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Encouraging IS developers to learn business skills: an examination of the MARS model

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Abstract

Purpose – Though prior research has recognized business skills as one of the keys to successful information system development, few studies have investigated the determinants of an IS developer's behavioral intention to learn such skills. Based on the motivation-ability-role perception-situational factors (i.e. the MARS model), the purpose of this paper is to argue that the intention of IS developers to acquire business skills is influenced by learning motivation (M), learning self-efficacy (A), change agent role perception (R), and situational support (S).

Design/methodology/approach – Data collected from 254 IS developers are analyzed using the partial least squares technique.

Findings – Results show that a developer's intention to learn business skills is positively influenced by intrinsic learning motivation and both absolute and relative learning self-efficacy. Furthermore, in comparison to two other change agent roles, the advocate role leads to a significantly higher level of learning intention. Finally, work and non-work support positively influence both extrinsic and intrinsic learning motivation. Notably, non-work support has a greater impact on both absolute and relative learning self-efficacy.

Research limitations/implications – Though many of the proposed hypotheses were supported, results showed several interesting and unexpected findings. First, regarding the change agent role perception, people who perceived themselves as advocates displayed a higher level of intention to learn business skills than did those who identified with the other two roles (i.e. traditionalist and facilitator). Second, when compared to extrinsic learning motivation, intrinsic learning motivation contributed more to the intention to learn business skills. Third, the study contributes to the literature by finding that, in terms of direction and magnitude, the two types of self-efficacy have similar influence on an IS developer's behavioral intention to learn business skills. Finally, work support was found to have a positive impact on both extrinsic and intrinsic learning motivation. However, it was interesting to note that work support did not lead to significantly higher level of relative and absolute learning self-efficacy.

Practical implications – The findings of this study provide several critical implications for practitioners seeking to encourage IS developers to learn b-skills. First, organizations should strongly encourage IS developers to take on the advocate role in ISD projects, and urge them to acquire business skills through formal education and on-the-job training. Second, organizations should also help IS developers understand how learning business skills is important for their future work and potential self-growth, rather than focusing solely on extrinsic benefits such as promotion or remuneration. Third, organizations can also make use of the strategies to enhance IS developer's learning self-confidence and beliefs, which will, in turn, increase their intention to learn business skills. Finally, support from others is influential in the formulation of positive work attitudes and behaviors, so organizations will benefit when employees are well supported.

Originality/value – While prior research has emphasized the importance of business skill possession for IS developers during the system development process, few studies have explored the factors affecting an IS developer's behavioral intention to learn those business skills. This study intends to bridge this gap by investigating factors that drive IS developers' intention to learn business skills. The findings of this study are useful to researchers in the development and testing theories related to IS developer learning behavior, and to practitioners to facilitate business skill learning for their IS development staff.

1. Introduction

Information systems development (ISD) involves the analysis, design and implementation of information technology (IT) to support business functions (Xia and Lee, 2005). Developing an information system (IS) is an interactive process between IS developers and their business partners/clients (Park and Lee, 2014). Challenges arise as IS developers attempt to assimilate new technologies and search for more cost-effective IT solutions for business problems. ISD projects are typically complex, dynamic, and unstructured (Schwalbe, 2007; Yeo, 2002). Implementing an ISD project also requires communicating and disseminating knowledge and expertise from different functional domains (Lee *et al.*, 2014; Tesch *et al.*, 2009). The development effort may stumble or even fail if IS professionals and their business partners/clients do not understand each other's professional languages and domain knowledge (Park and Lee, 2014). Common examples include IS developers failing to understand business workflow and users' specific needs (Joshi *et al.*, 2007), and users not understanding either the constraints or the possible applicability of a particular technology (Ko *et al.*, 2005; Rus and Lindvall, 2002). Laudon and Laudon (2006) described such phenomena as the "user-designer communications gap" which not only affects the quality of an IS (Klein and Jiang, 2001) but also hinders the future business relationship between the IS developers and the users. Therefore, management information systems (MIS) literature has considered critical the clearing of any obstructions to knowledge integration among IS developers and users from different business functional domains (Deng *et al.*, 2015).

In response to this, we argue that for the success of ISD projects and the overall competitiveness of organizations, IS personnel need to possess business skills (a.k.a. "b-skills") in addition to technical skills. We consider business skills to be comprised of industry and functional area knowledge, management and organizational skills, and interpersonal/communication skills (Todd *et al.*, 1995). By acquiring additional skill sets, IS personnel can help reengineer business processes, identify business problems, and apply appropriate technical solutions (Deng *et al.*, 2015; Sullivan-Trainor, 1988).

As technology increasingly intertwines with business operations, the importance and value of equipping IS personnel with b-skills have been highlighted not only by practitioners but also academics. For example, a Google search of "IT personnel and business skills" generates 17,900,000 results. Luftman *et al.*'s (2009) survey of 291 organizations of the Society for Information Management found that "Build Business Skills in IT" was second only to "IT and Business Alignment" in a ranking of the most important management concerns. Another interesting feature of the report was that, of the top 15 skills sought by IT executives when hiring entry level IT personnel, only three were technical. Non-technical skills are obviously considered important for new hires at both the executive and operational levels. Similarly, other studies have suggested a growing need for IS personnel to acquire industry knowledge and skills in

the fields of management, marketing, finance, etc. (e.g. Alshare *et al.*, 2011; Bartol and Martin, 1982; Benbasat *et al.*, 1980; Connelly *et al.*, 2000; Hawk *et al.*, 2012; Pee *et al.*, 2010; Wilkerson, 2012; Zaccaro, 2001). Educators and scholars have responded to the demands of the industry by helping students develop adequate skill sets for future jobs. For example, the IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems highlighted that MIS graduates should be equipped with not only IS-specific knowledge and skills, but also foundational business knowledge and skills (e.g. communication, leadership, and collaboration), and business domain fundamentals (e.g. evaluation of performance within a domain) (Topi *et al.*, 2010).

Despite the importance of b-skills, encouraging IS personnel to acquire such skills remains challenging. Gaps between industry expectations and the abilities of IS graduates have been documented (Trauth *et al.*, 1993; Haddan, 2002; Radermacher and Walia, 2013). There are several reasons why business skills are relatively scant among IS personnel. First, traditional education still focuses more on technical skills than non-technical skills (Luftman and Kempaiah, 2008), which results in a belief commonly shared by IS personnel that technological advancement alone is enough to make an IS successful and that users will love using any system based on innovative technologies (Park and Chen, 2007). This belief, to some extent, reflects a narrowly-focussed role perception common among many IT professionals. Many view themselves as technicians who provide solutions or services based on client requests rather than as influential champions who identify what clients really need and persuade them to adopt the appropriate IS. Second, IS personnel tend to have a strong professional identity, so that they self-identify with their highly professional knowledge, skills, and abilities (a.k.a. "KSAs") more closely than they do with their memberships in organizations (Hofstede, 1998). As a consequence, if KSAs associated with other disciplines are not factored into their performance appraisals, they may choose to improve their professional, IT-related KSAs rather than engage in "inter-disciplinary learning." Finally, rapid changes in technology cause IS personnel to experience relatively more work-related stress in comparison to workers in other functional domains (Moore, 2000). They must constantly update their knowledge of new technologies and/or new programming languages. Without additional support from the organization (e.g. in the form of time and financial resources), they may be less likely to invest time and energy to learn non-IT-related business skills.

As more IS development projects fail because of poor internal communication and the absence of an influential champion and change agent (Markus and Benjamin, 1996), understanding the factors that promote an IT developer's intention to acquire business skills becomes particularly important. While prior research has emphasized the importance of b-skill possession for IS developers during the system development process (Barki and Hartwick, 2001; Deng *et al.*, 2015; Joshi *et al.*, 2007; Todd *et al.*, 1995), few studies have explored the factors affecting an IS developer's behavioral intention to learn those business skills.

This study intends to bridge this gap by investigating factors that drive IS developers' intention to learn business skills. Using the MARS model (McShane and Von Glinow, 2005) as our foundation, we include a wider range of individual factors (i.e. change agent role perception, relative and absolute learning self-efficacy, and extrinsic and intrinsic motivation) and situational factors (i.e. work and non-work support). The findings of this study are useful to researchers in the development and testing of theories related to IS developer learning behavior, and to practitioners to facilitate business skill learning for their IS development staff.

The remainder of this paper is organized as follows. The next section reviews relevant streams of literature. A research model and a set of hypotheses are then proposed, followed by descriptions of the construct measures and data collection methods used in this study. Next, the results of the data analysis and hypothesis testing are presented. The paper concludes with a discussion of the theoretical and practical implications of the findings regarding IS developer business skill learning behavior.

2. Theoretical foundation

McShane and Von Glinow (2005) proposed the MARS model as a useful conceptual framework to understand what drives individual behavior and results. In the MARS model, individual behavior is a factor of motivation (M), ability (A), role perceptions (R), and situational factors (S). This model has been used to highlight how the four factors directly influence a person's voluntary behavior and the subsequent outcome (McShane and Von Glinow, 2009). Previous studies have assumed and empirically confirmed that learning intention precedes employees' actual participation in learning activities (e.g. Ajzen and Fishbein, 1980; Ajzen, 1991; Kim and Hunter, 1993; Maurer *et al.*, 2003). Several researchers have also found a positive relationship between employees' prior participation in learning activities and their learning intentions (e.g. Bates, 2001; Kyndt *et al.*, 2011; Maurer *et al.*, 2003; Renkema, 2006). The relationship between actual participation in learning activities and learning intention appears to be reciprocal in nature (Kyndt *et al.*, 2014). For instance, when employees wish to advance in their career, they might recognize their need to learn additional skills. According to Zwieg *et al.* (2006), IS personnel with a balance of technical and business skills is not found in the typical freshly minted undergraduate. Those who have strong business skills almost through the experiences they gained over many years and many projects in the workplace. However, the increasing emphasis on equipping IS personnel with business skills seems to suggest that actual b-skills learning behaviors may not be prevalent among IS personnel. Accordingly, instead of measuring the low level of actual b-skills learning behaviors of some participants, we focus on the learning intention of IS developers as the precedent of actual b-skills learning behavior.

The first element in the MARS model is motivation, which refers to internal forces that affect the direction, intensity, and persistence of one's voluntary choice of behavior (Campbell and Pritchard, 1976). Direction implies that the motivation is goal-oriented, not random. People are motivated to arrive at work on time, finish a project before the due date, or accomplish set goals. Intensity is the amount of effort allocated to goal attainment. Motivation also involves a level of persistence to sustain the effort over a certain period of time. The level of persistence varies: employees may sustain their efforts until they reach their goal, or they may give up beforehand. Note that motivation can come from both external and internal sources (Deci and Ryan, 1985). We believe that both extrinsic and intrinsic motivation influences IS personnel's intention to learn b-skills.

The second element in the MARS model is ability, which refers to both the natural aptitudes and learned capabilities required to successfully complete a task (McShane and Von Glinow, 2005). Aptitudes are the natural talents that help employees to learn specific tasks more quickly and to better perform those tasks. Many different physical and mental aptitudes can affect an individual's ability to acquire skills. Learned capabilities are skills and knowledge that an individual currently possesses. Though having the actual ability is important for individual performance, Bandura (1986) maintained that confidence in one's abilities – known as self-efficacy – often plays a more pivotal role than ability in predicting how well one learns a new subject or learns

in unfamiliar situations. Although a person may have the capabilities required to perform certain tasks, he may choose not to do them if he believes that he is unable to perform them. For example, Al-Eisa *et al.* (2009) studied training effectiveness and found that trainees who are highly confident in their ability to learn the training content are more likely to believe in their ability to apply their newly-gained knowledge and skills on-the-job after training is complete. In addition, Switzer *et al.* (2005) found that trainees with low self-efficacy are less likely to be open to new situations, limiting their ability to benefit from a training experience. Similarly, we believe that b-skills are a new knowledge domain for IS personnel and, therefore, it would be reasonable to use self-efficacy rather than actual ability as a predictor of their b-skills learning intentions.

Judgments of efficaciousness differ in terms of three distinct yet interrelated dimensions: magnitude, strength, and generalizability. First, the magnitude of self-efficacy refers to the level of task difficulty one believes is attainable. Individuals with a high magnitude of self-efficacy believe that they are able to accomplish difficult tasks, while those with a low magnitude of self-efficacy believe they are able to execute only simple forms of the behavior (Compeau *et al.*, 1999). Second, the strength of self-efficacy refers to the level of conviction regarding the judgment. It also reflects the individual's ability to resist being influenced by information which appears to disconfirm the individual's self-efficacy (Brief and Aldag, 1981). Individuals with a weak sense of self-efficacy are more easily frustrated by obstacles and react to a situation by lowering their perceptions of their capability. In contrast, individuals with a strong sense of self-efficacy are not deterred by difficult problems and retain their sense of self-efficacy (Compeau and Higgins, 1995). Third, the generalizability of self-efficacy refers to the extent to which perceptions of self-efficacy are limited to particular situations. Individuals may believe they are capable of performing a given behavior only under certain circumstances, while others may believe they can execute the particular behavior under any circumstance, and also perform behaviors that are slightly different (Compeau and Higgins, 1995). In light of this distinction between general and specific self-efficacy (Multon *et al.*, 1991), we focus on learning efficacy as a specific form of self-efficacy that will influence IS developers' behavioral intention to learn.

The third element in the MARS model is role perception, which refers to the extent to which people understand the job duties (roles) assigned to them or expected of them (McShane and Von Glinow, 2005). A clear role perception helps workers understand the tasks assigned to them, the relative importance of those tasks, and the preferred behaviors for accomplishing them (Ivancevich and Donnelly, 1974). Unfortunately, many employees do not have a clear perception of their role (McShane and Von Glinow, 2005). In IS development, for example, some developers perceive their role as "technical personnel," so they focus mainly on the technical aspect of an IS without interacting with the system users in the decision-making process. This narrow perception of the role results in many IT failures and reduces IS credibility (Markus and Benjamin, 1996). However, when developers perceive their role as "change agent," they value their clients' informed choices and recognize the criticality of communicating with users. As a result, they not only add business value but also enhance IS credibility (Markus and Benjamin, 1996). We believe that different role perceptions influence IS developers' b-skills learning intentions, depending on whether they perceive that acquiring b-skills helps them perform their job.

The last element in the MARS model is situational factors, which are environmental conditions outside of the individual's immediate control (e.g. time, people, budget, and physical work facilities). We chose situational support – from both work and non-work domains – as a primary factor that influences IS developers' intention to learn

business skills. Sources of work support include the organization, the supervisor, and coworkers; sources of non-work support include family, friends, and non-work peers. Research on perceived organizational support has shown that support has a variety of positive impacts on the organization as well as on individual workers, including job satisfaction, employee retention, and motivation to learn (Al-Eisa *et al.*, 2009; Rhoades and Eisenberger, 2002; Switzer *et al.*, 2005; Tracey *et al.*, 1995). The social support literature has also maintained that support from the non-work domain (e.g. spouse) has a cross-over effect on outcomes in the work domain (Takeuchi *et al.*, 2002; Westman and Etzion, 1995). Therefore, we include both domains of support to explain IS developers' learning intentions. Furthermore, prior findings indicated that the relationship between situational factors and behavioral intention is mediated through a number of different individual motivation and ability (Maurer *et al.*, 2003, 2008). Although there are several alternative pathways between situational factors and behavioral intention, our research regards situational factors as an antecedent of intermediary (i.e. motivation and ability) rather than simply as independent variable of behavioral intention.

The MARS model explicitly indicates that motivation, ability, role perception, and situational factors affect all conscious workplace behaviors and worker performance outcomes (McShane and Von Glinow, 2005). If any of the four factors is absent, employees' behavior will be affected. Most prior studies examined employees' learning intention and behavior from a single perspective: either motivation, ability, or situation. We aim to fill the gap in the literature by using a comprehensive view (i.e. the entire MARS model) to look into four specific influencing factors and the relationships among antecedents of IS developers' b-skills learning intention.

3. Hypothesis development and research model

The research model shown in Figure 1 provides a comprehensive view of the individual and situational factors that drive IS developers' intention to learn business skills.
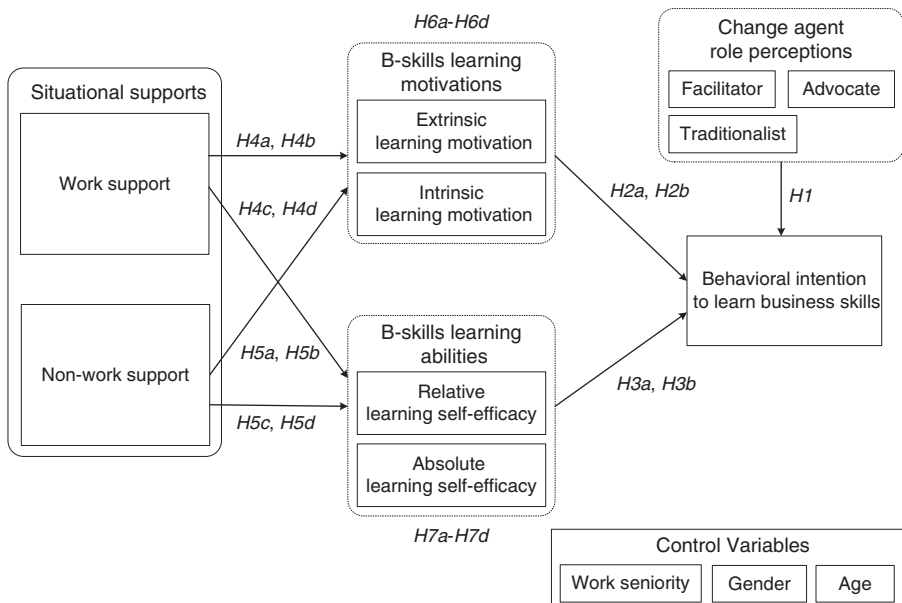

Figure 1.
Research model

This model suggests that situational support (work and non-work support), learning motivation (extrinsic and intrinsic motivation), learning self-efficacy (relative and absolute learning self-efficacy), and change agent role perception (facilitator, advocate, or traditionalist) directly and indirectly influence the behavioral intention to learn business skills. The relevant theories described below were used to develop our proposed hypotheses.

3.1 Conceptual definition of business skills

The emphasis on training IS personnel with business skills is driven by practicality. Demands from employers are evident from both IS personnel job advertisements and recent guidelines for curriculum design. For example, Todd *et al.* (1995) analyzed job advertisements for IS personnel (i.e. programmers, system analysts, and IS managers) across two decades. They identified three main knowledge/skills categories: technical, systems, and business. The technical knowledge/skills category is comprised of specific knowledge and skills related to hardware and software. The systems knowledge/skills category captures problem-solving skills, including analytical and modeling skills, knowledge of development methodologies, and systems analysis/design tools and techniques. The business knowledge/skills category is similar to the generalist/ managerial category of previous studies and includes industry and functional are a knowledge, management and organizational skills, and interpersonal/communication skills. Under the broad category of business knowledge/skills are three skill sub-categories: business, management, and social. Business skills include functional expertise (e.g. finance, marketing) and industry expertise (e.g. retail, mining). Management skills refer to general management skills, including leadership, project management, planning, controlling, training, and organization. Social skills pertain to interpersonal skills, communication skills, personal motivation, and the ability to work independently.

Similarly, the IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems (developed by the Association for Computing Machinery and the Association for Information Systems) suggested that MIS personnel should be equipped with three skill sets: "IS specific knowledge and skills, foundational knowledge and [business] skills, and [business] domain fundamentals" (Topi *et al.*, 2010). The first skill set is conceptually similar to technical skills as proposed by Todd *et al.* (1995). The second skill set, foundational knowledge and business skills, includes leadership and collaboration, communication, negotiation, and analytical and critical thinking (including creativity, problem solving, and ethical analysis). The third skill set, business domain fundamentals, refers to knowledge and skills regarding general business models, key business specializations, and the evaluation of business performance. In contrast to the knowledge/skill categories presented by Todd *et al.* (1995), the second and third skill sets in the IS 2010 Curriculum Guidelines also covered business and system knowledge/skills.

Note that the competency approach to personnel selection (Lado and Wilson, 1994) normally treats knowledge and skills as a cluster, since they represent different facets of worker competency. For this reason, we do not distinguish knowledge from skills, despite the conceptual differences between them. Furthermore, the term "b-skills" captures both the business knowledge and skills identified by Todd *et al.* (1995). Since the term "business skills" is so common and yet means different things to different groups of people, when we administered our questionnaires, we gave examples of what we meant by business skills (including examples from Todd *et al.*'s (1995) three sub-categories under business knowledge/skills), and asked respondents to answer accordingly.

3.2 Change agent role perception and learning b-skills

In the MIS literature, the work of IS developers has been classified in terms of the responsibility for managing change during an IS development project (Allen, 1995; Beath, 1991; Block, 1981; Markus and Benjamin, 1996). Several studies have examined the influence of the MIS specialist's change agent role on IS success (e.g. Allen, 1995; Beath, 1991; Block, 1981; Gable, 1991; Markus and Benjamin, 1996; Markus and Keil, 1994; Ryan and Deci, 2000). Markus and Benjamin (1996) proposed a change agency model that identifies three change agent roles for the IS specialist: the traditionalist, the facilitator and the advocate. These roles can be applied to IS developers.

First, ISD traditionalists believe that most organizational change is caused by technology, and their role is to build technology (e.g. IS) that causes change. They act like technicians, providing expertise only from within their own functional domain. They perceive their role as serving the objectives of others (e.g. managers or clients). Therefore, they have no responsibility beyond building technology. ISD traditionalists also do not hold themselves responsible for achieving organizational change or improving organizational performance.

Second, ISD facilitators view change as a function of both technology and people factors. Facilitators work with clients to understand their specific needs and produce an IS that incorporates the clients' ideas and knowledge. ISD facilitators perceive their role as facilitating clients' independence. However, similar to ISD traditionalists, facilitators do not hold themselves responsible for achieving organizational change or improving organizational performance.

Finally, ISD advocates view change as people-oriented (including everyone: the clients, the company, and the advocates). By increasing clients' awareness of the need for change, ISD advocates influence clients in directions which they, the advocates, view as desirable. Common advocate tactics include communication, persuasion, shock, manipulation, and the use of power. The advocate's primary responsibility is to be the visionary, to suggest efficient and effective business and technical solutions. Unlike ISD traditionalists and facilitators, ISD advocates share the change and performance outcomes with their clients.

The findings of previous studies indicate that the change agent role played by IS personnel influences the quality of the ISD project (Gable, 1991; Markus and Benjamin, 1996; Winston and Dologite, 1999) as well as worker attitudes (e.g. career development and turnover intention) (Mak and Sockel, 2001; Viator, 2001). Clearly, the IS developers' role perception reflects their relative level of emotional or psychological obligation to the project, which, in turn, influences their goal setting and goal-directed behavior. Those who have high expectations regarding the success of the project will be more willing to take on other development activities and learn new skills and approaches to support the system design. They will do their best to incorporate what they learnt into a new ISD project, solve the issues raised, improve the system development process throughout the project (Akgün *et al.*, 2007), and even embrace changes to the business processes that affect the system design. Such developers display very high growth needs and are receptive to learning new skills to keep their current capabilities (Mak and Sockel, 2001; Sockel *et al.*, 2004). In summary, IS developers' with different change agent role perceptions in relation to their intention to learn business skills. We thus expected that these role perceptions would affect IS developers' behavioral intention to learn business skills differently, and propose the first hypothesis:

H1. Three change agent role perceptions (traditionalist, facilitator, and advocate) have different relationships with behavioral intention to learn business skills.

3.3 B-skills learning motivations and learning b-skills

Motivation has been regarded as a key factor in determining workers' learning behavior (Malik *et al.*, 2011; Spinath *et al.*, 2006). Studies on training effectiveness have shown that the motivation to learn (i.e. learning motivation) significantly influences employees' intention to participate in training programs, their ability to master training materials and transfer training to job performance (Colquitt *et al.*, 2000; Liao and Tai, 2006; Maurer and Tarulli, 1994; Noe and Wilk, 1993). For example, Maurer and Tarulli (1994) and Noe and Wilk (1993) found that motivation influences the willingness of an employee to participate in the training program in the first place. A meta-analysis of training motivation conducted by Colquitt *et al.* (2000) further showed that learning motivation influences immediate training effectiveness (operationalized by declarative knowledge, skill acquisition, and reactions to training), and, consequently, job performance. Similarly, Liao and Tai (2006) argued that trainees with low levels of motivation may fail to master the training material.

Of the various motivation theories, self-determination theory (Deci and Ryan, 1985) specifically distinguishes different types of motivations based on reasons or goals that give rise to an action (Deci and Ryan, 2000), and places the types of regulations on a continuum between self-determined (intrinsic) and controlled (extrinsic) forms (Deci and Ryan, 1985). In this respect, research over three decades has shown that the quality of the experience and the performance vary depending on whether one's behavior is intrinsically or extrinsically motivated (Deci and Ryan, 2000).

Based on the classic definition of motivation, we employ Colquitt *et al.*'s (2000) definition of learning motivation (a.k.a. motivation to learn) as "the direction, intensity, and persistence of learning-directed behavior" (p. 678). Also, in line with the reasoning of SDT, we distinguish two types of learning motivations: extrinsic and intrinsic.

Extrinsic learning motivation refers to the impetus to perform a learning activity in order to attain outcomes such as a tangible reward, sanctions, praise, feedback, or grades (Ryan and Deci, 2000). It is induced by rewards or punishments which are contingent upon the individual's success or failure at a learning task. Common approaches that organizations use to motivate workers to learn include pay raises, promotions, or job security (Frey and Osterloh, 2002). Simply put, the aim of extrinsic motivation is to link monetary incentives to organizational goals (Osterloh and Frey, 2000).

Intrinsic learning motivation refers to motivation driven by one's interest in or enjoyment of the learning task itself. It exists within the individual rather than relying on external pressure. An individual is intrinsically motivated to learn simply because learning is enjoyable and interesting and it satisfies a personal need to do a task (e.g. personal development) (Deci and Ryan, 1980; Frey and Osterloh, 2002; Lee *et al.*, 2005). Elements of intrinsic learning motivation include enthusiastic task involvement, the desire to experience adventure and novelty, striving for excellence in one's work, trying to understand something and wishing to improve, and goal direction (Fredricks *et al.*, 2004; McInerney and McInerney, 2010; Reeve *et al.*, 2004).

There is a major distinction between extrinsic and intrinsic learning motivation. For the former, what motivates a person to learn is independent from the learning task or activity. For the latter, what motivates and satisfies a person comes directly from the task or activity itself (Calder and Staw, 1975; Covington and Dray, 2002). However, since the interaction between intrinsic and extrinsic rewards and motivation is not entirely clear (Bowditch *et al.*, 2008), we believe that both types of motivation are useful in determining an IS developer's b-skills learning intention. IS developers may learn business skills because it leads to visible outcomes such as gaining rewards or positive

feedback (extrinsic learning motivation). They may also learn b-skills because they believe that learning business skills has value for its own sake, i.e., is enjoyable or satisfying in and of itself (intrinsic learning motivation). Since both kinds of motivation encourage people to learn and obtain goals, we propose our second set of hypotheses as follows:

H2a. Extrinsic learning motivation has a positive relationship with the behavioral intention to learn business skills.

H2b. Intrinsic learning motivation has a positive relationship with the behavioral intention to learn business skills.

3.4 Self-efficacy and learning b-skills

In addition to motivation, ability is considered indispensable in the widely accepted "performance formula" (Anderson and Butzin, 1974). Even though ability (or absorptive capability) influences people's knowledge obtainment and usage (Michailova and Minbaeva, 2012), individuals may not realize their ability to obtain and apply knowledge if they perceive themselves as being unable. According to Social Cognitive Theory (SCT; Compeau and Higgins, 1995), self-efficacy is a central mechanism of personal agency. It is thought to influence not only one's level of effort and persistence on a specific task but also one's choice of activities and behavioral settings. Research examining self-efficacy and knowledge gain has found that pertinent self-efficacy measures positively predict learning (e.g. Cabrera *et al.*, 2006; Gist *et al.*, 1989; Martocchio and Webster, 1992; McGill *et al.*, 1992; Zimmerman, 2000). In the case of learning b-skills (acquiring new knowledge), believing one can learn is actually more predictive of actual learning intention than knowing what to learn. For example, a study by Andrew and Vialle (1998) noted that individuals with high self-efficacy showed better academic performance than those with low self-efficacy. The authors found that confident individuals typically took control of their own learning experiences, were more likely to participate in class, and preferred hands-on learning experiences. By contrast, people with low levels of self-efficacy typically shied away from academic interactions.

Our study adopted Brown's (2001) definition of learning self-efficacy: "the confidence learners have that they can learn the content of the course" (p. 282). In accordance with the distinction of development self-efficacy made by Maurer *et al.* (2003), we also distinguish two types of learning self-efficacies: absolute and relative. Absolute learning self-efficacy is a personal belief that one can learn to improve competencies in comparison to one's own current skill levels, whereas relative learning self-efficacy is a personal belief that one can learn to improve one's own skill level relative to that of other people (Maurer *et al.*, 2003). For example, when attending a developmental activity (e.g. workshop, training course), an individual with a high level of relative learning self-efficacy perceives that his or her success in that activity will be at least comparable to the success of most of the other participants (Maurer and Tarulli, 1994).

Learning self-efficacy has been shown to influence how individuals approach learning (Brown, 2001). First, learning self-efficacy increases engagement in a learning context. Individuals with a high level of learning self-efficacy tend to be actively involved in development and learning activities that often force them to explore new terrain (Pan *et al.*, 2010). For example, Bouffard-Bouchard (1990) found that students with high levels of self-efficacy worked more practice problems than did those with low levels of self-efficacy. Second, learning self-efficacy helps an individual set more challenging learning goals and hold a positive attitude toward challenges in the learning process

(McKee *et al.*, 2006). For example, Wood and Bandura (1989) found that high learning self-efficacy expectations regarding performance in a specific behavioral setting led individuals to approach that setting, whereas individuals with low learning self-efficacy expectations in that setting avoided it. Noe and Wilk (1993) presented that individuals with higher levels of self-efficacy are more likely to have a positive attitude toward learning, a belief that there are benefits to be gained from participation in such activities, and a greater awareness of their specific development needs. Pan *et al.* (2010) also argued that individuals with high levels of learning self-efficacy are better able to cope with the stress involved in personal learning because they believe they can influence things in order to overcome obstacles in the learning process. In contrast, when encountering challenging (or even threatening) learning situations, people with low levels of learning self-efficacy tend to give up easily, attribute failure to themselves, and experience high levels of anxiety and/or depression (Bandura, 1986).

Learning b-skills can be viewed as a challenging goal, as IS developers have to spend additional time and effort to take formal or informal training and learn new skills outside of their functional domain/comfort zone. Based on the above, we can reasonably infer that IS developers with a high level of self-efficacy are more aware of their specific developmental needs and tend to have a positive attitude toward learning b-skills since they believe in the benefits associated with participating in such activities. Therefore, both relative and absolute learning self-efficacies are expected to have a positive relationship with the behavioral intention to learn business skills, and the following hypotheses are proposed:

H3a. Relative learning self-efficacy has a positive relationship with the behavioral intention to learn business skills.

H3b. Absolute learning self-efficacy has a positive relationship with the behavioral intention to learn business skills.

3.5 Situational support and learning b-skills

Sources of situational support come from the work domain (e.g. organizations, supervisors, coworkers, etc.) and the non-work domain (e.g. family, friends, non-work peers, others outside of work, etc.) (Madjar *et al.*, 2002). Work support provides learning resources and enforces learning policies (Maurer *et al.*, 2003). Examples of work support include providing practical assignments, offering developmental opportunities, training workers with new skills, understanding workers' career goals and aspirations, and supporting workers' attempts to acquire additional training or education (Çakmak-Otluoğlu, 2012). In general, work support provides social resources that help individual employees tackle work-related challenges and satisfy their social needs (e.g. recognition, belongingness). Studies on organizational support have shown that support from the work domain helps to increase positive organizational behaviors such as self-regulation and learning behavior (Eisenberger *et al.*, 1986; Ng and Sorensen, 2008; Noe, 1986). For example, Bell and Menguc (2002) showed that when employees believe the organization recognizes their contribution to service quality, they are more likely to engage in customer-oriented behavior and adopt the organization's values and norms as their own. Ng and Sorensen (2008) found that, in addition to providing employees with a sense of belonging, supervisor, and coworker support in the form of providing work-related information and feedback is highly useful for workers' self-regulation and learning behavior. From a resource perspective, the benefits associated with work support can also motivate employees to acquire new

knowledge and skills. For example, organizations may encourage employees to acquire a new skill set by providing support in the forms of financial aid or promotional opportunities, which can be great incentives for employees who are extrinsically motivated (Gagne and Deci, 2005). Thus, we expect that employees will be more motivated to acquire business skills if more support is offered from the work domain (e.g. the organization, supervisors, peers, and even subordinates). We propose the following hypothesis:

H4a. Work support has a positive relationship with extrinsic learning motivation.

Studies on organizational support have shown that support from the work domain helps to increase employee affective commitment (Eisenberger *et al.*, 1986; Kuvaas, 2003), a positive job attitude widely found among intrinsically motivated employees (e.g. Bartlett, 2001; Eby *et al.*, 1999; Kuvaas, 2003). When work support (e.g. coworker, supervisor, organization) is low, those with high levels of intrinsic motivation are less affectively committed to the organization than are those with low levels of intrinsic motivation. However, when work support is high, those with high levels of intrinsic motivation will still have higher levels of affective commitment than will those with low levels of intrinsic motivation (Schwalbe, 2007). Thus, we expect that employees will be more motivated to acquire business skills if more support is offered from the work domain (e.g. the organization, supervisors, peers, and even subordinates). Based on the above reasoning, we propose the following hypothesis:

H4b. Work support has a positive relationship with intrinsic learning motivation.

Additionally, organizational support in the form of mentoring programs reinforces junior workers' learning self-efficacy via verbal persuasion (e.g. positive feedback from mentors) and vicarious learning (e.g. watching mentors perform a challenging task). Knowing how other people, whether mentors or peers, perform on a certain task gives a trainee the chance to evaluate his or her relative learning efficacy. Therefore, we expect that work support has a positive relationship with relative learning self-efficacy, and the following hypothesis is proposed:

H4c. Work support has a positive relationship with relative learning self-efficacy.

The view that the environment affects one's perceived self-efficacy is central to SCT. Bandura (1977) listed four sources of efficacy beliefs: enactive mastery, vicarious learning, verbal persuasion, and emotional arousal. Clearly, all of them originate from social interactions. Social interactions that encourage learning should boost an individual's confidence in his or her ability to learn and perform (Baldwin and Magjuka, 1997; Mathieu and Martineau, 1997; Maurer, 2001). The literature on perceived organizational support has provided examples of how organizations offer support to enhance workers' self-efficacy in learning skills and performing tasks (Eisenberger *et al.*, 1997; Loi *et al.*, 2006; Maurer and Tarulli, 1996; Rhoades *et al.*, 2001). For instance, organizational support in the form of offering on-the-job training provides workers with the opportunity to practice a novel task. If they carry out the task successfully, they become more confident in their ability to improve their competency in comparison to their current skill levels (Taylor *et al.*, 1984). That is, the experience of mastery gives workers more confidence in their ability to accomplish similar tasks in the future (Stajkovic and Luthans, 1998). Accordingly, we propose the following hypothesis:

H4d. Work support has a positive relationship with absolute learning self-efficacy.

In addition to work support, situational support comes from the non-work domain, including an individual's spouse, family, friends, non-work peers, etc. (Maurer *et al.*, 2003; Wentzel, 1998). Individuals are encouraged to pursue work-related learning when non-work support is provided in the form of emotional assurance, recognition of the individual's self-worth, a sense of belonging, relief from the individual's family-related workload, and so forth (Maurer *et al.*, 2003). Similar to work support, researchers have found that non-work support is related to several positive work-related individual outcomes. For example, Rosin (1990) found that career satisfaction was higher for individuals whose careers were supported by their spouses. Particularly, they found that spouses' careers were perceived to provide independent sources of social interaction and support, thus reducing dependence on the workers for such things. These conditions allow such workers to have more resources to meet the demands of their careers. Therefore, we expect that employees will be more motivated to acquire business skills if more support is offered from the non-work domain (e.g. family, friends, non-work peers, others outside of work, etc.). Thus, non-work support is expected to have a positive relationship with extrinsic learning motivation, and the following hypothesis is proposed:

H5a. Non-work support has a positive relationship with extrinsic learning motivation.

Different bodies of literature have demonstrated that factors within the non-work domain have a spillover effect on work-domain outcomes (Caligiuri *et al.*, 1998; Takeuchi *et al.*, 2002; Williams and Alliger, 1994). For example, the literature on education has shown that non-work support (e.g. parents) appears to contribute greatly to students' academic outcomes (Dennis *et al.*, 2005; Frederick and Ryan, 1995; Grolnick *et al.*, 1997). Specifically, Grolnick, *et al.* (1997) found that autonomy-supportive (rather than controlling) parental support helps individuals become more intrinsically motivated. Also, in the expatriate adjustment literature, Takeuchi *et al.* (2002) found that spouse adjustment has a positive spillover effect on expatriate adjustment. Since different bodies of literature indicate a spillover effect of non-work-domain inputs on work-domain outcomes, we expect that non-work support has a positive relationship with intrinsic learning motivation, and the following hypothesis is proposed:

H5b. Non-work support has a positive relationship with intrinsic learning motivation.

In regards to support from the non-work domain, the social support literature has demonstrated that non-work support enriches individuals' belief in their own learning efficacy. We further argue that non-work support functions similarly to work support, despite the fact that their effects on learning self-efficacy may differ. For example, information from non-work-related sources can act similarly to information from work-related sources, persuading a person that he or she is capable of performing a task (Bandura, 1977). In fact, a study by Maurer (2001) has revealed that support, encouragement, exhortations, positive feedback, and other sources of persuasion from people outside of work serve to enhance a person's self-efficacy for development (Maurer, 2001). Emotional support from non-work-related sources can act similarly to that from work-related sources, evoking positive moods such as excitement and enthusiasm (Madjar *et al.*, 2002). A study by Khan *et al.* (2009) showed that emotional support (e.g. listening and showing empathy) from non-work members can improve the behavior outcome by strengthening the individual's self-efficacy. We therefore postulate that IS developers with non-work support and guidance will establish a positive attitude toward career development activities (e.g. learning b-skills) and become more likely to increase their confidence in mastering these activities.

Although no studies have empirically tested the relationships between non-work support and absolute and relative learning self-efficacies, we argue that non-work support – functioning similarly to work support – can encourage an individual's absolute and relative efficacy beliefs. We thereby propose the following hypotheses:

H5c. Non-work support has a positive relationship with relative learning self-efficacy.

H5d. Non-work support has a positive relationship with absolute learning self-efficacy.

Based on the literature in the previous sections, we have demonstrated clear links between situational support (work and non-work) and learning motivation (extrinsic and intrinsic) and depicted IS developers' learning motivations can positively impact their behavioral intention to learn business skills. According to prior studies (e.g. Deci and Moller, 2005; Dysvik and Kuvaas, 2008; Kraiger and Ford, 2007; Maurer *et al.*, 2003, 2008; Noe and Wilk, 1993), work-related extrinsic and intrinsic learning motivation are regarded as key mediating variables. In other words, extrinsic and intrinsic learning motivations can be inferred to partially mediate the relationship between work/non-work support and IS developers' learning intention (Maurer *et al.*, 2003, 2008). For this reason, in addition to investigating a direct relationship, we posit that extrinsic and intrinsic learning motivation will partially mediate the relationship between work/non-work support and behavioral intention to learn b-skills. Therefore, we propose the following partially mediated hypotheses:

H6a. Extrinsic learning motivation partially mediates the relationship between work support and the behavioral intention to learn business skills.

H6b. Intrinsic learning motivation partially mediates the relationship between work support and the behavioral intention to learn business skills.

H6c. Extrinsic learning motivation partially mediates the relationship between non-work support and the behavioral intention to learn business skills.

H6d. Intrinsic learning motivation partially mediates the relationship between non-work support and the behavioral intention to learn business skills.

Similarly, relying on the literature, we have reported positive associations between situational support (work and non-work) and learning self-efficacy (relative and absolute) and explicated IS developers' learning self-efficacy can positively impact their behavioral intention to learn business skills. Previous studies were reviewed in the role of learning self-efficacy as a mediator. Learning self-efficacy would mediate in the relationship between situational supports and behavioral intention, including success in learning settings and favorable attitudes toward learning (Maurer *et al.*, 2008; Peng and Mao, 2015; Sukserm and Takahashi, 2012; Zimmerman, 2000). Therefore, it seems quite reasonable to expect that support received from work and non-work may have the effect of enhancing IS developers' sense of being able to cope effectively with the demands of business skills, which in turn ultimately increase their learning intentions. We thereby test the extent to which learning self-efficacy partially mediate the relationship between situational supports and behavioral intention, whether it is relative or absolute learning self-efficacy. Based on the aforesaid, the following partially mediated hypotheses are proposed:

H7a. Relative learning self-efficacy partially mediates the relationship between work support and the behavioral intention to learn business skills.

H7b. Absolute learning self-efficacy partially mediates the relationship between work support and the behavioral intention to learn business skills.

H7c. Relative learning self-efficacy partially mediates the relationship between non-work support and the behavioral intention to learn business skills.

H7d. Absolute learning self-efficacy partially mediates the relationship between non-work support and the behavioral intention to learn business skills.

4. Methods
4.1 Measures of the constructs
To ensure the content validity of the measurement, measurement items must represent the concept about which generalizations are to be made (Bohmstedt, 1970). Therefore, most measurement items in this study were adapted from prior studies to ensure content validity. Theories of intrinsic motivation focus on the satisfaction of the individual's needs for autonomy, competence and relatedness (Gagne and Deci, 2005). Maurer and Tarulli (1994) suggested that all employees (e.g. IS developers) must fully understand the perceived benefits and the value placed on those benefits in order to be effectively motivated to develop themselves. This is because there are different perceptions among employees. Nordhaug (1989) identified three different types of benefits that employees obtain from participation in training programs: job, career, and personally related benefits. These perceived training benefits, functioning as intrinsic or extrinsic rewards, have been found to affect attitudes or the motivation to engage in training and development activity (Maurer and Tarulli, 1994; Maurer *et al.*, 2003). Thus, our measures for intrinsic learning motivation were adapted from Nordhaug (1989). For extrinsic learning motivation, three items (EM1-EM3) (see the Appendix) were adapted from Nordhaug (1989). However, Compeau and Higgins (1995), Compeau *et al.* (1999), and Venkatesh *et al.* (2003) argued that extrinsic motivation has two outcome expectation sub-dimensions: performance expectations (job-related) and personal expectations (individual-related). Given that few studies have investigated job-related extrinsic motivation in a learning context, we combined performance expectation items with personal expectation items. We then adopted an expert panel approach (Lawshe, 1975; Templeton *et al.*, 2002), selecting a total of 35 IS developers with current or recent experience in an ISD project. A brainstorming session was held to identify the perceived benefits of learning business skills for IS developers. A total of 15 items for extrinsic learning motivation were derived from the brainstorming session. These 35 participants were then asked to assess the relevance of each item regarding extrinsic learning motivation by using a three-point scale: 1 (not relevant), 2 (important, but not essential), or 3 (essential). To ensure the content validity of the measures, we selected items with mean scores higher than 2 (important, but not essential). As a result, ten of 15 items (EM4-EM13) were selected for the final version of the measures of extrinsic learning motivation.

To measure change agent role perception, we developed a question based on Markus and Benjamin (1996). Measures of relative and absolute learning self-efficacies were adapted from studies by Bandura (1977) and Rigotti *et al.* (2008). Measures of work support were developed according to the definition made by Eisenberger *et al.* (1997). Also, measures for non-work support were developed according to the definition provided by Maurer *et al.* (2003). Finally, measures of behavioral intention to learn business skills were adapted from Venkatesh *et al.* (2003). Likert scales with anchors

ranging from "strongly disagree (1)" to "strongly agree (7)" were used for all measurement items. The survey items were pre-tested by a smaller number of ISD experts and modified to fit the ISD context being studied. The survey items are listed in the Appendix.

4.2 Data collection
Since one of the purposes of this study was to explore the relationship between situational support and behavioral intention to learn business skills in the context of ISD, the participants we chose were employees in ISs departments who had experience with system development. Data used to test the research model were gathered from the employees of organizational IS departments in Taiwan. To ensure that the respondent had ISD development project experience, a filter question was asked first. Respondents answered each question on the questionnaire by choosing the number that best described their degree of agreement with the statement. A total of 760 questionnaires were distributed to 35 companies and 254 usable responses (a valid responses rate of 33.42 percent) were obtained from IS developers working in various industries (e.g. manufacturing, service, science, and technology). Table I shows the respondents' demographic information, classified by their perception of their change agent role.

5. Results
Data were analyzed using the partial least squares (PLS) approach which has several advantages over regression and covariance based structural equation modeling (CBSEM). First of all, PLS is a convenient and powerful technique that is appropriate for many research situations. Our research model includes direct variables (i.e. situational support and change agent role perception) and indirect variables (i.e. b-skills learning motivations and abilities). For complex research models, PLS has an advantage over regression in that it can analyze the entire model as a unit, rather than dividing it into pieces (Goodhue *et al.*, 2012). In addition, our sample size for analysis was relatively small: 254 IS developer's effective samples were used. For smaller sample sizes, CBSEM may not converge. PLS had the smallest occurrence of false positives. Moreover, since we adopted the MARS model's conceptual constructs to examine IS developers' intention to learn business skills, PLS was highly suitable for the initial exploratory stages.

SmartPLS software (Ringle *et al.*, 2005) was used during the two-step data analysis stage. The first step examined the measurement models and their psychometric properties. The second step focussed on testing the structural models and hypotheses. PLS provided a convenient approach for simultaneous analysis of the measurement model and the structural model.

5.1 Measurement model
Assessment of the measurement model involved evaluations of the reliability, convergent validity, and discriminant validity of the construct measures. First, to ensure that each indicator shares more variance with the component score than with the error variance when assessing the reliability of each indicator, Chin *et al.* (2000) suggested that a construct (also known as a latent variable) should explain a substantial part (usually at least 50 percent) of the variance of each indicator. Accordingly, the absolute correlations between a latent variable/construct and each of its indicators should be higher than 0.7 (roughly equal to the square root of 0.5). However, other researchers also suggested that any factor loadings greater than 0.50

	Traditionalist ($n = 72$)	Facilitator ($n = 148$)	Advocate ($n = 34$)
Gender			
Female	29	34	8
Male	43	114	26
Age			
21-25	4	7	2
26-30	13	40	5
31-35	32	48	18
36-40	19	37	4
41-45	4	12	4
46-50	0	2	1
> 50	0	2	0
Education			
High school	1	0	0
Junior college	5	4	3
Bachelor's degree	47	98	13
Master's degree	19	46	18
Work seniority (*year*)			
< 1	2	7	2
1-3	4	21	4
4-6	23	35	7
7-10	25	41	12
11-15	13	32	6
16-20	3	8	3
21-30	2	4	0
Professional title			
Programmer	52	65	8
System analyst	1	29	7
Project leader	3	12	7
Supervisor	2	8	9
Network manager	2	4	1
Tester	0	1	0
Database manager	1	10	1
Maintainer	6	5	0
Other	5	14	1
Industry			
Manufacturing	41	65	15
Service	12	22	4
Science and technology	12	36	9
School	1	5	0
Financial institution	5	5	2
Transport service	0	4	0
Retail business	1	0	0
Software	0	2	1
Telecommunications	0	4	3
Medical	0	3	0
Other	0	2	0

(continued)

Table I.
Respondent characteristics by role

	Traditionalist (n = 72)	Facilitator (n = 148)	Advocate (n = 34)
Number of employees in organization			
1-5	6	11	2
6-10	8	8	1
11-15	12	9	5
16-20	3	7	2
21-40	6	16	4
41-60	5	14	4
61-80	3	4	1
81-100	0	3	2
> 100	29	76	13

Table I.

can be considered significant (Hair *et al.*, 2010). Factor loadings of all items were greater than 0.60 (see Table II); therefore, reliability at the indicator level was satisfactory. Cronbach's α and composite reliability (CR) were used to assess the reliability of the scales at the construct level. Henseler *et al.* (2009, p. 300) suggested that, to show a measure's internal consistency, CR must not be lower than 0.6. As shown in Tables II and III, the Cronbach's α and CR of each construct exceeded 0.7. Thus, reliability was also adequate at the construct level.

Second, convergent validity was assessed using the average variance extracted (AVE). Fornell and Larcker (1981) suggested that an AVE value of at least 0.5 indicates sufficient convergent validity. As shown in Table III, the AVE for each construct exceeded 0.5, meaning more than half of the variances observed in the indicators were accounted for by their corresponding constructs. Finally, to examine discriminant validity, we compared the shared variances between constructs with the AVE values of individual constructs (Fornell and Larcker, 1981). Results indicated that the shared variances between factors were lower than the AVE of the individual factors, confirming discriminant validity (see Table III). To conclude, the measurement model demonstrated adequate reliability, convergent validity, and discriminant validity.

Moreover, since our research conducted a self-report survey by using the same instrument (i.e. Likert scales) to measure correlations between variables at a single point in time, inflationary common method bias (CMB) might be a concern for this study (Conway and Lance, 2010; Podsakoff *et al.*, 2003; Schwarz *et al.*, 2008; Straub *et al.*, 2004). Harman's single-factor test (Harmon, 1967) was performed to measure CMB and to ensure that the relationships among causal variables were originally insignificant. All the indicators in this study were examined via exploratory factor analysis using principal component analysis without rotation. We found that once the variables were extracted, they explained 30.5 percent by the first component with no single-factor accounting for the majority of the covariance among the measures (Podsakoff *et al.*, 2003). The latent method factor approach (Liang *et al.*, 2007; Podsakoff *et al.*, 2003; Saraf *et al.*, 2007; Williams *et al.*, 2003) was also used for testing CMB. The method model includes factor loadings linking the method effect's latent variable to the substantive indicators. Most of the latent variable's factor loadings were found to be insignificant (about 88.1 percent), and the method variances were substantially less than the indicators' substantive variances. This suggests that CMB should not be a serious concern in this study (Liang *et al.*, 2007; Saraf *et al.*, 2007; Williams *et al.*, 2003).

Construct	ELM	ILM	RLSE	ALSE	WS	NWS	BITL
ELM1	0.616	0.318	0.134	0.193	0.245	0.119	0.156
ELM2	0.750	0.526	0.160	0.213	0.227	0.196	0.307
ELM3	0.737	0.511	0.172	0.206	0.224	0.151	0.287
ELM4	0.741	0.480	0.272	0.235	0.184	0.196	0.186
ELM5	0.802	0.443	0.151	0.173	0.323	0.204	0.314
ELM6	0.706	0.361	0.146	0.117	0.254	0.188	0.315
ELM7	0.772	0.397	0.158	0.173	0.231	0.148	0.216
ELM8	0.714	0.436	0.236	0.245	0.279	0.104	0.150
ELM9	0.694	0.444	0.192	0.216	0.275	0.215	0.215
ELM10	0.737	0.367	0.231	0.227	0.276	0.139	0.156
ELM11	0.630	0.440	0.170	0.186	0.182	0.209	0.192
ELM12	0.647	0.435	0.059	0.133	0.299	0.225	0.242
ELM13	0.641	0.384	0.116	0.125	0.259	0.210	0.148
ILM1	0.553	0.772	0.251	0.316	0.239	0.229	0.457
ILM2	0.400	0.790	0.340	0.346	0.151	0.330	0.416
ILM3	0.565	0.809	0.302	0.377	0.177	0.308	0.373
ILM4	0.538	0.870	0.320	0.336	0.195	0.319	0.451
ILM5	0.529	0.898	0.342	0.376	0.212	0.381	0.424
ILM6	0.478	0.846	0.322	0.287	0.245	0.333	0.447
ILM7	0.489	0.881	0.279	0.283	0.201	0.344	0.418
RLSE1	0.224	0.369	0.942	0.570	0.102	0.329	0.364
RLSE2	0.231	0.375	0.934	0.585	0.067	0.311	0.355
RLSE3	0.185	0.276	0.899	0.529	0.084	0.277	0.305
RLSE4	0.220	0.336	0.938	0.553	0.121	0.346	0.305
ALSE1	0.129	0.218	0.433	0.768	0.040	0.216	0.193
ALSE2	0.136	0.201	0.358	0.737	0.015	0.084	0.166
ALSE3	0.219	0.354	0.479	0.821	0.102	0.189	0.339
ALSE4	0.286	0.398	0.581	0.842	0.037	0.138	0.402
WS1	0.330	0.246	0.090	0.123	0.835	0.262	0.276
WS2	0.345	0.187	0.042	0.048	0.867	0.248	0.207
WS3	0.363	0.192	0.081	0.068	0.852	0.269	0.223
WS4	0.297	0.206	0.127	0.054	0.879	0.253	0.188
WS5	0.198	0.182	0.104	0.085	0.813	0.321	0.239
WS6	0.271	0.220	0.085	0.079	0.830	0.300	0.254
WS7	0.269	0.170	0.065	−0.007	0.817	0.322	0.225
WS8	0.287	0.213	0.084	−0.014	0.809	0.363	0.197
NWS1	0.171	0.327	0.298	0.183	0.247	0.866	0.401
NWS2	0.285	0.361	0.252	0.185	0.403	0.907	0.367
NWS3	0.218	0.336	0.359	0.173	0.267	0.900	0.397
BITL1	0.310	0.498	0.336	0.322	0.254	0.415	0.960
BITL2	0.314	0.481	0.336	0.379	0.272	0.407	0.952
BITL3	0.309	0.485	0.361	0.383	0.251	0.431	0.964
Cronbach's α	0.917	0.929	0.947	0.816	0.940	0.869	0.956

Notes: ELM, extrinsic learning motivation; ILM, intrinsic learning motivation; RLSE, relative learning self-efficacy; ALSE: absolute learning self-efficacy; WS, work support; NWS, non-work support; BITL, behavioral intention to learn. The italic numbers indicate the correspond constructs, the other numbers indicate the cross loadings

Table II.
Cronbach's α,
item loadings and
cross-loadings

5.2 Structural model
Path significance was tested using a bootstrapping re-sampling technique with 500 sub-samples. We included three demographic variables (gender, age, and work seniority) as control variables to focus our attention on the effect of the proposed

Construct	CR	Mean	SD	ELM	ILM	RLSE	ALSE	WS	NWS	BITL
ELM	0.929	5.335	0.797	*0.709*						
ILM	0.943	5.726	0.791	0.605	*0.839*					
RLSE	0.961	4.675	0.884	0.237	0.369	*0.928*				
ALSE	0.871	4.962	0.954	0.261	0.397	0.603	*0.793*			
WS	0.950	4.525	1.089	0.356	0.242	0.101	0.067	*0.838*		
NWS	0.920	4.860	1.134	0.251	0.383	0.341	0.199	0.344	*0.891*	
BITL	0.972	5.213	1.052	0.320	0.509	0.359	0.378	0.270	0.436	*0.959*

Table III.
Inter-construct correlations and reliability measures

Notes: CR, composite reliability; ELM, extrinsic learning motivation; ILM, intrinsic learning motivation; RLSE, relative learning self-efficacy; ALSE, absolute learning self-efficacy; WS, work support; NWS, non-work support; BITL, behavioral intention to learn. Diagonal elements are the square roots of the average variance extracted (AVE) values; off-diagonal elements are correlations among constructs

independent variables on dependent variables. Table IV shows the statistics of the structural model, including path coefficients, t-values, p-values and R^2 values. Path coefficients indicate the strengths of the relationships between the independent and dependent variables. R^2 values represent the amount of variance explained by the independent variables.

H1 proposed that the three change agent role perceptions (traditionalist, facilitator, and advocate) would have different relationships with the behavioral intention to learn business skills. To test this hypothesis, we used dummy variables to represent the three change agent roles and performed regression analyses using PLS. The results show that, overall, change agent role perceptions have a significant positive relationship with the behavioral intention to learn ($\beta = 0.103$, $p < 0.05$). A one-way analysis of variance (ANOVA) was also conducted using SPSS to determine whether there were statistically significant differences among IS developers with different change agent role perceptions in relation to their intention to learn business skills. As shown in Table V, the results revealed statistically significant differences among the change agent role perceptions ($F = 3.143$, $p < 0.05$). This is consistent with the

Dependent variable	Independent variable	Path coefficient	t-value	R^2
BITL	(*H1*) RP	0.103	1.973	0.327
	(*H2a*) ELM	0.025	0.499	
	(*H2b*) ILM	0.377	4.951	
	(*H3a*) RLSE	0.117	2.032	
	(*H3b*) ALSE	0.165	2.334	
ELM	(*H4a*) WS	0.307	4.058	0.147
	(*H5a*) NWS	0.148	2.107	
ILM	(*H4b*) WS	0.125	2.138	0.161
	(*H5b*) NWS	0.340	5.454	
RLSE	(*H4c*) WS	−0.019	0.422	0.116
	(*H5c*) NWS	0.347	5.352	
ALSE	(*H4d*) WS	−0.002	0.053	0.041
	(*H5d*) NWS	0.203	2.996	

Table IV.
Statistical results of the structural model

Notes: RP, role perception; ELM, extrinsic learning motivation; ILM, intrinsic learning motivation; RLSE, relative learning self-efficacy; ALSE, absolute learning self-efficacy; BITL, behavioral intention to learn; WS, work support; NWS, non-work support

results of PLS analysis. After multiple *post hoc* comparisons (see Table VI), Fisher's least significant difference (LSD) tests revealed a statistically significant difference between the advocate role (mean = 5.54, SD = 0.98) and the traditionalist role (mean = 5.00, SD = 0.95). However, the facilitator role (mean = 5.23, SD = 1.10) has no significant difference with advocate role and traditionalist role. Thus, *H1* was supported.

H2a and H2b proposed that extrinsic (*H2a*) and intrinsic (*H2b*) learning motivations would be positively related to the behavioral intention to learn business skills. *H2b* was supported since intrinsic learning motivation had a significant positive relationship with the behavioral intention to learn ($\beta = 0.377$, $p < 0.001$). However, the relationship between extrinsic learning motivation and the behavioral intention to learn was not significant ($\beta = 0.025$, $p > 0.05$). Thus, *H2a* was not supported.

H3a and H3b proposed that relative (*H3a*) and absolute (*H3b*) learning self-efficacy would be positively associated with the behavioral intention to learn business skills. As shown in Table IV, relative and absolute learning self-efficacy were found to have significant positive relationships with the behavioral intention to learn ($\beta = 0.117$, $p < 0.05$ and $\beta = 0.165$, $p < 0.05$, respectively), meaning that *H3a* and *H3b* were both supported.

H4a and H4b proposed that work support would have a positive relationship with extrinsic learning motivation (*H4a*) and intrinsic learning motivation (*H4b*). The results in Table IV show that work support was significantly related to both extrinsic learning motivation ($\beta = 0.307$, $p < 0.001$) and intrinsic learning motivation ($\beta = 0.125$, $p < 0.05$). Thus, both *H4a* and *H4b* were supported. *H4c and H4d* proposed, furthermore, that work support would have a positive relationship with relative learning self-efficacy (*H4c*) and absolute learning self-efficacy (*H4d*). However, neither type of self-efficacy was shown to be significantly related to work support ($\beta = -0.019$, $p > 0.05$ and $\beta = -0.002$, $p > 0.05$, respectively). Thus, *H4c* and *H4d* were not supported.

H5a-H5d proposed that non-work support would have a positive relationship with extrinsic learning motivation (*H5a*), intrinsic learning motivation (*H5b*), relative learning self-efficacy (*H5c*), and absolute learning self-efficacy (*H5d*). Table IV shows that all four relationships were significant ($\beta = 0.148$, $p < 0.05$, $\beta = 0.340$, $p < 0.001$, $\beta = 0.347$, $p < 0.001$ and $\beta = 0.203$, $p < 0.01$, respectively). Thus, *H5a-H5d* were all supported.

Dependent variable: BITL	Sum of squares	df	Mean square	F	p
Between group	6.842	2	3.421	3.143	0.045
Within groups	273.233	251	1.089		
Total	280.075	253			

Table V.
ANOVA results

(*H1*) RP [*I*]	RP [*J*]	Mean difference [*I–J*]	SE	p
Dependent variable: BITL				
Traditionalist	Facilitator	−0.234	0.150	0.120
	Advocate	−0.535	0.217	0.014
Facilitator	Traditionalist	0.234	0.150	0.120
	Advocate	−0.300	0.198	0.131
Advocate	Traditionalist	0.535	0.217	0.014
	Facilitator	0.300	0.198	0.131
Notes: BITL, behavioral intention to learn; RP, role perception				

Table VI.
LSD multiple
comparisons results

H6a-H6d and *H7a-H7d* stated that learning motivation (extrinsic and intrinsic) and learning self-efficacy (relative and absolute) partially mediate the effect of situational support (work and non-work) on behavioral intention to learn b-skills. As proposed by Baron and Kenny (1986), a mediating factor should meet the following three conditions: first, the independent variable must affect the mediated variable; second, the independent variable must affect the dependent variable; and third, the mediated variable must affect the dependent variable. This study conducted Sobel tests to examine the significance of the mediation effect of each eligible hypothesis (i.e. *H6b*, *H6d*, *H7c*, and *H7d*). The results of the Sobel test for each antecedent construct via intrinsic learning motivations, relative learning self-efficacy, and absolute learning self-efficacy, respectively, are summarized in Table VII. The indirect effects of non-work support on the behavioral intention to learn business skills via relative and absolute learning self-efficacy ($Z = 3.321$, $p < 0.001$ and $Z = 2.672$, $p < 0.01$, respectively), and the indirect effects of work support ($Z = 3.516$, $p < 0.001$) and non-work support ($Z = 4.808$, $p < 0.001$) on the behavioral intention to learn business skills via intrinsic learning motivation are all significant. Furthermore, in order to clearly understand the degree of those indirect effects, we conducted the variance accounted for (VAF) examination (Hair *et al.*, 2013; Helm *et al.*, 2010). Table VII shows that the indirect effects of work support (42.4 percent) and non-work support (35.2 percent) on the behavioral intention to learn business skills via intrinsic learning motivation are partial mediations. In contrast, the indirect effect of non-work support on the behavioral intention to learn business skills via relative (18.6 percent) and absolute learning self-efficacy (14.0 percent) is statistically rather low (less than 20 percent), and almost no mediation takes place. To summarize, the results indicate that intrinsic learning motivation partially mediates the impact of work support and non-work support on the behavioral intention to learn business skills. Thus, *H6b* and *H6d* were supported.

The coefficient of determination (R^2) value was calculated for each latent endogenous variable's explained proportion of the variance. The research model accounted for 32.7 percent of the overall variance in the behavioral intention to learn (see Table IV). Previous research (e.g. Chin, 1998) has proposed that the R^2 value must meet or exceed 0.3 to be satisfactory and acceptable. As for control variables, work seniority, gender, and age were all found to have no significant effect on the behavioral intention to learn business skills ($\beta = -0.047$, $p > 0.05$, $\beta = 0.092$, $p > 0.05$ and $\beta = 0.032$, $p > 0.05$, respectively). Figure 2 shows a visual representation of the standardized path coefficients of the research model.

IV	MV	DV	IV→DV	IV→MV	IV+MV→DV MV→DV	IV→DV	Z-value	VAF
WS	ILM	BITL	0.274***	0.245***	0.472***	0.157**	3.516***	0.424
NWS	ILM	BITL	0.437***	0.384***	0.400***	0.283***	4.808***	0.352
NWS	RLSE	BITL	0.437***	0.344***	0.237***	0.356***	3.321***	0.186
NWS	ALSE	BITL	0.437***	0.202***	0.302***	0.376***	2.672**	0.140

Table VII.
Results of mediating effect tests

Notes: IV, independent variable; MV, mediate variable; DV, dependent variable; ILM, intrinsic learning motivation; RLSE, relative learning self-efficacy; ALSE, absolute learning self-efficacy; BITL, behavioral intention to learn; WS, work support; NWS, non-work support. **$p < 0.01$; ***$p < 0.001$
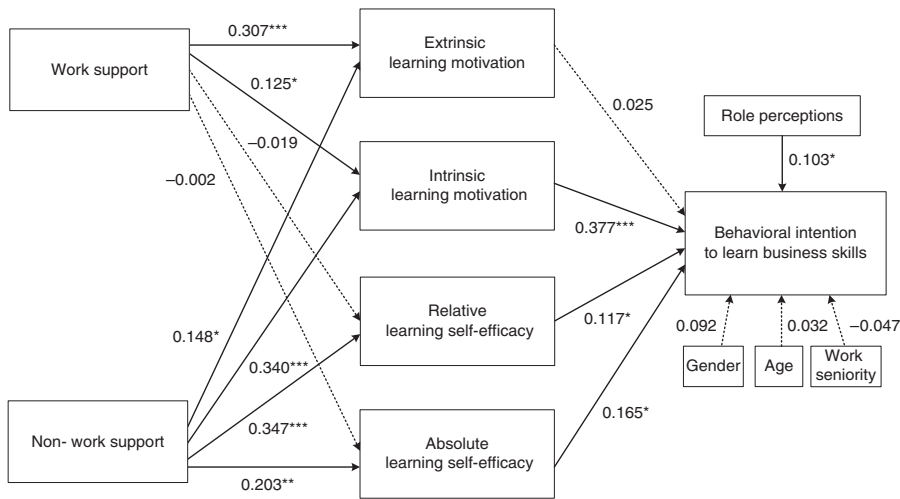
Notes: ——, Significant; ---, not significant. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Figure 2.
Standardized path
coefficients

6. Discussion

"Building business skills in IT" has gained enormous attention from IT executives, as noted in a study by Luftman *et al.* (2009) published by the Society for Information Management. Rather than focussing on on-the-job training for general employees, we targeted IT professionals and examined factors that influence their business skills learning. Unlike prior studies which focussed on either individual characteristics or situational predictors of the intention to learn b-skills, this study considered a broader range of factors through MARS model (i.e. motivations, abilities, role perception, and situational factors) that influence the behavioral intention of IS developers to learn business skills. Moreover, we provided fine-grained examinations of different types of learning motivation (extrinsic and intrinsic), learning self-efficacy (relative and absolute), role perception (traditionalist, facilitator, and advocate), and situational support (work and non-work) to show the influences of these sub-dimensions on the intention to learn b-skills. The theoretical contribution of our research primary advances the theory development of IS personnel's learning behavior. Our study successfully represents the MARS model to explain IS developers' behavioral intention to learn b-skills, which has rarely been explored in the existing literature. As such, the structure of the proposed model of IS developers' learning behavior can serve as a reference framework for future researchers in studying IS personnel's work-related learning behavior.

Though many of our proposed hypotheses were supported, results showed several interesting and unexpected findings. First, regarding the change agent role perception, people who perceived themselves as advocates displayed a higher level of intention to learn b-skills than did those who identified with the other two roles (i.e. traditionalist and facilitator). These findings are the same with the notion of Winston (1999) that advocate is the most effective role for achieving a high quality IS implementation. Advocates understand the strategic advantages a business attains when the ISD project is implemented properly. Thus, advocates may further improve their effectiveness by acquiring the b-skills. Our finding contributes to the IS literature by

showing that role perception plays a part in determining an individual's learning intention. A valuable and interesting future study can explore the effect of different organizational structure on the change agent role.

Besides, when compared to extrinsic learning motivation, intrinsic learning motivation contributed more to the intention to learn b-skills. This is consistent with past research indicating that people are typically most creative (a major characteristic in higher level learning) when their motivation comes from within (Amabile, 1997; Deci and Flaste, 1995). A study of Minbaeva *et al.* (2010) also showed that intrinsic motivation and ability were predictors of individuals' knowledge acquisition and usage, while extrinsic motivation was not. Our findings suggest that when an activity is more learning-oriented than performance-oriented (in our case, learning b-skills), individuals' attitudes toward the activity itself seem to be more crucial than other external factors. Organizations should focus on activities that facilitate workers' intrinsic learning motivation, such as making the training process more interesting or showing the benefits of learning b-skills for personal development. Future research can validate this finding in different areas of organizational cultures.

Although we distinguished between relative and absolute learning self-efficacy, we found that individuals with high levels of either type of self-efficacy (relative or absolute) are more likely to have high levels of learning intention. This finding is similar to previous research (e.g. Maurer *et al.*, 2003) which also found that higher learning self-efficacy about relative and absolute leads to greater behavioral intentions to learn. Our study contributes to the literature by finding that, in terms of direction and magnitude, the two types of self-efficacy have similar influence on an IS developer's behavioral intention to learn business skills. Moreover, extant literature on self-efficacy has suggested various ways of enhancing the belief in one's efficacy, and these apply to all forms of self-efficacy (specifically, in our case, learning b-skills self-efficacy). Sources of self-efficacy, including mastery experience, vicarious learning, verbal persuasion, and emotional arousal, can be used to boost IS developers' belief in their own abilities to learn b-skills. Future studies can reexamine this finding in different learning environments or organizational level.

Work support was found to have a positive impact on both extrinsic and intrinsic learning motivation. However, it was interesting to note that work support did not lead to significantly higher levels of relative and absolute learning self-efficacy. This finding is consistent with prior research (e.g. Al-Eisa *et al.*, 2009) indicating that work support (e.g. supervisor support) acts as stronger predictor of the motivation to learn than of self-efficacy. In contrast, non-work support influenced extrinsic and intrinsic learning motivation and both types of learning self-efficacy. Our knowledge is insufficient to explain this difference. One possible reason, however, might be related to the different types of support an individual receives from work vs non-work domains. It is possible that IS developers receive different types of social support (e.g. network support, emotional support, instrumental support) with higher quality from their non-work networks. Since we measured only the perceived amount of support from different domains, it would be interesting for future researchers to examine the effects of different types of support on learning intention.

7. Practical implications
In today's hypercompetitive business environment, fundamental business changes have compelled IT organizations to value managerial, business, and social skills (i.e. the sub-categories of b-skills) along with technical skills, among other imperatives

(Byrd and Turner, 2001). Previous studies have emphasized that, since users' system needs change frequently, b-skills are highly important for IS developers as they design and implement innovative IT for the organization. In order to successfully serve their organization, manage ISD performance, and gain a sustainable competitive advantage for the company, IS developers need to learn important skills in both IT and business. For these reasons, we investigated the determinants of IS developers' behavioral intention to learn b-skills within an organizational ISD context, based on the MARS model. The findings of this study provide several critical implications for practitioners seeking to encourage IS developers to learn b-skills.

Role perception was found to have a significant positive relationship with the behavioral intention to learn b-skills. When IS developers perceive their role as that of an advocate (as opposed to a traditionalist or facilitator), they are more likely to learn b-skills. Thus, organizations should strongly encourage IS developers to take on the advocate role in ISD projects, and urge them to acquire b-skills through formal education and on-the-job training. Each developer in the ISD project should have an equal opportunity to learn to be an advocate who is responsible for the success or failure of the system, and be motivated to combine b-skills with technical skills to facilitate better coordination with users.

The significant positive relationship between intrinsic learning motivation and the behavioral intention to learn b-skills suggests that IS developers' learning intention is mainly motivated intrinsically rather than extrinsically. Thus, organizations should pay greater attention to providing suitable personal career development opportunities, which will motivate workers by matching their needs with the organization's needs (Petroni, 2000). Organizations should also help IS developers understand how learning b-skills is important for their future work and potential self-growth, rather than focusing solely on extrinsic benefits such as promotion or remuneration. We also recommend that, in order to enhance IS developers' intrinsic motivation to learn b-skills, organizations should foster a learning-oriented culture instead of a performance-oriented culture.

Both relative and absolute learning self-efficacy were found to have a significant positive relationship with the behavioral intention to learn b-skills. Previous studies have suggested that mastery experiences (e.g. prior successful development experiences), vicarious experiences (observation of similar development models), persuasion (support and encouragement, perceived access to resources and experiences), physiological influences (situational anxiety and arousal), social comparison (goals and comparative information), performance feedback, and role modeling are important ways to enhance relative and absolute learning self-efficacy (Bandura, 1977; Schunk, 1985; Gist and Mitchell, 1992; Marakas et al., 1998; Maurer, 2001). Organizations can also make use of these strategies to enhance IS developer's learning self-confidence and beliefs, which will, in turn, increase their intention to learn b-skills.

Both work and non-work support were found to have a significant positive relationship with both extrinsic and intrinsic learning motivations. Support from others is influential in the formulation of positive work attitudes and behaviors, so organizations will benefit when employees are well supported (Heaney et al., 1995). Work support has received a great deal of research attention in the literature. Suggestions of ways in which an organization can offer work support include providing valuable resources (e.g. mentors and information), offering instrumental and emotional assistance (sympathy, caring, comfort, and encouragement), developing supportive policies (e.g. flexible schedules) and practices (e.g. training in supervisor supportive behaviors), sharing skills and similar experiences,

demonstrating the usefulness of knowledge provided by the effort, answering employees' questions, giving suggestions, guiding career development, and listening to concerns and complaints (Ng and Sorensen, 2008). IS developers' intrinsic and extrinsic learning motivations will be enhanced to the extent that the developers know they have access to work support which can help them improve their b-skills. On the other hand, prior research has noted that non-work support (e.g. family) may diminish the conflict between work and non-work roles, along with its attendant stress (Williams and Alliger, 1994; Ng and Sorensen, 2008). Furthermore, employees may need non-work support to motivate them to maintain a positive work attitude, which the organization can facilitate by providing time off, setting reasonable work expectations, providing opportunities to perform well at work, sharing similar experiences, providing care and encouragement, and providing opportunities for work tasks to enrich self-growth – all of which might help the employee meet the demands of the work role (Wayne *et al.*, 2013). Different forms of non-work support in the prior research, such as instrumental, informational, and emotional support, appear relevant in the context of work-life balance (Schwarzer and Knoll, 2007). Instrumental support, which refers to providing tangible help such as money, material objects or services; information support is regarded as giving advice, information, necessary or useful knowledge; and emotional support is related to displaying interest, friendship, reassurance, listen empathetically, affirmation of affection, and caring about a person in need (Greenhaus and Parasuraman, 1994; Parasuraman and Greenhaus, 2002). Therefore, IS developers who receive these kinds of non-work support may find greater enrichment and be more motivated, both extrinsically and intrinsically, to learn job-related skills, including b-skills.

The results of this study also show that non-work support has a significant positive relationship with both relative and absolute learning self-efficacy. Past research has noted that informational support, emotional support, encouragement, exhortations, regular communication, and positive, persuasive feedback from people outside of work (e.g. friends and family) may persuade workers that they are capable of improving and developing their skills (Bandura, 1977; Maurer and Tarulli, 1996). Also, Parasuraman *et al.* (1996) suggested that high levels of non-work support may enhance the employee's feeling of self-efficacy and thereby keep work-life balance. The perception that learning opportunities are available may also help persuade workers that they are capable of developing their skills. Thus, people within the IS developer's social circle who are not related to work can use these various ways to enhance the developer's belief that he or she can develop b-skills which can be put to use in the ISD project.

These practical suggestions can contribute to promoting b-skills learning among IS developers. Since business strategies, corporate culture, and available resources differ, each organization will likely pursue the specific direction that suits it best. Determining the best direction for supporting b-skills learning based on the organization's culture and strategy is one of several interesting topics that might provide fodder for future research.

8. Limitations
Based on the MARS model, we included a broad range of factors and considered their influences on IS developers' behavioral intention to learn business skills. While we exhausted these factors, the study might not be comprehensive; there are several limitations that could be addressed in future studies. First, there may be other predicting factors which can affect individuals' behavior, and other relationships between them

might be discovered by using a moderator or mediator. For instance, the MARS model suggests that individual characteristics including personality, self-concept, and values are likely to be stimulating elements. Future research could establish other relationships within the MARS model by integrating potential predictors.

Moreover, this study included only three demographic variables (i.e. gender, age, and work seniority) as the control variables. The results failed to show any significant relationship between these variables and the behavioral intention to learn business skills. Given prior research (Morgeson *et al.*, 2005), other kinds of individual characteristics, such as cognitive ability and job-related skills, may perhaps be suitable as control variables. Cognitive ability not only reflects an individual's all-around competence at work, but also directly affects the performance of job-related tasks and learning. Similarly, employees who have higher levels of job-related skills will have a deeper understanding of the specific tasks and learning associated with the job. Future research might also examine how these factors affect IS developers' behavioral intention to learn b-skills.

Finally, a more detailed investigation or a different operationalization of each of the four MARS factors may be necessary. For example, we measured the perceived level of support from work and non-work domains to represent situational factors, and used individuals' behavioral intention (rather than actual behavior) to represent the MARS model's behavior and results factor. Longitudinal evidence might enhance our current understanding of the relationships among the factors of the MARS model. However, other questions remain. What resources do companies provide to support learning? Do companies formally require employees to have b-skills? Do employees have enough time and financial resources to learn? Future research can answer these important questions and provide specific recommendations.

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Appendix. Measuring items used in this study
Extrinsic learning motivation (Learning business skills can …)
EM1: increase my chances of promotion.
EM2: ensure I keep my job.
EM3: help me get better pay.
EM4: help me reduce conflicts with users.
EM5: help me obtain more accurate user requirements.
EM6: help me communicate better with users.
EM7: help me have a greater say in the team.
EM8: enhance user acceptance of the system.
EM9: help me reduce the probability of system re-development.
EM10: enhance my status in the users' minds.
EM11: improve our teamwork.
EM12: help me be more creative in analyzing a system for our project.
EM13: improve the performance of my team.

Intrinsic learning motivation
IM1: Learning business skills helps my personal development.
IM2: The process of learning business skills is interesting.
IM3: Learning business skills makes my skill set more comprehensive.
IM4: I feel that the process of learning business skills is challenging.
IM5: Learning business skills will enrich me.
IM6: Learning business skills develops my potential.
IM7: Learning business skills helps me grow personally.

Relative learning self-efficacy (When I learn business skills, …)
RLSE1: I am better than others in terms of the ability to learn.
RLSE2: I am better than others at understanding learning content.
RLSE3: I perform better than others.
RLSE4: I learn faster than others.

Absolute learning self-efficacy
ALSE1: I think I am able to learn business skills.
ALSE2: I think I have a knowledge foundation from which I can learn business skills.
ALSE3: I am not afraid to learn business skills.
ALSE4: I have enough intelligence to learn business skills.

Behavioral intention to learn business skills
BITL1: I intend to learn relevant business skills.
BITL2: I think that I will learn relevant business skills.
BITL3: I plan to learn business skills in the future.

Work support
WS1: My company is concerned about developing my work knowledge.
WS2: My company really cares about developing my work knowledge.
WS3: My company strongly supports my learning goals and values.
WS4: My company provides adequate resources for me to learn new business skills, including
     time, information, incentives, etc.
WS5: My company encourages me to learn a variety of new business skills.
WS6: My company has policies to encourage employees to learn new business skills.
WS7: When I have problems learning work-related skills, I can get help from my company.
WS8: If I make a special request for work-related learning, my company is usually willing to
     help me.

Non-work support
NWS1: My family encourages me to learn new business skills.
NWS2: My non-work peers encourage me to learn new business skills.
NWS3: My friends encourage me to learn new business skills.

Change agent role perception
According to descriptions of the three change agent roles (see below), what kind of role do you play in your company?
☐ Traditionalist ☐ Facilitator ☐ Advocate

Characteristics of the three roles are as follows:

(1) Traditionalist:

- focuses primarily on the development of information technology.

- acts as a technician during information system development.

- is responsible only for building an information system. Non-IT related problems of the organization and users are not the concern or responsibility of a traditionalist.

(2) Facilitator:

- focuses primarily on helping users.

- is responsible for using information technology to assist users to make changes.

- helps users and the organization enhance their ability to make (organizational) changes.

- the success or failure of an organizational change is not a facilitator's responsibility.

(3) Advocate:

- is responsible for the success or failure of an information system and the corresponding organizational changes.

- uses an information system to advocate and implement organizational changes.

- often uses means such as communicating with users, active persuasion and manipulation to implement a better information system.

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