaries, we will turn our attention to implications for IS Doctoral education.

Table 2: Profiles of Hiring Clusters

	Cluster 1: Technology Services	Cluster 2: Internal IT Function	Cluster 3: Business Management and Strategy
Key IS-related roles	<ul style="list-style-type: none"> • Account manager • Consultant 	<ul style="list-style-type: none"> • Business analysts • Project managers • Vendor relationship management 	<ul style="list-style-type: none"> • Consultants • Business process managers (corporations)
Near and long term skills	<ul style="list-style-type: none"> • Business process management • Project management • Communication • Global delivery management • Rapid economic justification • Service management strategies (e.g., ITIL) 	<ul style="list-style-type: none"> • Communication and collaboration skills • Governance frameworks (COBIT, ITIL) • Security frameworks and tools • Project management • Less emphasis on deep technical skills 	<ul style="list-style-type: none"> • Strategic analysis • Business technology management • Business process management • Communication • Economic value analysis
Perspective on existing IS programs	<ul style="list-style-type: none"> • Greater emphasis desired on multi-lingual skills • Enhance the ability to make the business case for IT investments • Facilitate certification of specific bodies of knowledge (e.g., ITIL) 	<ul style="list-style-type: none"> • Enhance knowledge about the complexities of project management • Less interested in certification • Do not wish deeper technical expertise 	<ul style="list-style-type: none"> • Advance business analysis skills through projects • Consultants want knowledge related certification on industry standards • Deepen focus on business process management and enterprise architectures • Enhance rigor in economic value analysis
Projected shortages	<ul style="list-style-type: none"> • Shortage of people with IT, business, AND soft skills 	<ul style="list-style-type: none"> • Significant 	<ul style="list-style-type: none"> • Shortage of people with IT, business, AND soft skills

Cluster 1: Technology Services

As described, this cluster represents companies that provide IS services (products, consulting) to external customers. Representatives of two leading firms – Microsoft (www.microsoft.com) and Oracle (www.oracle.com) – were interviewed.

Key Roles where IS Knowledge Makes a Difference

For these companies, key hiring roles are account managers and consultants. Account managers support customers in technology assessments, prototyping, benchmarking, and migration activities. Both consultants and account managers are actively engaged in selling products and services, not only in the context of the current engagement, but also for future engagements. Thus, roles typically involve “bridging” the business-technology language gap and facilitating the development of current and future customer relationships.

Near and Long Term Skills

Not surprisingly, companies in this cluster emphasize consulting and project management skills. Here, the ability to map business processes and match IT solutions is a key need. Soft skills (i.e., oral and written communication) are needed to communicate with customers and to assist in implementing solutions, e.g., training customer employees on the newly implemented IT.

Given globalization, and an extended marketplace, these companies also emphasize working with developers in distant locations. Technical skills (e.g., Java) are desired, but the primary emphasis rests on more business-oriented skills, including value calculation methods such as total cost of ownership (TCO), rapid economic justification (REJ), etc. as well as knowledge about businesses and strategies of potential customers.

Longer term, these companies expect skills and knowledge related to service management strategies, e.g., IT Infrastructure Library (ITIL), Service Level Agreements (SLAs) etc. Moreover, hires should possess the ability to recognize changes in the IT marketplace and adapt accordingly. With increasing globalization of work, international experience and fluent English with knowledge of one or two other languages will also distinguish candidates.

IS Programs Delivery Assessment

While companies in this cluster generally are appreciative of the skills and knowledge of graduates of IS programs, two key areas of current IS program deficiencies were noted. First, more educational emphasis is needed relative to developing international and language skills. Respondents recognize that this deficiency goes beyond IS curricula, however, fluency in these areas would advance the standing of IS programs. Second, concerns were raised regarding the ability of graduates to “make the case” for business investment in a solution (product or service), e.g., the financials surrounding the business case.

Projected shortages

Overall, companies in this cluster are seeking job candidates who possess a combination of business, technical and soft skills. Interview respondents suggested that, in general, while a sufficient number of candidates exist relative to each of these skills, there are too few candidates who possess the combination of all three.

Cluster 2: Internal IT Function

Companies included in this cluster deploy IS/IT internally to support their primary business. Representative of six, industry diverse, companies were interviewed – 3M (www.3m.com), Siemens (w1.siemens.com/), Eli Lilly & Co. (www.lilly.com), Ford Motor (www.ford.com), Dow Chemical (www.dow.com), and General Motors (www.gm.com).

Key Roles where IS Knowledge Makes a Difference

Representatives of companies in this cluster identified several roles that can be characterized as system analysts and business analysts. With experience, hires move into project leader or IT account manager roles that reflect project management roles within the IT function. Increasingly, hires are also engaging in IT vendor relationship management roles. Broadly, roles involve managing sales of services to internal business units or departments (often in competition with external service providers) and the evaluation of ways in which IT can be used in various business processes. In general, these companies expect hires to have a proficient knowledge of business processes (e.g., supply chain, manufacturing, etc.), coupled with knowledge of IT solutions.

Near and Long term Skills

With the increased emphasis on “internal service”, companies are seeking hires with a service- and sales-oriented mindset. Increasingly, these companies are emphasizing soft skills (i.e., communication, collaboration) and more of a consulting mindset. This internal sales orientation seems to be reflective of increased competition from external providers and the need to demonstrate the value of the IT function to the business, thus skills associated with the ability to bridge the language gap between business and technology are highly sought. Moreover, several

respondents noted that two of their biggest challenges are in systems integration (i.e., how to integrate off-the-shelf technologies into the current environment) and securing data that is transmitted between firms (e.g., business to business). In addition, several companies noted needs for hires that possess a fundamental understanding of industry frameworks, e.g., ITIL, International Standards Organization (ISO), Control Objectives for Information and Related Technology (CoBIT). Thus, IT governance is a growing area that will take on heightened importance long term.

Overall, companies continue to seek a blend of business and IT skills and knowledge, albeit with a greater emphasis placed on the business side. That is, hires are expected to possess deep business knowledge that allows the analysis of business processes, mapping and the articulation of system design specifications. Project management skills were also consistently noted as needed both near and long term. Overall, given the roles hires play, there is less emphasis on deep technical skills and a greater emphasis on business knowledge and the ability to think logically through business problems. Companies thus noted the need for strong skills associated with the systems development lifecycle (SDLC). Finally, given globalization, companies in this cluster increasingly expect employees to have an understanding of foreign cultures, and often language skills, such that they can quickly integrate with and provide value to international project teams.

IS Programs Delivery Assessment

In general, companies in this cluster were satisfied with graduates of IS programs. However, they noted that IS programs should introduce and/or increase opportunities for students to advance skills associated with project management, solution/system integration, niche areas (e.g., security), and industry frameworks. In many cases, they noted that the scale of organizational projects is far greater than the scale emphasized in IS programs, i.e., wherein students are developing solutions for a small set of end-users. Given that roles tend to focus on business and softer skills, these companies express limited interest in IS programs expanding the development of deep technical (i.e., programming) skills. Unlike external consultants, companies in this cluster are less interested in certifications/credentialing.

Projected Shortages

Respondents noted shortages related to finding hires who possess sound project management skills and who can do systems integration well.

Cluster 3: Business Management and Strategy

This cluster reflects companies engaged in global management consulting and technology services. Representatives of four companies – Accenture (www.accenture.com/), A.T. Kearney (www.atkearney.com/), Ernst & Young ([E&Y], www.ey.com/), and PricewaterhouseCoopers ([PWC], www.pwc.com) were interviewed. In addition, this cluster also represents the hiring of IT-savvy business executives in functions such as supply chain management or marketing and customer relationship management. Consistent with our earlier description of companies in this cluster, overall these firms emphasize business acumen more so than technical (IS/IT) acumen.

Key roles where IS Knowledge Makes a Difference

Companies in this cluster consistently emphasized IT as an enabler. Here, they seek hires that understand the strategic benefits of IT such that they can help direct clients to capitalize on IT, e.g., to reduce risk, drive efficiency, etc. Respondents noted that most consulting engagements start with defining business requirements, rather than discussion of a technology solution. Moreover, the overarching value of IT will vary by client and, as such, roles require the ability to speak to multiple stakeholders with alternative worldviews. The primary value that hires/consultants bring is the ability to define or “frame” a messy business problem and bridge the business-technology language gap. In this cluster, respondents consistently emphasized the “interpreter” role.

Near and Long term Skills

A consistent theme that emerged was the need for hires who can “frame” problems, i.e., define business requirements, in multiple contexts. Furthermore, hires need to be able to speak to multiple stakeholders with

alternative worldviews. For example, when talking about risk, one must be able to discuss risk in relation to alternative stakeholder perspectives and needs. Not surprisingly, communication skills (verbal, written) are needed such that hires can convey to clients what they need to understand and in a language they understand. Consistent with the primary role, described above, skills center on bridging the business-technology language gap.

Respondents were consistent in that they desire basic technical skills, but primarily they are looking for evidence that graduates can advance those skills in the future. Overall, technical skills were emphasized less than business acumen and soft skills. Programming skills are not generally required. Rather, these companies are seeking graduates with deep business knowledge and a foundational understanding of major IT/IS concepts and approaches such that they are able to “link IT back to the business.”

IS Programs Delivery Assessment

In general, respondents indicated that IS programs situated in business schools are delivering on their near and long terms needs. Respondents did, however, suggest that Bachelor-level programs (B.S.) may be too focused on technology, while Master-level programs (M.S.) do a better job of preparing graduates in problem framing, i.e., B.S. graduates lead with technology solutions, while M.S. graduates lead with framing the business problem. Respondents did recognize, however, that this may be reflective of curriculum constraints at the undergraduate level as well as the limited degree of work experience (e.g., internships, full-time employment) possessed by graduates of B.S. programs. A consistent suggestion was to provide opportunities to further advance systems analysis and design skills through coursework and projects.

For companies in this cluster, three interesting themes did emerge. First, companies raised the issue of certifications and/or credentialing. Here, companies often use certifications as a component of what they sell to prospective clients. Certifications also are viewed as an aspect of ongoing learning and may, in fact, be used to distinguish prospective hires. Furthermore, certifications provide evidence that a candidate can “talk” industry standards (e.g., ITIL, CoBIT, etc). Second, and reflective of the fact these firms often organize work around industry segments, they would like to see graduates who possess deeper knowledge of either a particular industry (e.g., healthcare) or technology (e.g., security). Third, there exist concerns that “too much” emphasis on technology in IS curricula may lead to less emphasis on key business and management skills, including soft skills (i.e., communication, collaboration). Within this context, there appears to be some deficiency around the ability of IS graduates to justify recommendations with financials (e.g., value analysis, NPV, etc.) and to successfully manage projects.

Projected Shortages

Overall, a consistent theme was the difficulty in finding graduates who can “truly bridge the language of business and technology” such that they can present the “right information to the right stakeholder at the right level.” Companies are also challenged in finding graduates who “can make sense of chaos, take a portfolio, value it and put a workable process around it.”

Results Summary

Several key themes emerged from our interviews with representatives of the three clusters. Broadly, it appears that the general characteristics of an IS professional (reflected in Gorgone et al. 2003; Gorgone et al. 2006) have remained fairly stable. Specifically:

IS professionals must have a broad business and real world perspective.

IS professionals must have strong analytical and critical thinking skills.

IS professionals must have interpersonal communication and team skills.

IS professionals must design and implement information technology solutions that enhance organizational performance.

Each cluster to varying degrees noted the need for graduates who can bridge the language gap between business and technology, whether internally or externally, and who understand the value of IT to various business processes. It appears that bridging roles require less emphasis on technology skills and a greater emphasis on business and soft

skills. Interestingly, while our industry respondents noted general satisfaction with the products of our IS programs, they noted shortages relative to students who possess sound, combined skills in business, technology, and soft skills (communication, collaboration). Clearly, continued attention to these areas is warranted.

Several areas are emerging that may offer opportunities for curricula revision and enhancement, including:

1. Development of enterprise and systems integration skills (particularly for Cluster 2);
2. Enhancement of project management and vendor relationship management offerings (Clusters 1 and 2)
3. Preparation for acquisition of industry recognized certifications (particularly for Clusters 1 and 3 engaged in external consulting services);
4. Understanding of industry governance frameworks (all Clusters);
5. Development of skills (e.g., financial methods) required for economic analysis and “making the case” for IT investment (particularly for Clusters 1 and 3);
6. Development of international perspectives (all Clusters);
7. Development of deeper skills and knowledge as related to particular business processes (e.g., Supply Chain Management), enterprise architectures, or key IT management areas (e.g., security, risk and controls, data analytics) (all Clusters); and,
8. Further enhancement of communications skills (all Clusters).

Some of these areas are reflected in recent updates to the MSIS Model Curriculum (Gorgone et al. 2006) that strengthened the emphasis on business processes, emerging technologies, globalization, human-computer interaction, and impacts of digitization.

Implications

Our premise has been that an understanding of the demand for IS skills by industry is important in making predictions about how IS programs should design their offerings and prepare undergraduate and graduate students for those jobs. Further, by understanding the nature of the programmatic offerings, we can begin to evaluate how IS academics will be successful in developing the appropriate courses. Finally, this should help in examining how doctoral programs can prepare next generation IS academics to teach those courses and conduct research on topics related to these programs.

We find that instead of a monolithic structure, it is useful to recognize the existence of three distinct clusters of firms who choose to hire undergraduate and masters students with IS skills and knowledge. Though all of the three clusters share some common expectations about what they seek in their hires (i.e., a blend of IT, business process, and organizational knowledge), we have identified some of specific differences between them. We also believe that not many schools will find their recruiters falling into all of the clusters. Therefore, a first step for every school/IS department is to understand which cluster(s) it currently serves and to what degrees. Since most IS departments are unlikely to grow significantly or be large in size, they will need to decide how to focus their limited faculty resources on the skill needs of their key recruiter cluster(s). This is not to suggest that curricula is fully customized, but rather that an understanding of differentiated needs can inform aspects of programmatic offerings. For example, if companies from Cluster 2 (Internal IT Function) represent the key hiring market, offerings that develop enterprise and systems integration skills will be aligned with the interests of those recruiters. Further, a quick look at Table 2 shows that the curricular needs of the clusters are not radically different; instead, they differ in some specific courses, while sharing a base of other courses. Therefore, our recommendation should not be viewed as implying that IS departments should pursue a vocational training with a narrower focus on specific skills. Instead, our recommendation is that a focus on one or two distinctive course needs of the specific cluster will help in encouraging the recruiters designate the school as the preferred recruiting outlet. At the same time, we recognize that the composition of the recruiters might change and, therefore, IS departments must continuously pay attention to external factors that may cause shifts in the relative makeup of its hiring market.

Second, in looking across the three clusters, it is evident that there is an opportunity and need for curricular innovation and design. Some of the areas for development and refinement of course offerings include:

- Course offerings for MBA programs (core course and electives): During the past few years, many schools have made a concerted effort at refining the core IS course in the MBA program. Recently, Dhar and Sundarajan (2007) interviewed the deans of about 45 leading business schools to develop a blueprint for an effective IS core course. In addition, electives that address the expectations of Cluster 3 (Strategic Analysis of IT, Economic Valuation of IT, Business Process Management, and Business Technology Management) are likely to be attractive. Finally, with the growing corporate interest in leveraging business intelligence technologies, electives that provide insights about business analytics, particularly in finance and marketing, are likely to be significant.
- Course offerings in the Masters' Programs: In addressing the needs of the three clusters, electives in the area of business process management, project management, economic valuation of IT, vendor relationship management, IT services management, and the governance and control of IT are likely to be significant. Some of these offerings could benefit from collaboration with organizations that provide relevant certification and bodies of knowledge, e.g., the Information Systems Audit and Control Association and the IT Services Management Forum, associated with CoBIT and ITIL, respectively.
- Course offerings in the undergraduate programs should include business process management, solution integration, and business analysis and systems design.

Third, and importantly, our findings have significant implications for the management of doctoral programs. Doctoral programs are going to produce the faculty of tomorrow, and many of the curricular opportunities identified in our study can only be realized if the IS community is attracting, training, and motivating the doctoral students in ways that fit the above opportunities. It is clear that a common theme across the emerging curricular opportunities is a reduced emphasis on deep technical knowledge and a greater emphasis on strategy, process, and economics. Therefore, the IS community must ask two important questions when it comes to the nature of IS doctoral programs.

1. What type of applicant is likely to be a successful IS academic? Given that future industry demand and curricular offerings will need to emphasize the business, economic, and organizational aspects of IT rather than deep technical knowledge, doctoral applicants with work experience in consulting, business management, and IT services delivery should have the necessary background and expertise. Therefore, IS doctoral programs should seek to recruit students with such backgrounds.
2. What type of doctoral program training will enhance the ability of doctoral graduates to be valued? Phenomena such as the strategic use of IT, business analytics, economic value of IT, vendor relationship management, and project management are associated with courses and skills that appear to be in high demand in industry. Therefore, doctoral programs should find ways of orienting students to these phenomena in order to "seed" their understanding and insights. As an example, encouraging doctoral students to intern in IT services or consulting companies for a summer in the early stages of the doctoral program might warrant consideration. Similarly, exposing doctoral students to the bodies of knowledge embedded in CoBIT, ITIL, and emerging security standards might be another worthy goal. Traditionally, doctoral students have limited teaching opportunities, and they are mostly confined to the introductory course in information systems in the undergraduate programs. By involving the doctoral students in curricular design efforts and the delivery of some of the courses referred to above, doctoral programs are likely to raise their preparedness to teach the emerging courses and, thereby, enhance their market attractiveness for academic jobs.

For schools and departments that have current doctoral students, we propose that faculty should involve their students in any ongoing curricular design and development efforts. Doctoral students should be viewed not just as research assistants, but also as teaching apprentices and should gain experience in the course design. If courses are being developed to address some of the skills that we have listed in Table 2, doctoral students should be encouraged to sit in those classes and observe the content and pedagogy. Similarly, students should be encouraged to observe the teaching of the core IS class in the MBA class, if such a course exists at the school. Finally, faculty should encourage their students to read trade press magazines such as the CIO and Information Week as well as practice-oriented journals such as the MIS Quarterly Executive to stay on top of emerging practitioner issues. By implementing a culture and an environment that nurtures doctoral students' interest in the emerging courses, schools can better prepare their current students for the academic job market.

Conclusion

While it appears that schools are beginning to revive their hiring efforts for IS academics, the number of IS doctoral graduates still exceeds demand. In this paper we sought to understand the needs of key industry segments that hire students from IS undergraduate and graduate programs, and address the question of whether IS curricula are meeting their needs. Relative to the three hiring clusters we identified, our findings suggest that while the general characteristics of IS professionals remains fairly stable, there are a number of areas that may offer opportunities for curricula revision and enhancement. In turn, it is our position that these opportunities should inform IS doctoral programs – in terms of both applicant selection and training – so that graduates are better prepared to succeed in an evolving market.

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