Should I Take More MIS Courses?
Implications from Interviews with Business Recruiters

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ABSTRACT

It is important for MIS educators to have a good understanding of what IT knowledge and skills are required in business. In this study, 103 open job positions in the Midwestern United States were investigated via semi-structured interviews with hiring companies. The interviews with key business recruiters suggest that IT knowledge and skills are significantly considered during the recruiting process, even if the target position is not IT-related. The most sought-after skills are summarized. Implications for MIS education and research are discussed.

INTRODUCTION

"Should I take more MIS courses?" Non-MIS business majors often ask the question when planning their course selections. As information technology (IT) increasingly saturates every corner of business operations, few people doubt the importance of IT knowledge and skills to one's career success. However, many students are daunted by the misperception that IT could be hard and boring (Beyer, 2008; Karsten and Schmidt, 2008; He and Freeman, 2010); others wonder the essential elements of IT knowledge that enable them to cope with today's competitive business environment.

IT knowledge and skills set the cognitive foundation upon which one can employ IT tools to solve business problems (Compeau and Higgins, 1995). Empirical studies provide strong evidence that IT-related abilities largely shape one's job performance. The exact makeup of IT knowledge and skills, however, remains unclear in the literature (Gregor, 2006). The vague understanding of IT knowledge and skills leads to the symbolic use of computers or computing applications as a proxy for assessing one's ability of utilizing IT in various situations. This proxy will inevitably restrict our research of IT influence in workplace from further advance.

This study attempts to advance our understanding of what IT knowledge and skills are required in business. Unlike previous research that focuses on the special knowledge requirements of IT workforce, the current study places attention on other business professions. Such an investigation will enrich our understanding of IT knowledge and skills beyond the boundary of the IT profession, provide important guidance to the development of IT curriculum for all business majors, and alleviate the often "significant disconnect between the realms of business and education" (LaFrance 2010; p. 25).

The paper proceeds as follows. First, previous efforts of studying IT knowledge and skills are reviewed, and a gap in our understanding of IT knowledge and skills required by other business professions is highlighted. Then, a research strategy is developed by using semi-structured interviews to analyze business expectations of IT skills especially in the job market of the Midwestern United States. Results of the interviews are summarized. The paper ends with a discussion of the implications of the results.

ReviEw Of The Research Literature

One major goal of MIS education is to provide students, both MIS majors and non-MIS majors, with IT knowledge and skills that will be needed for the success in their future careers (He and Freeman, 2010). Recently, understanding the makeup of IT knowledge and skills has received increasing attention among IS researchers. Research in the area provides important guidance to education, training, and career development.

There are two lines of research on IT knowledge and skills. One line of the research studies the effects of IT-re-

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TABLE 1
REVIEW OF THE RESEARCH LITERATURE ON
KEY DIMENSIONS OF IT KNOWLEDGE AND SKILLS

Paper	Research Subject	Key Dimensions or Categories
Nelson 1991	**IS and business professionals**	• Organizational knowledge (knowledge of the organizational goals and objectives, key functions, and environmental factors) • Organizational skills (interpersonal, group, and project skills) • Organizational unit (knowledge of work unit objectives, problems, and links to others) • General IS knowledge (IS policies, main IS applications, privacy policies etc) • Technical skills (programming, database, etc) • IS product knowledge (specific applications being used)
Leitheiser 1992	**IS managers**	• Developer (interpersonal, analysis and design, programming, business, environment, programming language, specific application) • Specialist (database and data communication, software, hardware, advanced applications)
Lee et al 1995	**IS managers, business managers, and IS consultants**	• Technical specialties knowledge • Knowledge of technology management • Business functional knowledge • Interpersonal and management skills
Todd et al., 1995	**Content of advertisements for IS professionals**	• Technical skills (relating to hardware and software competence) • Business skills (industry and organizational knowledge, interpersonal, and communication skills) • System skills (analytical, modeling, and problem-solving skills).
Lee et al., 2002	**IS professionals**	• IS core knowledge • Organizational and society knowledge (specific functional areas, specific organizations, specific industries, and general environment) • Interpersonal (interpersonal behavior, interpersonal communication, international communication ability, teaching and training skills) • Personal traits (Personal motivation and ability to work independently, creative thinking, critical thinking)
Bassellier et al., 2001 and 2003	**Business managers**	IT competence components: • Explicit knowledge: technology, applications, system development, management of IT, access to IT knowledge • Tacit knowledge: experience and cognition
Bassellier and Benbasat, 2004	**IT professionals**	Business competence • Organization-specific (organizational overview, organizational units, organizational responsibility, IT-business integration) • Interpersonal and management (interpersonal communication, leadership, knowledge networking).
Cash et al., 2004	**IS professionals**	• Technical (hardware, system, application, and software knowledge) • Business (Organizational, business, and management-related competencies) • Relationship (interpersonal skills) • Conceptual (the ability of taking unrelated information and organize it in an ordered manner)
Gallivan et al., 2004	**Classified job advertising for IT professionals**	• Operating system skills • Programming language skills • Networks/communications skills • Software development tools • Non-technical skills (communication, interpersonal, leadership, organization, self-motivation, and creativity)
Litechy et al., 2004	**IS hiring**	• Technical skills (skills acquired through training and education or learned on the job and are specific to each work setting) • Soft skills (the cluster of personality traits, social graces, language skills, friendliness, and optimism that mark each one of us to varying degrees)
Simon et al., 2007	**IT executives**	• Technical • Project management • Business domain • Source • IT administration
Smith, 2008	Chief audit executives	Three categories of IT knowledge that are relevant for internal auditors • Basic IT knowledge needed by all professional auditors, focusing on computing concepts • Special knowledge needed by auditor supervisors for managing auditing process • Technical knowledge for IT audit specialists.
Lee and Mirchandani, 2010	IT managers	Dynamics of the importance of 17 sets of IT skills

lated abilities on job/task performance. Examples include perceived ease of use (Davis et al., 1989; Venkatesh, 2000; Venkatesh et al., 2003), computer self-efficacy (Compeau and Higgins, 1995), general and specific computer self-efficacy (Marakus et al., 1998, 2007), computer anxiety (Harrison and Rainer, 1992; Compeau et al., 1999), and personal innovativeness in IT (Thatcher and Perrewe, 2002). Through the development of IT behavioral theories and models, research in this line has established a strong linkage between one's IT-related abilities and his/her performance on job or on particular tasks.

Another line of the research studies the makeup of IT knowledge and skills that are required in the business world. This research originated with the seminal work of Ashenhurst (1972) in which important recommendations were given for IT curriculum development. Since then numerous attempts have been conducted to depict an overall pattern of IT knowledge and skills. Table 1 summarizes the recent work in this area.

As shown in Table 1, researchers have developed various IT-skill taxonomies, and there is no commonly-agreed upon theory to explain the makeup of IT knowledge and skills (Lee et al., 2002; Gregor, 2006). Two reasons may explain the phenomenon. First, the frequent changes in the technological environment require a constant adjustment of the relevance of key dimensions of IT knowledge and skills (Lee et al., 1995; Todd et al., 1995), making it "an impossible task" to produce a valid list of concrete computing skills (He and Freeman, 2010). Taking the recent ascension of E-Commerce as an example, "the implementation of e-commerce in an organisation has introduced three main business changes: changes in business expectations, in business perceptions, and in business compliance. These three changes ... have driven changes in the competency requirements of IS professionals (Cash et al., 2004; p. 62)." Secondly, IT is a diverse field consisting of a variety of domains, each of which has its own set of core knowledge. Coupled with the fast pace of technology development, it is hard to have a taxonomy that is both general enough to cover all the advancements and reasonably parsimonious for a meaningful interpretation.

In addition, prior research on IT knowledge and skills has emphasized the special knowledge requirements of IT workforce. Little attention has been paid to the basic IT skills that are essential for other business professions (the work of Smith (2008) is a rare exception). Given the fast pace of IT proliferation, we need to develop a better understanding of IT-related knowledge and skills that are required in the broad business world beyond the boundary of IT profession. For this purpose, we conduct the current research.

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Review Of The Prescriptive Literature

The research literature does not provide a convergent pattern of IT knowledge and skills required by the general business. We turned to the prescriptive literature[1] for such a pattern.

The most popular MIS textbooks were sampled to represent the prescriptive literature on the research topic. The premise is that MIS educators are striving to educate students for entering the job market with the ability to deal with today's business problems; thus, the MIS textbooks selected by most MIS educators well reflect the needs of the dynamic business environment as well as the competitive job market.

Twelve top-selling MIS textbooks at Amazon.com (as of March 31, 2013) were selected for review. These textbooks are designed for MIS introductory courses, where students come from various business majors. Content analysis was performed to identify book coverage. Since all these books have broad coverage of IT topics and concepts, we have narrowed our analysis to the main topic of each book chapter. For example, all books discuss to some extent supply chain management systems and customer relationship management systems, but only Valacich and Schneider (2010) single out the two types of systems as the main topics of two chapters. Thus, the two types of systems were coded as main topics for Valacich and Schneider (2010). We believe that this approach will lead to the most distinct pattern of coverage of these MIS textbooks. Table 2 summarizes the findings of the content analysis of the sampled books.

As presented in Table 2, the topic pattern of the sampled MIS textbooks is comparatively convergent and consistent. Although it has not been explicitly discussed in the literature, MIS educators have general agreement on the IT knowledge and skills that are important for business students. In addition, some textbooks provide training sessions, often in the form of extended learning module (e.g., Haag and Cummings 2009) or technological plug-in (e.g., Baltzan and Phillips 2009), for some popular applications such as Access, Excel, HTML, and/or MS Project. An open question is whether the coverage meets the requirements of today's business.

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1   The term "prescriptive literature" refers to practitioner-oriented publications including methodologies, textbooks and handbooks (Kirsch and Beath 1996). In general, the prescriptive literature reports commonly-accepted practices or views in certain area of the industry.

Research Methods

The research intends to identify a general pattern of expected IT knowledge and skills in the job market under the assumption that business recruiters require certain IT qualifications for successful job candidates. To this end, we employed a qualitative research strategy with semi-structured interviews. Business recruiters that were able to make hiring decisions were sampled, semi-structured interviews were conducted with questions designed to explore the implicit IT requirements while allowing the emergence of new questions in order to fully understand a phenomenon that is complex, dynamic, and practical in nature.

Research Participants

Many private and public organizations located in the Midwestern United States with potential hiring in the near future were asked to participate in the study. These organizations all had internship or other collaboration programs with the researchers' university so that the chance of participation in the study was high. Each open position was treated as one case for the study of required IT knowledge of skills in business. Organizational background information was collected during interviews with key recruiters. In total, eighty-six organizations, representing 103 open positions, participated in the study. Profiles of the participating organizations are reported in Table 3 for company size and Table 4 for industry distribution.

Our sample is dominated by large companies (about 67%), followed by medium-sized companies (about 16%) and small companies (9%). Six organizations did not report the information about their business scale. Thus, results from the interviews should be interpreted with caution because the investigated positions are skewed toward hiring in large organizations.

As demonstrated in Table 4, 41 out of 86 (or 47%) participating organizations were in auto and other manufacturing areas with the rest evenly distributed over ten other industries. Such a pattern is consistent with the Midwest economy that emphasizes large scale manufacturing of finished medium to heavy consumer and industrial products. Thus, job openings from these organizations, while perhaps not representing a national pattern, provide important insights of IT knowledge requirements of the Midwest job market.

Data Collection and Analysis

Interview teams composed of MBA students (with an average work experience of six years) were trained to conduct semi-structured interviews. They then interviewed key recruiters in participating organizations. The following questions had been prepared for the interviews:

Table 2
Main Topics Covered in MIS Textbooks

Main Topics	Book											
	1	2	3	4	5	6	7	8	9	10	11	12
IT, Organization, and Strategy	X	X	X	X	X	X	X	X	X	X	X	X
IT Infrastructure	X	X		X	X	X		X			X	X
Computer Hardware and Software		X	X	X	X		X	X	X	X		
Database	X	X	X	X	X		X	X	X	X		
Telecommunications and Networks	X	X	X	X			X	X	X	X		X
Ethics	X	X		X	X	X	X		X			
Security	X	X	X	X			X	X	X	X		X
Decision Support Systems	X			X	X		X	X	X	X		X
Business Intelligence Systems	X		X			X		X	X		X	X
Enterprise Systems	X	X	X	X	X		X	X	X		X	
Supply Chain Management Systems											X	
Customer Relationship Management Systems											X	
System Development	X	X	X	X	X	X	X	X	X	X	X	X
Project Management	X	X			X	X						
E-Commerce	X			X	X	X		X	X	X		X
E-Business		X		X	X		X			X		
Mobil-Business		X										X
Collaboration			X									
Access								X				
Excel								X				
MS Project												
HTML/Website Development								X			X	X

Notes:

1. "X" indicates main topics covered at the chapter level

2. Books reviewed:
   Book1: Laudon and Laudon (2011)'s *Management Information Systems* (12th Edition)
   Book2: Baltzan (2012)'s *Business Driven Information Systems* (3rd Edition)
   Book3: Kroenke (2010)'s *Using MIS* (4th Edtion)
   Book4: O'Brien and Marakas (2010)'s *Management Information System* (10th Edition)
   Book5: Laudon and Laudon (2012)'s *Essentials of MIS* (10th Edition)
   Book6: Pearlson and Saunders (2012)'s *Managing and Using Information Systems: A Strategic Approach* (5th Ed.)
   Book7: O'Brien and Marakas (2009)'s *Introduction to Information Systems* (15th Edition)
   Book8: Haag and Cummings (2009)'s *Management Information Systems for the Information Age* (8th Edition)
   Book9: Bidgoli (2011)'s *MIS2* (2nd Edition)
   Book10: Oz (2008)'s *Management Information Systems* (6th Edition)
   Book11: Valacich and Schneider (2010)'s Information Systems Today: Managing the Digital World (4th Ed.)
   Book12: McNurlin, Sprague, and Bui (2008)'s Information Systems Management in Practice (8th Edition)

3. The books sampled here are the top-selling MIS books at Amazon.com as checked on March 31, 2013. We acknowledge that the popularity of a book with a particular website is subject not only to the content of the book but also to factors such as price and the release of a new edition. However, we believe that the twelve sampled books as a whole represent the pattern of IT knowledge coverage in the MIS textbook market.

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1. Please describe the position that you are planning to recruit for, including the job description, the management level, and some primary tasks.

2. Please describe the qualifications (education background and professional experiences) that you expect for a successful job candidate.

3. Please describe the IT knowledge and skills that are expected for the position, and rank them in terms of importance.

Based on interviewees' responses, additional follow-on questions were asked. Examples of these questions include the influence of the current economic crisis on hiring, the demand and the supply of qualified candidates, and the expectations for business education. Each interview lasted 20-30 minutes. All interviews were noted and the transcripts were returned to interviewees for checking before analysis. Researchers jointly coded the interview transcripts for IT knowledge and skills that were required or expected by these business recruiters.

TABLE 3
COMPANY SIZES

Company Size	Count
Small	8
Medium	14
Large	58
Not Reported	6
Total	86

TABLE 4
INDUSTRY DISTRIBUTIONS

Industry	Count
Auto Industry	25
Manufacturing other than Auto	16
Finance and Banking	5
Marketing and Business Consulting	3
Retailing and Distribution	7
Telecommunication and IT	7
Healthcare	6
Energy and Environment	6
Education and Publication	3
Non-Profit Organizations	4
Military	2
Government	2
Total	86

FINDINGS

103 open position cases were collected via interviews with recruiters. The interviews have generated rich data about IT knowledge and skills required by different business professions. The breakdown of job categories is reported in Table 5. In each job category some representative positions are listed to illustrate the scope of the data sample. The comparatively high numbers of job opening in manufacturing, operation, and supply chain management reflect the regional economic structure of the Midwest[2].

TABLE 5
JOB CATEGORIES

Job Category	Representative Job Positions	Count
Accounting	Accountant, billing manager, tax consultant	6
Finance	Financial analyst, cost analyst, banking credit specialist	7
Marketing	Marketing manager, research analyst, group sales manager, sales representative	17
Human Resources	Recruiter, benefits analyst, HR project manager	5
Operation and Supply Chain Management	Operation manager, service engineer, project coordinator, material planner	19
Manufacturing	Engineer, product manager, work management specialist, assembly technician	27
IT	IT developer, database analyst, tech supporter	15
Office Administration	Portfolio analyst, management assistant, business assistant	7
Total		103

2 The United States Midwestern region has a strong sector of manufacturing. The employment statistics from the United States Department of Labor (http://www.bls.gov/sae/eetables/tabled1.pdf) shows that in January 2013 (the latest data when the manuscript was prepared), manufacturing took a significant share of nonfarm employment in the twelve states of Midwest, ranging from 6.0% in North Dakota to 16.9% in Indiana with a weighted average of 12.6%. Some sectors of nonfarm employment, such as government, education and health services, and leisure and hospitality, may not be appealing to business students as greatly as to students of other colleges. Combined with the research design of interviewing recruiters seeking business graduates, we conclude that the sample reasonably reflects the target job market for students of business schools in the US Midwest.

Table 6 reports the management levels of these positions. About 60% of the investigated positions were at the entry level, the rest were at the middle management level. Our sample does not include any senior level positions. Probably due to the sensitivity of senior-level positions to an organization's operation status and business strategy, the participating organizations were reluctant to release information about any senior-level position opening.

TABLE 6
POSITION LEVELS

Position Levels	Counts
Entry Level	62
Middle Management Level	41
Total	103

The authors carefully examined the content of the interview scripts, and coded the suggested IT knowledge and skills into different categories. The coding was guided by the knowledge pattern of MIS textbooks concluded in Table 2. The label of each category was modified based on the language used by the interviewed recruiters. For example, Enterprise Systems, Supply Chain Management Systems, and Customer Relationship Management Systems are discussed separately in many MIS textbooks. But most of the interviewed recruiters regarded these systems either as general ERP systems, or as specific enterprise application software such as SAP that their companies had implemented for managing major business operations. We therefore used the label of ERP/SAP for the requirement of knowing these systems.

There was little dispute between the coders regarding the categorization of IT knowledge/skills revealed in the interview scripts; however, a few discussions were conducted on how to label a category to better reflect the common views of the interviewed recruiters. Ten categories emerged from the coding process.

General Computing includes basic knowledge of computers, basic knowledge of Microsoft Office Suite, and using operating systems such as Windows. *Database* covers all database-related issues, including database development and management. It also includes using particular database software other than ERP and SAP. *Project Management* covers the skills of project management, time management, and multi-task management. *Communication via IT* includes the use of emails, PowerPoint, and electronic devices (e.g., mobile devices and teleconferencing) for oral and written communications. *Internet Knowledge* covers the knowledge of web surfing and search, website development and maintenance, and social media. *Networking* involves the use of network devices and software, such as FTP. *Excel* and *Word* were singled out because

most recruiters viewed them as stand-alone skills. Other categories are self explanatory. Such a coding scheme also matches the main knowledge areas identified in our review of the introductory MIS textbooks (Table 2).

Interview responses were analyzed in aggregation[3]. Table 7 reports the frequency of each IT skill being mentioned by the sampled business recruiters. Of the ten IT-skill categories, more than half of the recruiters had expressed expectations for database, general computing, Excel, and communication via IT, suggesting that questions about the four IT skills would very likely be asked in a job interview. In contrast, 15% and 13% of the sampled recruiters had mentioned programming and networking skills respectively; the chance of having questions of the two IT skills would be low in a general job interview.

TABLE 7
FREQUENCY RANKING OF IT SKILLS

Skills	Freq.	Possibility of Being Asked	Rank
Database	71	69%	1
General Computing	69	67%	2
Excel	57	55%	3
Communication via IT	57	55%	4
Project Management	43	42%	5
Word	36	35%	6
ERP/SAP	25	24%	7
Internet	23	22%	8
Programming	15	15%	9
Networking	13	13%	10

It may not be enough to know the possibility of an IT skill being asked in job interviews; candidates will be eager to learn the extent to which recruiters count the IT skill for judging one's job qualification. A balanced analysis of the relevance of an IT skill should take into account both the possibility of being asked and the perceived importance from recruiters. Such analysis is presented in Table 8, in which we calculate the product of frequency and perceived importance (the ranked importance provided by interviewees in response to the third interview question) as the weighted relevance for each IT skill. For an easy interpretation, the results are standardized by assigning the level of 100 to the most heavily weighted IT skill.

The pattern of Table 8 is similar to that of Table 7, with an exception that the rank of database skill drops from the first in frequency counts to the third in weights. This change suggests that the sampled recruiters were looking

3 Due to the limited sample size, we could not conduct a reliable break-down analysis at industry and job category levels.

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TABLE 8
WEIGHTED RANKING OF IT SKILLS

Skills	Weights	Rank
General Computing	100	1
Excel	89	2
Database	85	3
Communication via IT	84	4
Project Management	57	5
Word	54	6
ERP/SAP	34	7
Internet	25	8
Networking	18	9
Programming	18	10

for working knowledge rather than mastery of database from job candidates.

DISCUSSION

The importance of IT knowledge and skills to one's career success is widely accepted (He and Freeman, 2010). The study provides further evidence that one may not be able to start a career without knowing IT. All the sampled recruiters agreed that IT knowledge and skills should be significantly considered during the hiring process. One recruiter observed that "90% of what our engineers do is on computer." Another recruiter pointed out that "people with advanced technical skills seem to excel at the job." In a rare case, one recruiter admitted ignorance on the issue: "It's interesting how important these skills are to our work but honestly I've never thought about it before ... I just assume that most people have IT skills and if they don't I assume they can be taught pretty easily."

Implications for Job Applicants

This study investigates today's IT requirements for job applicants. Findings of the study suggest that questions of database, general computing, Excel, and communication via IT are likely to be asked in job interviews. Often it is the answer of an IT-skill question that sets a job candidate apart from the large pool of applicants. One recruiter noted that most applicants had prepared well for common questions such as personal weakness and strength, but failed on Excel questions. She further commented that "a person who really knows Excel stands out of the crowd."

The importance of having database skills and project management skills needs further attention. The requirement of database skills reflects a reality in which business operations have been largely digitalized. For example, for

a marketing position, a recruiter described the primary tasks as dealing with "the input of customer orders, distribution of supplies, payment and collection dates, and databases housing their ... data sheets." It is common in the workplace, remarked another recruiter, that "managers are constantly training themselves on ... the company's proprietary applications and databases." In many cases, familiarity with Microsoft Access was mentioned as a proxy for one's knowledge of database. In a small company, the recruiter admitted that "knowledge in Access is crucial because this is the main database for established customer information here."

Having project management skills was required by 42% of the sampled recruiters for successful job candidates. Unlike the way we define project management in academic research, business recruiters interpret the term with broad meaning that covers the ability to schedule product deliveries, manage business processes, work under pressure, cope with multiple tasks, facilitate teamwork, motivate colleagues and keep good relationship with different management levels. This reflects the fact that many companies have adopted project-based team structures in the workplace. Such a broad and practical set of skills can hardly be assessed during a brief interview. However, most recruiters mentioned that experience with MS Project or similar project management software could be used as the indicator.

Less than 30% of the sampled recruiters mentioned ERP/SAP, Internet, programming, and networking skills in their expectations for successful candidates. This finding is contradictory to our original expectations. With many of the sampled companies being in the manufacturing sector, we predicted that specialist technical skills (Leitheiser 1992) such as ERP and networking would be required. An in-depth analysis of the interview transcripts suggests that this result should be taken with caution. We found that most recruiters would not ask questions about ERP/SAP when interviewing job candidates unless some integrated enterprise systems had been implemented in their organizations. For organizations where ERP/SAP was in the workplace, recruiters admitted that showing adequate knowledge of ERP/SAP would no doubt give a job candidate the edge; however, many of the recruiters also stated that training for the special integrated enterprise systems would be provided at work, therefore knowledge of ERP/SAP would not be a determining factor for them to make hiring decisions. Similar phenomena exist for programming and networking knowledge. As for Internet skills, we found that marketing positions asked for them most frequently. One recruiter remarked that "beyond that (of classical marketing knowledge) we need someone who understands websites, social networking sites, online marketing, etc." Thus, we conclude that in general the

technical knowledge and skills of ERP/SAP, Internet, programming, and networking are more of a differentiator rather than a requirement in the recruiting process.

Implications for Education

This study attempts to depict the overall IT requirements raised from the business world. The findings provide strong implications for MIS education. First, we should assure that our curriculum has a broad coverage of IT knowledge and skills that are highly expected by companies. Secondly, we need to understand that different business requires different IT skills. Broad knowledge of IT including general computing and communication via IT will help a student enter the competitive job market; mastery of particular applications such as Excel, MS project, ERP/SAP may help the student stand out from the crowd. The two aspects should be treated with balance in our curriculum.

Our review shows a certain level of consistency in terms of the foundation knowledge of IT among introductory MIS textbooks. However they differ in coverage of more specific applications. Findings of the study will help MIS authors develop textbooks that better meet industry requirements. For example, the introduction and exercise of certain applications, such as MS Access and MS Project, should be incorporated in the book. Students should be able to access more in-depth knowledge either by optional supplemental material or follow-up elective courses. The mastery of these particular applications will be recognized by business recruiters as valid indicators for meeting certain requirements. We do realize that with the rapid advance in IT and the ever-changing nature of IT profession, a regular update to the content of textbooks is needed.

Implications for Research

Although it is not our focus, the study provides implications for the research of IT influence in workplace. Current measures for one's IT-related abilities have focused largely on the use of computers and computing applications. Taking computer self-efficacy as an example, the concept is deemed an appropriate construct for understanding people's reactions to IT or IT-based applications (Marakas et al., 2007). Findings of the study suggest that a broader range of IT knowledge and skills are required in business. Narrowing our attention on the use of computers may limit the research in the future. This study provides guidelines for designing new measures of IT ability with dimensions that are relevant to current business reality.

LIMITATIONS

The study has several limitations. One is the geographical limitation of the sample population. In the study, participating organizations were selected from the Midwestern United States with cultural and economic characteristics that are different from other areas of the U.S. and other countries. From the point of view of employment, survey data from the US Department of Labor, as illustrated in Figure 9, suggests that the job market of Midwest differs from that of other regions notably in the sector of manufacturing. Thus, the research findings should be interpreted with caution.

Note: The statistics was calculated based on the employment survey data of January 2013 from the United States Department of Labor

In the study, participating firms were selected from local organizations that had internship or other collaboration

TABLE 9
EMPLOYMENT PATTERN BASED ON THE
US DEPARTMENT OF LABOR SURVEY DATA

	Northeast	South	Midwest	West
Construction	3.4%	4.6%	3.6%	4.5%
Manufacturing	7.5%	7.7%	12.6%	7.8%
Trade, transportation, and utilities	18.5%	19.3%	19.2%	18.9%
Financial activities	6.7%	5.5%	5.8%	5.5%
Professional and business services	13.5%	13.4%	12.5%	14.2%
Education and health services	19.6%	14.1%	15.7%	13.2%
Leisure and hospitality	9.2%	10.4%	9.2%	11.7%
Other services (except public administration)	6.6%	7.3%	6.0%	6.9%
Government	15.0%	17.7%	15.4%	17.3%
Total	100.0%	100.0%	100.0%	100.0%

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programs with the researchers' university. This approach resulted in high level of participation. However, the data was not a random dataset, which may limit the generalizability of our findings. On the other hand, such a sampling frame targets firms and job openings that are believed to be relevant and appealing to business students. However, other less-favorable job areas, such as low-pay operational level clerks, are largely ignored. The small sample size may raise another concern. In the study, data were collected from interviews with 86 business recruiters on 103 job openings. The limited sample size allows the data to be analyzed only in aggregation. Future research that incorporates larger sample sizes will allow other in-depth investigations such as break-down analysis at industry and job category levels. Results from such research will help design special IT education programs tailored for different majors and career requirements.

CONCLUSION

Understanding IT-related knowledge and skills for different business occupations "is especially important for IS academics since it directly influences what we teach our students" (Cash et al 2004, p. 60). This study is another endeavor to enrich our understanding of IT knowledge and skills with special interests in the requirements of non-IT business professions.

Semi-structured interviews were conducted with 86 hiring companies in the Midwest United Sates. Questions were centered on the required or preferred IT knowledge and skills for a target position. Data from a total of 103 job openings were collected. Recruiters widely agreed that IT knowledge and skills should be significantly considered during the hiring process. Ten categories of IT skills were identified from the interviews. These IT skills are ranked in terms of frequency, perceived importance, and their relevance to the business.

Today, the proliferation of IT imposes strong requirements of IT knowledge and skills on business professionals across all occupations. Thus, we need to deliver IT knowledge and skills in an efficient and effective way to help our students gain an edge in the competitive job market, and eventually achieve success in their future career. However, our curriculum, such as the one recommended by the Association for Computing Machinery and the Association for Information Systems (Topi et al., 2010), focuses on students who major in MIS; the special needs of non-MIS majors are not well addressed. As MIS educators, it is a challenge as well as our responsibility to make appropriate adjustments in the MIS curriculum. We should encourage our students to take MIS courses, deliver IT knowledge and skills that are relevant to business,

and prepare our students for the challenge of IT-enabled global economy.

We hope the study will help MIS educators convince students of the importance of learning IT, and guide the selection of MIS courses regardless of their majors. Indeed, the necessity of increasing MIS education does not come from IS educators; rather, business recruiters are speaking out with their raised expectations of advanced IT skills for job candidates.

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