

## An Analysis of Required Information Technology Competence for MIS Students in Taiwan's Universities

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**Abstract.** Information technology (IT) competence has become one of the critical factors for students of management information systems (MIS) if they wish to be successful in their career. However, little research has been conducted on the required IT competence for MIS students after they graduate from colleges/universities. Hence, the purpose of this study was to identify the required IT competence for MIS students in Taiwan's universities, and to provide important implications for Taiwan's MIS education. Through a 2-round qualitative Delphi study and a large sample survey, seven dimensions of IT competence including 44 ability items were proposed. The seven dimensions are (1) access to IT knowledge, (2) current and emerging technologies, (3) experience, (4) basic computer skills, (5) applications, (6) cognition, and (7) management of IT. The ability to access to IT knowledge was considered to be the most important dimension of IT competence according to the respondents. Finally, this study discusses the implications of the results for Taiwan's MIS education research and practice.

**Keywords:** IT competence, Delphi study, MIS education

### 1. Introduction

The continuing progress of computer technology has provided a great impetus for expanding information technology (IT) education and practices. Computers, communications, digital information, and software – the constituents of the information age – are everywhere. IT is playing an increasingly important role in the way we work and in our everyday lives. According to Lin [9], individuals may have many different rationales for wanting to learn about how to use IT: (1) A personal rationale is that the use of IT can enhance the quality of life; (2) A workforce rationale is that IT is increasingly common in today's workplace; (3) An educational rationale is that IT is an enabler for many new types of educational opportunities; and (4) A societal rationale is that in today's increasingly technological society many public policy debates are connected to IT. Moreover, being proficient at IT is becoming a critical factor for academic and career development. Individuals with low IT competence may have less career opportunities than those with a higher IT competence. Furst-Bowe et al. [5] suggested that students should acquire strong computer competence if they wished to be successful in many academic careers in the future. Sufficient skills and knowledge of IT are especially necessary for students majoring in management information systems/information systems (MIS/IS) if they hope to succeed in their future career paths. Consequently, colleges/universities are responding aggressively to a dynamic, constantly evolving IT environment by reexamining their curriculum designs to ensure they deliver an adequate IT education for MIS students. However, the question remains; what IT competence should a university student with an MIS/IS major (henceforth, "MIS student") possess when he or she graduates from school?

Much of the literature on IT education has suggested that there is a need to reexamine the content and delivery of IT education in light of the new initiatives in an ever-changing and evolving environment, and that there is a lack of consensus on the IT competence issue by both academia and the practitioner [1][2][4][5][6][7]. Employers expect their newly hired MIS graduate to possess sufficient IT competence.

Business practitioners share the view of academicians regarding the growing demand for IT education. Concerns have been raised by business executives and educators as to the level of knowledge and skills that are required for IS professionals to function effectively in today's changing technological and business environments. They also have raised the issue that the university curriculum must be revised to meet the changing needs of the profession [10][17]. Although both college faculty members and business executives expect students to possess adequate IT competence and knowledge, little research has been conducted as to what kind of IT competence the MIS students should have. Thus, the main purpose of this study was to examine the required IT competence for MIS students in Taiwan's universities. Based on the opinions obtained from academics and business practitioners, this study developed a consensus on the issue of required IT competence for Taiwan's MIS students. A qualitative Delphi study and a quantitative survey were used sequentially to determine the IT competence dimensions and items and their relative importance. The results of this study can help MIS students prepare for their future IT-related careers, as well as provide several important implications for the IT education system and related research.

## **2. IT Competence**

Polanyi [12] considered two types of knowledge: explicit and tacit. Explicit knowledge is the formal knowledge that can be clearly transmitted using systematic language. This type of knowledge, by itself, is not sufficient to describe competence. The ability to perform well is tacit knowledge, or "know-how" [8][13]. Practice, or experience, where the individual modifies his action based on the results of previous actions, builds competence through the enrichment of know-how [13]. Thus, the knowledge-based approach to competence has explicit and implicit categories. Bassellier et al. [1] developed a comprehensive model of the two categories of IT competence: explicit and tacit knowledge. In that model, the dimensions of explicit knowledge encompass technology, applications, systems development, management of IT, and access to IT knowledge; while tacit IT knowledge consists of experience and cognition. This provides a more comprehensive view with respect to IT competence than both computer literacy and information literacy. Thus, the Bassellier et al.'s [1] framework of IT competence was adopted in this study for classifying several IT ability items into different IT dimensions.

## **3. Discussion**

This study attempted to investigate the required IT competence for MIS students from the point of view of experts in the field of MIS/IS education and IS work practice. Through a two-round Delphi study and a large sample survey, a 7-dimension, 44-item IT competence model was proposed. Based on the results of this survey, the rankings for the seven critical dimensions of IT competence were (1) access to IT knowledge, (2) current and emerging technologies, (3) experience, (4) basic computer skills, (5) applications, (6) cognition, and (7) management of IT. This model is generic in nature and is not directed towards a particular type of technology, organization, or industry. The findings suggested that the ability to "access to IT knowledge" was considered the most critical IT competence for MIS students. Further discussions about the seven dimensions are as follows.

### **3.1. Access to IT Knowledge**

This dimension received the most attention from the respondents and had the highest mean score of importance in comparison with the other six dimensions. That is, many experts considered "access to IT knowledge" to be very important for MIS students. It is unreasonable to expect that an MIS student knows everything about IT. However, it is important for students to know something about sources of information – human and otherwise – both inside and outside the organization. Based on the results of the survey, the item "knowledge of secondary sources of IT knowledge (e.g., Internet, journals, and conferences)" was judged by respondents as being the most important in this dimension. Many respondents also considered that knowledge of IT-knowledgeable people outside/within the organization is critical for MIS students. A person, who knows whom to contact to get more information about IT and secondary sources of knowledge, increases his or her level of competence by developing the capabilities to use other people's knowledge [1]. So the ability to get IT information timely and effectively has become even more important than possessing IT skills and technical competence.

### **3.2. Current and Emerging Technologies**

This dimension of current and emerging technologies was ranked as the second most important IT competence by respondents. The knowledge of current and emerging technologies is generic to all industries and organizations [1]. The survey results showed that some critical technologies such as database management systems, computer networks, computer programming, computer security, operating systems, distributed systems, computer organization and architecture, and multimedia systems should be given much attention. The burden of effectively dealing with complexities and uncertainties associated with new technologies and ensuring the smooth adoption and operation of these technologies within an organization invariably rests on the shoulders of MIS students, who will be the IT professionals and managers of the future.

### **3.3. Experience**

In addition to the knowledge and the skills of personnel, experience is a distinctive competence that helps companies obtain a competitive advantage [16]. The respondents as a whole suggested that MIS students should cultivate more IT experience during their time as a university student. One important implication of our findings is that the IT curriculum must be designed to help MIS students develop their experience in IT projects. This may require the cooperation between MIS education institutes and IS practitioners. For example, businesses could provide some IS work practice opportunities for MIS students during the summer/winter vacation. In addition, the IT curriculum must meet the career objectives of MIS students so as to facilitate their future career success.

### **3.4. Basic Computer Skills**

Being familiar with basic computer skills is necessary for MIS students to be proficient in advanced information technology. An MIS student should be aware of the basic computer skills he or she may need in future work. The results of our study indicated that designing Web pages and using Internet application tools as well as office automation tools were categorized into the dimension of basic computer skills, with Web page design being considered the most important one within this dimension.

### **3.5. Applications**

Applications refer to the ways IT is used or can be used by organizations to achieve their business goals [1]. Experts in the field of MIS/IS education and work practice suggest that an MIS student should be proficient at business applications concerning electronic commerce, management information systems, customer relationship management, knowledge management systems, enterprise resources planning, inter-organizational systems, decision support systems, strategic information systems, group support systems, and supply chain management. Now that we are in the Internet age, knowledge concerning electronic commerce is considered the most important in the application dimension of IT competence. This is due to the fact that Web technology may require a new round of re-engineering of the primary infrastructure, leading to a faster turn-around of customer orders, enhanced customer support, improvements in the product unit-cost structure and a shorter time to market for new products [3].

### **3.6. Cognition**

Cognition refers to the working models of the world formed by an individual [1]. These models offer a perspective for the individual to perceive and define his/her world and act as a guide [8][11]. Thus, it is important for an MIS student to have the ability to see beyond the task and visualize the impact of IT on various organizational variables. Developing an understanding of the impact of IT on business process, organizational change, intra-organizational and industrial structure, individuals and roles, business strategy, power structure, and culture was thought as a critical IT competence by the respondents. These cognitions include (1) a perspective on how IT can influence organizational transformation and (2) a vision of how IT can be strategically used to gain a competitive advantage for an organization. Individuals with this knowledge can help their organizations implement IT/IS in a more successful fashion.

### **3.7. Management of IT**

Good IT management is composed of activities regarding IT visions and goal setting, allocation of resources and monitoring of the progress [1]. IT vision regarding how IT contributes to business value, and awareness of the integration of business strategic planning and IT strategic planning reflects competence [14]. Silver et al. [15] included knowledge of a firm's strategic planning, IT planning, and resource allocation in their list of required knowledge elements. In this study, knowledge of building an e-business, business strategic planning, establishing IT strategy, policy and vision for a business, the critical success factors for IT/IS implementation, carrying out software outsourcing, strategic information systems planning, and knowledge of purchasing a software package were proposed as indicators that could be used to assess an individual's competence in IT management.

In summary, the fluid state of the environment has placed a new demand for reforming the MIS curricula that might be beyond the capabilities of a single, discipline-oriented academic department within a university. The curriculum design of the MIS program needs the cooperative efforts of educators and practitioners, and will require interdisciplinary approaches cutting across several departments. The MIS educators must consider their educational missions and must not be constrained by traditional academic biases when attempting to design effective curricula to match the needs of the targeted students. The findings of our study can offer a concrete and clear direction for the MIS education development.

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