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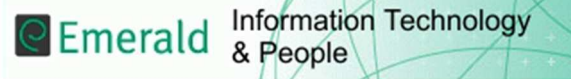
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**Encouraging IS developers to learn business skills: An examination of the MARS model**

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

### Abstract

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), this study argues 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). Data collected from 254 IS developers are analyzed using the Partial Least Squares (PLS) technique. 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. Our results suggest several theoretical and practical implications.

**Keywords:** IS development; Business skills; MARS model; Change agent role

### 1. Introduction

Information systems development (ISD) involves the analysis, design and implementation of information technology (IT) to support business functions (Xia & Lee, 2005). Developing an information system is an interactive process between information system (IS) developers and their business partners/clients (Park & 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, Park, & Lee, 2014; Tesch, Sobol, Klein, & Jiang, 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 & Lee, 2014). Common examples include IS developers failing to understand business workflow and users' specific needs (Joshi, Sarker, & Sarker, 2007), and users not understanding either the constraints or the possible applicability of a particular technology (Ko, Kirsch, & King, 2005; Rus & Lindvall, 2002). Laudon and Laudon (2006) described such

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3 phenomena as the “user-designer communications gap” which not only affects the  
4 quality of an information system (Klein & Jiang, 2001) but also hinders the future  
5 business relationship between the IS developers and the users. Therefore,  
6 management information systems (MIS) literature has considered critical the clearing  
7 of any obstructions to knowledge integration among IS developers and users from  
8 different business functional domains (Deng, Wang, & Galliers, 2015).  
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11 In response to this, we argue that for the success of ISD projects and the overall  
12 competitiveness of organizations, IS personnel need to possess business skills (a.k.a.  
13 “b-skills”) in addition to technical skills. We consider business skills to be comprised  
14 of industry and functional area knowledge, management and organizational skills, and  
15 interpersonal/communication skills (Todd, McKeen, & Gallupe, 1995). By acquiring  
16 additional skill sets, IS personnel can help reengineer business processes, identify  
17 business problems and apply appropriate technical solutions (Deng et al., 2015;  
18 Sullivan-Trainor, 1988).  
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21 As technology increasingly intertwines with business operations, the importance  
22 and value of equipping IS personnel with b-skills have been highlighted not only by  
23 practitioners but also academics. For example, a Google search of “IT personnel and  
24 business skills” generates 17,900,000 results. Luftman, Kempaiah, and Henrique’s  
25 (2009) survey of 291 organizations of the Society for Information Management found  
26 that “Build Business Skills in IT” was second only to “IT and Business Alignment” in  
27 a ranking of the most important management concerns. Another interesting feature of  
28 the report was that, of the top fifteen skills sought by IT executives when hiring entry  
29 level IT personnel, only three were technical. Non-technical skills are obviously  
30 considered important for new hires at both the executive and operational levels.  
31 Similarly, other studies have suggested a growing need for IS personnel to acquire  
32 industry knowledge and skills in the fields of Management, Marketing, Finance, etc.  
33 (e.g., Alshare, Lane, & Miller, 2011; Bartol & Martin, 1982; Benbasat, Dexter, &  
34 Mantha, 1980; Connelly et al., 2000; Hawk et al., 2012; Pee, Kankanhalli, & Kim,  
35 2010; Wilkerson, 2012; Zaccaro, 2001). Educators and scholars have responded to the  
36 demands of the industry by helping students develop adequate skill sets for future jobs.  
37 For example, the IS 2010 Curriculum Guidelines for Undergraduate Degree Programs  
38 in Information Systems highlighted that MIS graduates should be equipped with not  
39 only IS specific knowledge and skills, but also foundational business knowledge and  
40 skills (e.g., communication, leadership and collaboration), and business domain  
41 fundamentals (e.g., evaluation of performance within a domain) (Topi et al., 2010).  
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45 Despite the importance of b-skills, encouraging IS personnel to acquire such  
46 skills remains challenging. Gaps between industry expectations and the abilities of IS  
47 graduates have been documented (Trauth, Farwell, & Lee, 1993; Haddan, 2002;  
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3 Radermacher & Walia, 2013). There are several reasons why business skills are  
4 relatively scant among IS personnel. First, traditional education still focuses more on  
5 technical skills than non-technical skills (Luftman & Kempaiah, 2008), which results  
6 in a belief commonly shared by IS personnel that technological advancement alone is  
7 enough to make an information system successful and that users will love using any  
8 system based on innovative technologies (Park & Chen, 2007). This belief, to some  
9 extent, reflects a narrowly-focused role perception common among many IT  
10 professionals. Many view themselves as technicians who provide solutions or services  
11 based on client requests rather than as influential champions who identify what clients  
12 really need and persuade them to adopt the appropriate information system. Second,  
13 IS personnel tend to have a strong professional identity, so that they self-identify with  
14 their highly professional knowledge, skills, and abilities (a.k.a. “KSAs”) more closely  
15 than they do with their memberships in organizations (Hofstede, 1998). As a  
16 consequence, if KSAs associated with other disciplines are not factored into their  
17 performance appraisals, they may choose to improve their professional, IT-related  
18 KSAs rather than engage in “inter-disciplinary learning.” Finally, rapid changes in  
19 technology cause IS personnel to experience relatively more work-related stress in  
20 comparison to workers in other functional domains (Moore, 2000). They must  
21 constantly update their knowledge of new technologies and/or new programming  
22 languages. Without additional support from the organization (e.g., in the form of time  
23 and financial resources), they may be less likely to invest time and energy to learn  
24 non-IT-related business skills.  
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35 As more information system development projects fail because of poor internal  
36 communication and the absence of an influential champion and change agent (Markus  
37 & Benjamin, 1996), understanding the factors that promote an IT developer’s  
38 intention to acquire business skills becomes particularly important. While prior  
39 research has emphasized the importance of b-skill possession for IS developers during  
40 the system development process (Barki & Hartwick, 2001; Deng et al., 2015; Joshi et  
41 al., 2007; Todd et al., 1995), few studies have explored the factors affecting an IS  
42 developer’s behavioral intention to learn those business skills.  
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47 This study intends to bridge this gap by investigating factors that drive IS  
48 developers’ intention to learn business skills. Using the MARS model (McShane &  
49 Von Glinow, 2005) as our foundation, we include a wider range of individual factors  
50 (i.e., change agent role perception, relative and absolute learning self-efficacy, and  
51 extrinsic and intrinsic motivation) and situational factors (i.e., work and non-work  
52 support). The findings of this study are useful to researchers in the development and  
53 testing of theories related to IS developer learning behavior, and to practitioners to  
54 facilitate business skill learning for their IS development staff.  
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3 The remainder of this paper is organized as follows. The next section reviews  
4 relevant streams of literature. A research model and a set of hypotheses are then  
5 proposed, followed by descriptions of the construct measures and data collection  
6 methods used in this study. Next, the results of the data analysis and hypothesis  
7 testing are presented. The paper concludes with a discussion of the theoretical and  
8 practical implications of the findings regarding IS developer business skill learning  
9 behavior.  
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## 13 14 15 **2. Theoretical foundation**

16 McShane and Von Glinow (2005) proposed the MARS model as a useful  
17 conceptual framework to understand what drives individual behavior and results. In  
18 the MARS model, individual behavior is a factor of motivation (M), ability (A), role  
19 perceptions (R), and situational factors (S). This model has been used to highlight  
20 how the four factors *directly* influence a person's voluntary behavior and the  
21 subsequent outcome (McShane & Von Glinow, 2009). Previous studies have assumed  
22 and empirically confirmed that learning intention precedes employees' actual  
23 participation in learning activities (e.g., Ajzen & Fishbein, 1980; Ajzen, 1991; Kim &  
24 Hunter, 1993; Maurer, Weiss, & Barbeite, 2003). Several researchers have also found  
25 a positive relationship between employees' prior participation in learning activities  
26 and their learning intentions (e.g., Bates, 2001; Kyndt, Govaerts, Dochy, & Baert,  
27 2011; Maurer et al., 2003; Renkema, 2006). The relationship between actual  
28 participation in learning activities and learning intention appears to be reciprocal in  
29 nature (Kyndt, Onghena, Smet, & Dochy, 2014). For instance, when employees wish  
30 to advance in their career, they might recognize their need to learn additional skills.  
31 According to Zwieg et al. (2006), IS personnel with a balance of technical and business  
32 skills is not found in the typical freshly minted undergraduate. Those who have strong  
33 business skills almost through the experiences they gained over many years and many  
34 projects in the workplace. However, the increasing emphasis on equipping IS personnel  
35 with business skills seems to suggest that actual b-skills learning behaviors may not be  
36 prevalent among IS personnel. Accordingly, instead of measuring the low level of  
37 actual b-skills learning behaviors of some participants, we focus on the learning  
38 intention of IS developers as the precedent of actual b-skills learning behavior.  
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49 The first element in the MARS model is *motivation*, which refers to internal  
50 forces that affect the *direction*, *intensity*, and *persistence* of one's voluntary choice of  
51 behavior (Campbell & Pritchard, 1976). Direction implies that the motivation is  
52 goal-oriented, not random. People are motivated to arrive at work on time, finish a  
53 project before the due date, or accomplish set goals. Intensity is the amount of effort  
54 allocated to goal attainment. Motivation also involves a level of persistence to sustain  
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3 the effort over a certain period of time. The level of persistence varies: employees  
4 may sustain their efforts until they reach their goal, or they may give up beforehand.  
5 Note that motivation can come from both external and internal sources (Deci & Ryan,  
6 1985). We believe that both extrinsic and intrinsic motivation influences IS  
7 personnel's intention to learn b-skills.  
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10 The second element in the MARS model is *ability*, which refers to both the  
11 natural aptitudes and learned capabilities required to successfully complete a task  
12 (McShane & Von Glinow, 2005). Aptitudes are the natural talents that help employees  
13 to learn specific tasks more quickly and to better perform those tasks. Many different  
14 physical and mental aptitudes can affect an individual's ability to acquire skills.  
15 Learned capabilities are skills and knowledge that an individual currently possesses.  
16 Though having the actual ability is important for individual performance, Bandura  
17 (1986) maintained that confidence in one's abilities—known as self-efficacy—often  
18 plays a more pivotal role than ability in predicting how well one learns a new subject  
19 or learns in unfamiliar situations. Although a person may have the capabilities  
20 required to perform certain tasks, he may choose not to do them if he *believes* that he  
21 is unable to perform them. For example, Al-Eisa, Furayyan, and Alhemoud (2009)  
22 studied training effectiveness and found that trainees who are highly confident in their  
23 ability to learn the training content are more likely to believe in their ability to apply  
24 their newly-gained knowledge and skills on the job after training is complete. In  
25 addition, Switzer, Nagy, and Mullins (2005) found that trainees with low self-efficacy  
26 are less likely to be open to new situations, limiting their ability to benefit from a  
27 training experience. Similarly, we believe that b-skills are a new knowledge domain  
28 for IS personnel and, therefore, it would be reasonable to use self-efficacy rather than  
29 actual ability as a predictor of their b-skills learning intentions.  
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40 Judgments of efficaciousness differ in terms of three distinct yet interrelated  
41 dimensions: *magnitude*, *strength* and *generalizability*. First, the magnitude of  
42 self-efficacy refers to the level of task difficulty one believes is attainable. Individuals  
43 with a high magnitude of self-efficacy believe that they are able to accomplish  
44 difficult tasks, while those with a low magnitude of self-efficacy believe they are able  
45 to execute only simple forms of the behavior (Compeau, Higgins, & Huff, 1999).  
46 Second, the strength of self-efficacy refers to the level of conviction regarding the  
47 judgment. It also reflects the individual's ability to resist being influenced by  
48 information which appears to disconfirm the individual's self-efficacy (Brief & Aldag,  
49 1981). Individuals with a weak sense of self-efficacy are more easily frustrated by  
50 obstacles and react to a situation by lowering their perceptions of their capability. In  
51 contrast, individuals with a strong sense of self-efficacy are not deterred by difficult  
52 problems and retain their sense of self-efficacy (Compeau & Higgins, 1995). Third,  
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3 the generalizability of self-efficacy refers to the extent to which perceptions of  
4 self-efficacy are limited to particular situations. Individuals may believe they are  
5 capable of performing a given behavior only under certain circumstances, while  
6 others may believe they can execute the particular behavior under any circumstance,  
7 and also perform behaviors that are slightly different (Compeau & Higgins, 1995). In  
8 light of this distinction between general and specific self-efficacy (Multon, Brown, &  
9 Lent, 1991), we focus on learning efficacy as a specific form of self-efficacy that will  
10 influence IS developers' behavioral intention to learn.  
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14 The third element in the MARS model is *role perception*, which refers to the  
15 extent to which people understand the job duties (roles) assigned to them or expected  
16 of them (McShane & Von Glinow, 2005). A clear role perception helps workers  
17 understand the tasks assigned to them, the relative importance of those tasks, and the  
18 preferred behaviors for accomplishing them (Ivancevich & Donnelly Jr., 1974).  
19 Unfortunately, many employees do not have a clear perception of their role (McShane  
20 & Von Glinow, 2005). In IS development, for example, some developers perceive  
21 their role as "technical personnel," so they focus mainly on the technical aspect of an  
22 information system without interacting with the system users in the decision-making  
23 process. This narrow perception of the role results in many IT failures and reduces IS  
24 credibility (Markus & Benjamin, 1996). However, when developers perceive their  
25 role as "change agent," they value their clients' informed choices and recognize the  
26 criticality of communicating with users. As a result, they not only add business value  
27 but also enhance IS credibility (Markus & Benjamin, 1996). We believe that different  
28 role perceptions influence IS developers' b-skills learning intentions, depending on  
29 whether they perceive that acquiring b-skills helps them perform their job.  
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32 The last element in the MARS model is *situational factors*, which are  
33 environmental conditions outside of the individual's immediate control (e.g., time,  
34 people, budget, and physical work facilities). We chose situational support—from  
35 both work and non-work domains—as a primary factor that influences IS developers'  
36 intention to learn business skills. Sources of work support include the organization,  
37 the supervisor, and coworkers; sources of non-work support include family, friends,  
38 and non-work peers. Research on perceived organizational support has shown that  
39 support has a variety of positive impacts on the organization as well as on individual  
40 workers, including job satisfaction, employee retention, and motivation to learn  
41 (Al-Eisa et al., 2009; Rhoades & Eisenberger, 2002; Switzer et al., 2005; Tracey,  
42 Tannenbaum, & Kavanagh, 1995). The social support literature has also maintained  
43 that support from the non-work domain (e.g., spouse) has a crossover effect on  
44 outcomes in the work domain (Takeuchi, Yun, & Tesluk, 2002; Westman & Etzion,  
45 1995). Therefore, we include both domains of support to explain IS developers'  
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3 learning intentions. Furthermore, prior findings indicated that the relationship between  
4 situational factors and behavioral intention is mediated through a number of different  
5 individual motivation and ability (Maurer et al., 2003; Maurer, Lippstreu, & Judge,  
6 2008). Although there are several alternative pathways between situational factors and  
7 behavioral intention, our research regards situational factors as an antecedent of  
8 intermediary (i.e., motivation and ability) rather than simply as independent variable of  
9 behavioral intention.

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

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35 The research model shown in Figure 1 provides a comprehensive view of the  
36 individual and situational factors that drive IS developers' intention to learn business  
37 skills. This model suggests that situational support (work and non-work support),  
38 learning motivation (extrinsic and intrinsic motivation), learning self-efficacy  
39 (relative and absolute learning self-efficacy), and change agent role perception  
40 (facilitator, advocate, or traditionalist) directly and indirectly influence the behavioral  
41 intention to learn business skills. The relevant theories described below were used to  
42 develop our proposed hypotheses.  
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#### 48 **3.1. Conceptual definition of business skills**

49 The emphasis on training IS personnel with business skills is driven by  
50 practicality. Demands from employers are evident from both IS personnel job  
51 advertisements and recent guidelines for curriculum design. For example, Todd et al.  
52 (1995) analyzed job advertisements for information system personnel (i.e.,  
53 programmers, system analysts, and IS managers) across two decades. They identified  
54 three main knowledge/skills categories: *technical*, *systems*, and *business*. The  
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3 technical knowledge/skills category is comprised of specific knowledge and skills  
4 related to hardware and software. The systems knowledge/skills category captures  
5 problem-solving skills, including analytical and modeling skills, knowledge of  
6 development methodologies, and systems analysis/design tools and techniques. The  
7 business knowledge/skills category is similar to the generalist/managerial category of  
8 previous studies and includes industry and functional area knowledge, management  
9 and organizational skills, and interpersonal/communication skills. Under the broad  
10 category of business knowledge/skills are three skill sub-categories: *business*,  
11 *management*, and *social*. Business skills include functional expertise (e.g., finance,  
12 marketing) and industry expertise (e.g., retail, mining). Management skills refer to  
13 general management skills, including leadership, project management, planning,  
14 controlling, training and organization. Social skills pertain to interpersonal skills,  
15 communication skills, personal motivation, and the ability to work independently.  
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19 Similarly, the IS 2010 Curriculum Guidelines for Undergraduate Degree  
20 Programs in Information Systems (developed by the Association for Computing  
21 Machinery [ACM] and the Association for Information Systems [AIS]) suggested that  
22 MIS personnel should be equipped with three skill sets: “IS specific knowledge and  
23 skills, foundational knowledge and [business] skills, and [business] domain  
24 fundamentals” (Topi et al., 2010). The first skill set is conceptually similar to  
25 technical skills as proposed by Todd et al. (1995). The second skill set, foundational  
26 knowledge and business skills, includes leadership and collaboration, communication,  
27 negotiation, and analytical and critical thinking (including creativity, problem solving  
28 and ethical analysis). The third skill set, business domain fundamentals, refers to  
29 knowledge and skills regarding general business models, key business specializations,  
30 and the evaluation of business performance. In contrast to the knowledge/skill  
31 categories presented by Todd et al. (1995), the second and third skill sets in the IS  
32 2010 Curriculum Guidelines also covered business and system knowledge/skills.  
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36 Note that the competency approach to personnel selection (Lado & Wilson, 1994)  
37 normally treats knowledge and skills as a cluster, since they represent different facets  
38 of worker competency. For this reason, we do not distinguish knowledge from skills,  
39 despite the conceptual differences between them. Furthermore, the term “b-skills”  
40 captures both the business knowledge and skills identified by Todd et al. (1995). Since  
41 the term “business skills” is so common and yet means different things to different  
42 groups of people, when we administered our questionnaires, we gave examples of  
43 what we meant by business skills (including examples from Todd et al.’s [1995] three  
44 sub-categories under business knowledge/skills), and asked respondents to answer  
45 accordingly.  
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### 3.2. *Change agent role perception & 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 & 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 & Benjamin, 1996; Markus & Keil, 1994; Ryan & 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 information system 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 & Benjamin, 1996; Winston & Dologite, 1999) as well as worker attitudes (e.g., career development and turnover intention) (Mak & 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 learn into a new ISD project, solve the issues raised, improve the system development process throughout the project (Akgün, Byrne, Lynn, & Keskin, 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 & Sockel, 2001; Sockel, Mah, & Bucholz, 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 & learning b-skills***

Motivation has been regarded as a key factor in determining workers' learning behavior (Malik, Danish, & Usman, 2011; Spinath, Spinath, Harlaar, & Plomin, 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, LePine, & Noe, 2000; Liao & Tai, 2006; Maurer & Tarulli, 1994; Noe & 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 & Ryan, 1985) specifically distinguishes different types of motivations based on reasons or goals that give rise to an action (Deci & Ryan, 2000), and places the types of regulations on a continuum between self-determined (intrinsic) and controlled (extrinsic) forms (Deci & 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 & Ryan, 2000).

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3 Based on the classic definition of motivation, we employ Colquitt et al.'s (2000)  
4 definition of learning motivation (a.k.a. *motivation to learn*) as “the direction,  
5 intensity, and persistence of learning-directed behavior” (p.678). Also, in line with the  
6 reasoning of SDT, we distinguish two types of learning motivations: extrinsic and  
7 intrinsic.  
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10 Extrinsic learning motivation refers to the impetus to perform a learning activity  
11 in order to attain outcomes such as a tangible reward, sanctions, praise, feedback, or  
12 grades (Ryan & Deci, 2000). It is induced by rewards or punishments which are  
13 contingent upon the individual's success or failure at a learning task. Common  
14 approaches that organizations use to motivate workers to learn include pay raises,  
15 promotions, or job security (Frey & Osterloh, 2002). Simply put, the aim of extrinsic  
16 motivation is to link monetary incentives to organizational goals (Osterloh & Frey,  
17 2000).  
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22 Intrinsic learning motivation refers to motivation driven by one's interest in or  
23 enjoyment of the learning task itself. It exists within the individual rather than relying  
24 on external pressure. An individual is intrinsically motivated to learn simply because  
25 learning is enjoyable and interesting and it satisfies a personal need to do a task (e.g.,  
26 personal development) (Deci & Ryan, 1980; Frey & Osterloh, 2002; Lee, Cheung, &  
27 Chen, 2005). Elements of intrinsic learning motivation include enthusiastic task  
28 involvement, the desire to experience adventure and novelty, striving for excellence in  
29 one's work, trying to understand something and wishing to improve, and goal  
30 direction (Fredricks, Blumenfeld, & Paris, 2004; McInerney & McInerney, 2010;  
31 Reeve, Deci, & Ryan, 2004).  
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37 There is a major distinction between extrinsic and intrinsic learning motivation.  
38 For the former, what motivates a person to learn is independent from the learning task  
39 or activity. For the latter, what motivates and satisfies a person comes directly from  
40 the task or activity itself (Calder & Staw, 1975; Covington & Dray, 2002). However,  
41 since the interaction between intrinsic and extrinsic rewards and motivation is not  
42 entirely clear (Bowditch, Buono, & Stewart, 2008), we believe that both types of  
43 motivation are useful in determining an IS developer's b-skills learning intention. IS  
44 developers may learn business skills because it leads to visible outcomes such as  
45 gaining rewards or positive feedback (extrinsic learning motivation). They may also  
46 learn b-skills because they believe that learning business skills has value for its own  
47 sake, i.e., is enjoyable or satisfying in and of itself (intrinsic learning motivation).  
48 Since both kinds of motivation encourage people to learn and obtain goals, we  
49 propose our second set of hypotheses as follows:  
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57 **H2a.** Extrinsic learning motivation has a positive relationship with the behavioral  
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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 & learning b-skills*

In addition to motivation, ability is considered indispensable in the widely accepted “performance formula” (Anderson & Butzin, 1974). Even though ability (or absorptive capability) influences people’s knowledge obtainment and usage (Michailova & 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 & 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, Collins, & Salgado, 2006; Gist, Schwoerer, & Rosen, 1989; Martocchio & Webster, 1992; McGill, Slocum Jr., & Lei, 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 & Tarulli, 1994).

Learning self-efficacy has been shown to influence how individuals approach

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3 learning (Brown, 2001). First, learning self-efficacy increases engagement in a  
4 learning context. Individuals with a high level of learning self-efficacy tend to be  
5 actively involved in development and learning activities that often force them to  
6 explore new terrain (Pan, Pan, Lee, & Chang, 2010). For example,  
7 Bouffard-Bouchard (1990) found that students with high levels of self-efficacy  
8 worked more practice problems than did those with low levels of self-efficacy. Second,  
9 learning self-efficacy helps an individual set more challenging learning goals and hold  
10 a positive attitude toward challenges in the learning process (McKee, Simmers, &  
11 Licata, 2006). For example, Wood and Bandura (1989) found that high learning  
12 self-efficacy expectations regarding performance in a specific behavioral setting led  
13 individuals to approach that setting, whereas individuals with low learning  
14 self-efficacy expectations in that setting avoided it. Noe and Wilk (1993) presented  
15 that individuals with higher levels of self-efficacy are more likely to have a positive  
16 attitude toward learning, a belief that there are benefits to be gained from participation  
17 in such activities, and a greater awareness of their specific development needs. Pan et  
18 al. (2010) also argued that individuals with high levels of learning self-efficacy are  
19 better able to cope with the stress involved in personal learning because they believe  
20 they can influence things in order to overcome obstacles in the learning process. In  
21 contrast, when encountering challenging (or even threatening) learning situations,  
22 people with low levels of learning self-efficacy tend to give up easily, attribute failure  
23 to themselves, and experience high levels of anxiety and/or depression (Bandura,  
24 1986).

25  
26 Learning b-skills can be viewed as a challenging goal, as IS developers have to  
27 spend additional time and effort to take formal or informal training and learn new  
28 skills outside of their functional domain/comfort zone. Based on the above, we can  
29 reasonably infer that IS developers with a high level of self-efficacy are more aware  
30 of their specific developmental needs and tend to have a positive attitude toward  
31 learning b-skills since they believe in the benefits associated with participating in such  
32 activities. Therefore, both relative and absolute learning self-efficacies are expected to  
33 have a positive relationship with the behavioral intention to learn business skills, and  
34 the following hypotheses are proposed:

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

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52 **H3b.** Absolute learning self-efficacy has a positive relationship with the  
53 behavioral intention to learn business skills.  
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### 56 57 **3.5. Situational support & learning b-skills** 58

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3 Sources of situational support come from the work domain (e.g., organizations,  
4 supervisors, coworkers, etc.) and the non-work domain (e.g., family, friends,  
5 non-work peers, others outside of work, etc.) (Madjar, Oldham, & Pratt, 2002). Work  
6 support provides learning resources and enforces learning policies (Maurer et al.,  
7 2003). Examples of work support include providing practical assignments, offering  
8 developmental opportunities, training workers with new skills, understanding workers'  
9 career goals and aspirations, and supporting workers' attempts to acquire additional  
10 training or education (Çakmak-Otluoğlu, 2012). In general, work support provides  
11 social resources that help individual employees tackle work-related challenges and  
12 satisfy their social needs (e.g., recognition, belongingness). Studies on organizational  
13 support have shown that support from the work domain helps to increase positive  
14 organizational behaviors such as self-regulation and learning behavior (Eisenberger,  
15 Huntington, Hutchison, & Sowa, 1986; Ng & Sorensen, 2008; Noe, 1986). For  
16 example, Bell and Menguc (2002) showed that when employees believe the  
17 organization recognizes their contribution to service quality, they are more likely to  
18 engage in customer-oriented behavior and adopt the organization's values and norms  
19 as their own. Ng and Sorensen (2008) found that, in addition to providing employees  
20 with a sense of belonging, supervisor and coworker support in the form of providing  
21 work-related information and feedback is highly useful for workers' self-regulation  
22 and learning behavior. From a resource perspective, the benefits associated with work  
23 support can also motivate employees to acquire new knowledge and skills. For  
24 example, organizations may encourage employees to acquire a new skill set by  
25 providing support in the forms of financial aid or promotional opportunities, which  
26 can be great incentives for employees who are extrinsically motivated (Gagne & Deci,  
27 2005). Thus, we expect that employees will be more motivated to acquire business  
28 skills if more support is offered from the work domain (e.g., the organization,  
29 supervisors, peers, and even subordinates). We propose the following hypothesis:

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44 **H4a.** Work support has a positive relationship with extrinsic learning motivation.  
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47 Studies on organizational support have shown that support from the work  
48 domain helps to increase employee affective commitment (Eisenberger et al., 1986;  
49 Kuvaas, 2003), a positive job attitude widely found among intrinsically motivated  
50 employees (e.g., Bartlett, 2001; Eby, Freeman, Rush, & Lance, 1999; Kuvaas, 2003).  
51 When work support (e.g., coworker, supervisor, organization) is low, those with high  
52 levels of intrinsic motivation are less affectively committed to the organization than  
53 are those with low levels of intrinsic motivation. However, when work support is high,  
54 those with high levels of intrinsic motivation will still have higher levels of affective  
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3 commitment than will those with low levels of intrinsic motivation (Schwalbe, 2007).  
4 Thus, we expect that employees will be more motivated to acquire business skills if  
5 more support is offered from the work domain (e.g., the organization, supervisors,  
6 peers, and even subordinates). Based on the above reasoning, we propose the  
7 following hypothesis:  
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11 **H4b.** Work support has a positive relationship with intrinsic learning motivation.  
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15 Additionally, organizational support in the form of mentoring programs  
16 reinforces junior workers' learning self-efficacy via verbal persuasion (e.g., positive  
17 feedback from mentors) and vicarious learning (e.g., watching mentors perform a  
18 challenging task). Knowing how other people, whether mentors or peers, perform on a  
19 certain task gives a trainee the chance to evaluate his or her relative learning efficacy.  
20 Therefore, we expect that work support has a positive relationship with relative  
21 learning self-efficacy, and the following hypothesis is proposed:  
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26 **H4c.** Work support has a positive relationship with relative learning self-efficacy.  
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30 The view that the environment affects one's perceived self-efficacy is central to  
31 SCT. Bandura (1977) listed four sources of efficacy beliefs: enactive mastery,  
32 vicarious learning, verbal persuasion, and emotional arousal. Clearly, all of them  
33 originate from social interactions. Social interactions that encourage learning should  
34 boost an individual's confidence in his or her ability to learn and perform (Baldwin &  
35 Magjuka, 1997; Mathieu & Martineau, 1997; Maurer, 2001). The literature on  
36 perceived organizational support has provided examples of how organizations offer  
37 support to enhance workers' self-efficacy in learning skills and performing tasks  
38 (Eisenberger, Cummings, Armeli, & Lynch, 1997; Loi, Hang-yue, & Foley, 2006;  
39 Maurer & Tarulli, 1996; Rhoades, Eisenberger, & Armeli, 2001). For instance,  
40 organizational support in the form of offering on-the-job training provides workers  
41 with the opportunity to practice a novel task. If they carry out the task successfully,  
42 they become more confident in their ability to improve their competency in  
43 comparison to their current skill levels (Taylor, Locke, Lee & Gist, 1984). That is, the  
44 experience of mastery gives workers more confidence in their ability to accomplish  
45 similar tasks in the future (Stajkovic & Luthans, 1998). Accordingly, we propose the  
46 following hypothesis:  
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55 **H4d.** Work support has a positive relationship with absolute learning  
56 self-efficacy.  
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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:

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**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, Hyland, Joshi & Bross, 1998; Takeuchi et al., 2002; Williams & 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, Phinney, & Chuateco, 2005; Frederick & Ryan, 1995; Grolnick, Deci, & Ryan, 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.

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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 & Moller, 2005; Dysvik & Kuvaas, 2008; Kraiger & Ford, 2007; Maurer et al., 2003; Maurer et al., 2008; Noe & 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; Maurer et al., 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 & Mao, 2015; Sukserm & 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 & 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 & 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 Appendix A) were adapted from Nordhaug (1989). However, Compeau and Higgins (1995), Compeau, Higgins, and Huff (1999), and Venkatesh, Morris, Davis, and Davis (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, Lewis, & Snyder, 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 fifteen 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 fifteen 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, Schyns, and

Mohr (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 Appendix A.

#### **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 information systems 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%) were obtained from IS developers working in various industries (e.g., manufacturing, service, science and technology). Table 1 shows the respondents’ demographic information, classified by their perception of their change agent role.

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Insert Table 1 about here  
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#### **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, Lewis, & Thompson, 2012). In addition, our sample size for analysis was relatively small: 254 IS developer’s effective samples were used.

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3 For smaller sample sizes, CBSEM may not converge. PLS had the smallest  
4 occurrence of false positives. Moreover, since we adopted the MARS model's  
5 conceptual constructs to examine IS developers' intention to learn business skills, PLS  
6 was highly suitable for the initial exploratory stages.  
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9 SmartPLS software (Ringle, Wende, & Will, 2005) was used during the two-step  
10 data analysis stage. The first step examined the measurement models and their  
11 psychometric properties. The second step focused on testing the structural models and  
12 hypotheses. PLS provided a convenient approach for simultaneous analysis of the  
13 measurement model and the structural model.  
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### 17 18 **5.1. Measurement model**

19 Assessment of the measurement model involved evaluations of the reliability,  
20 convergent validity, and discriminant validity of the construct measures. First, to  
21 ensure that each indicator shares more variance with the component score than with  
22 the error variance when assessing the reliability of each indicator, Chin, Monroe, and  
23 Fiscella (2000) suggested that a construct (also known as a *latent variable*) should  
24 explain a substantial part (usually at least 50%) of the variance of each indicator.  
25 Accordingly, the absolute correlations between a latent variable/construct and each of  
26 its indicators should be higher than 0.7 (roughly equal to the square root of 0.5).  
27 However, other researchers also suggested that any factor loadings greater than 0.50  
28 can be considered significant (Hair, Black, Babin, & Anderson, 2010). Factor  
29 loadings of all items were greater than 0.60 (see Table 2); therefore, reliability at the  
30 indicator level was satisfactory. Cronbach's  $\alpha$  and composite reliability (CR) were  
31 used to assess the reliability of the scales at the construct level. Henseler, Ringle, and  
32 Sinkovics (2009, p.300) suggested that, to show a measure's internal consistency, CR  
33 must not be lower than 0.6. As shown in Tables 2 and 3, the Cronbach's  $\alpha$  and CR of  
34 each construct exceeded 0.7. Thus, reliability was also adequate at the construct level.  
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42 Second, convergent validity was assessed using the average variance extracted  
43 (AVE). Fornell and Larcker (1981) suggested that an AVE value of at least 0.5  
44 indicates sufficient convergent validity. As shown in Table 3, the AVE for each  
45 construct exceeded 0.5, meaning more than half of the variances observed in the  
46 indicators were accounted for by their corresponding constructs. Finally, to examine  
47 discriminant validity, we compared the shared variances between constructs with the  
48 AVE values of individual constructs (Fornell & Larcker, 1981). Results indicated that  
49 the shared variances between factors were lower than the AVE of the individual  
50 factors, confirming discriminant validity (see Table 3). To conclude, the measurement  
51 model demonstrated adequate reliability, convergent validity, and discriminant  
52 validity.  
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Insert Table 2 about here  
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Insert Table 3 about here  
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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 & Lance, 2010; Podsakoff, MacKenzie, & Podsakoff, 2003; Schwarz, Schwarz, & Rizzuto, 2008; Straub, Boudreau, & Gefen, 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 (EFA) using principal component analysis (PCA) without rotation. We found that once the variables were extracted, they explained 30.5% 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, Saraf, Hu, & Xue, 2007; Podsakoff et al., 2003; Saraf, Langdon, & Gosain, 2007; Williams, Edwards, & Vandenberg, 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%), 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).

## 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 independent variables on dependent variables. Table 4 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.



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Insert Table 4 about here  
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Hypothesis 1 (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 5, the results revealed statistically significant differences among the change agent role perceptions ( $F = 3.143$ ,  $p < 0.05$ ). This is consistent with the results of PLS analysis. After multiple post-hoc comparisons (see Table 6), 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.

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Insert Table 5 about here  
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Hypotheses 2a and 2b 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.

Hypotheses 3a and 3b 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 4, relative and absolute learning self-efficacy were

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3 found to have significant positive relationships with the behavioral intention to learn  
4 ( $\beta = 0.117, p < 0.05$  and  $\beta = 0.165, p < 0.05$ , respectively), meaning that H3a and H3b  
5 were both supported.  
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7 Hypothesis 4a and 4b proposed that work support would have a positive  
8 relationship with extrinsic learning motivation (H4a) and intrinsic learning motivation  
9 (H4b). The results in Table 4 show that work support was significantly related to both  
10 extrinsic learning motivation ( $\beta = 0.307, p < 0.001$ ) and intrinsic learning motivation  
11 ( $\beta = 0.125, p < 0.05$ ). Thus, both H4a and H4b were supported. Hypotheses H4c and  
12 H4d proposed, furthermore, that work support would have a positive relationship with  
13 relative learning self-efficacy (H4c) and absolute learning self-efficacy (H4d).  
14 However, neither type of self-efficacy was shown to be significantly related to work  
15 support ( $\beta = -0.019, p > 0.05$  and  $\beta = -0.002, p > 0.05$ , respectively). Thus, H4c and  
16 H4d were not supported.  
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18 Hypotheses 5a, 5b, 5c and 5d proposed that non-work support would have a  
19 positive relationship with extrinsic learning motivation (H5a), intrinsic learning  
20 motivation (H5b), relative learning self-efficacy (H5c), and absolute learning  
21 self-efficacy (H5d). Table 4 shows that all four relationships were significant ( $\beta =$   
22  $0.148, p < 0.05$ ,  $\beta = 0.340, p < 0.001$ ,  $\beta = 0.347, p < 0.001$  and  $\beta = 0.203, p < 0.01$ ,  
23 respectively). Thus, H5a, H5b, H5c and H5d were all supported.  
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38 Hypotheses 6a-d and 7a-d stated that learning motivation (extrinsic and intrinsic)  
39 and learning self-efficacy (relative and absolute) partially mediate the effect of  
40 situational support (work and non-work) on behavioral intention to learn b-skills. As  
41 proposed by Baron and Kenny (1986), a mediating factor should meet the following  
42 three conditions: 1) the independent variable must affect the mediated variable; 2) the  
43 independent variable must affect the dependent variable; and 3) the mediated variable  
44 must affect the dependent variable. This study conducted Sobel tests to examine the  
45 significance of the mediation effect of each eligible hypothesis (i.e., H6b, H6d, H7c  
46 and H7d). The results of the Sobel test for each antecedent construct via intrinsic  
47 learning motivations, relative learning self-efficacy, and absolute learning  
48 self-efficacy, respectively, are summarized in Table 7. The indirect effects of  
49 non-work support on the behavioral intention to learn business skills via relative and  
50 absolute learning self-efficacy ( $Z = 3.321, p < 0.001$  and  $Z = 2.672, p < 0.01$ ,  
51 respectively), and the indirect effects of work support ( $Z = 3.516, p < 0.001$ ) and  
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3 non-work support ( $Z = 4.808, p < 0.001$ ) on the behavioral intention to learn business  
4 skills via intrinsic learning motivation are all significant. Furthermore, in order to  
5 clearly understand the degree of those indirect effects, we conducted the variance  
6 accounted for (VAF) examination (Hair, Hult, Ringle, & Sarstedt, 2013; Helm, Eggert,  
7 & Garnefeld, 2010). Table 7 shows that the indirect effects of work support (42.4%)  
8 and non-work support (35.2%) on the behavioral intention to learn business skills via  
9 intrinsic learning motivation are partial mediations. In contrast, the indirect effect of  
10 non-work support on the behavioral intention to learn business skills via relative  
11 (18.6%) and absolute learning self-efficacy (14.0%) is statistically rather low (less  
12 than 20%), and almost no mediation takes place. To summarize, the results indicate  
13 that intrinsic learning motivation partially mediates the impact of work support and  
14 non-work support on the behavioral intention to learn business skills. Thus, H6b and  
15 H6d were supported.

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22 The coefficient of determination ( $R^2$ ) value was calculated for each latent  
23 endogenous variable's explained proportion of the variance. The research model  
24 accounted for 32.7% of the overall variance in the behavioral intention to learn (see  
25 Table 4). Previous studies (e.g., Chin, 1998; Hermann, Tomczak, & Befurt, 2006)  
26 have proposed that the  $R^2$  value must meet or exceed 0.3 to be satisfactory and  
27 acceptable. As for control variables, work seniority, gender and age were all found to  
28 have no significant effect on the behavioral intention to learn business skills ( $\beta =$   
29  $-0.047, p > 0.05, \beta = 0.092, p > 0.05$  and  $\beta = 0.032, p > 0.05$ , respectively). Figure 2  
30 shows a visual representation of the standardized path coefficients of the research  
31 model.  
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## 44 6. Discussion

45 "Building business skills in IT" has gained enormous attention from IT  
46 executives, as noted in a study by Luftman et al. (2009) published by the Society for  
47 Information Management. Rather than focusing on on-the-job training for general  
48 employees, we targeted IT professionals and examined factors that influence their  
49 business skills learning. Unlike prior studies which focused on either individual  
50 characteristics or situational predictors of the intention to learn b-skills, this study  
51 considered a broader range of factors through MARS model (i.e., motivations, abilities,  
52 role perception, and situational factors) that influence the behavioral intention of IS  
53 developers to learn business skills. Moreover, we provided fine-grained examinations  
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3 of different types of learning motivation (extrinsic and intrinsic), learning self-efficacy  
4 (relative and absolute), role perception (traditionalist, facilitator, and advocate), and  
5 situational support (work and non-work) to show the influences of these  
6 sub-dimensions on the intention to learn b-skills. The theoretical contribution of our  
7 research primarily advances the theory development of IS personnel's learning behavior.  
8 Our study successfully represents the MARS model to explain IS developers'  
9 behavioral intention to learn b-skills, which has rarely been explored in the existing  
10 literature. As such, the structure of the proposed model of IS developers' learning  
11 behavior can serve as a reference framework for future researchers in studying IS  
12 personnel's work-related learning behavior.  
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18 Though many of our proposed hypotheses were supported, results showed  
19 several interesting and unexpected findings. First, regarding the change agent role  
20 perception, people who perceived themselves as advocates displayed a higher level of  
21 intention to learn b-skills than did those who identified with the other two roles (i.e.,  
22 traditionalist and facilitator). These findings are the same with the notion of Winston  
23 (1999) that advocate is the most effective role for achieving a high quality IS  
24 implementation. Advocates understand the strategic advantages a business attains when  
25 the ISD project is implemented properly. Thus, advocates may further improve their  
26 effectiveness by acquiring the b-skills. Our finding contributes to the IS literature by  
27 showing that role perception plays a part in determining an individual's learning  
28 intention. A valuable and interesting future study can explore the effect of different  
29 organizational structure on the change agent role.  
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35 Besides, when compared to extrinsic learning motivation, intrinsic learning  
36 motivation contributed more to the intention to learn b-skills. This is consistent with  
37 past research indicating that people are typically most creative (a major characteristic  
38 in higher level learning) when their motivation comes from within (Amabile, 1997;  
39 Deci & Flaste, 1995). A study of Minbaeva, Mäkelä, and Rabbiosi (2010) also showed  
40 that intrinsic motivation and ability were predictors of individuals' knowledge  
41 acquisition and usage, while extrinsic motivation was not. Our findings suggest that  
42 when an activity is more learning-oriented than performance-oriented (in our case,  
43 learning b-skills), individuals' attitudes toward the activity itself seem to be more  
44 crucial than other external factors. Organizations should focus on activities that  
45 facilitate workers' intrinsic learning motivation, such as making the training process  
46 more interesting or showing the benefits of learning b-skills for personal development.  
47 Future research can validate this finding in different areas of organizational cultures.  
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54 Although we distinguished between relative and absolute learning self-efficacy,  
55 we found that individuals with high levels of either type of self-efficacy (relative or  
56 absolute) are more likely to have high levels of learning intention. This finding is  
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3 similar to previous research (e.g., Maurer et al., 2003) which also found that higher  
4 learning self-efficacy about relative and absolute leads to greater behavioral intentions  
5 to learn. Our study contributes to the literature by finding that, in terms of direction  
6 and magnitude, the two types of self-efficacy have similar influence on an IS  
7 developer's behavioral intention to learn business skills. Moreover, extant literature  
8 on self-efficacy has suggested various ways of enhancing the belief in one's efficacy,  
9 and these apply to all forms of self-efficacy (specifically, in our case, learning b-skills  
10 self-efficacy). Sources of self-efficacy, including mastery experience, vicarious  
11 learning, verbal persuasion and emotional arousal, can be used to boost IS developers'  
12 belief in their own abilities to learn b-skills. Future studies can reexamine this finding  
13 in different learning environments or organizational level.  
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19 Work support was found to have a positive impact on both extrinsic and intrinsic  
20 learning motivation. However, it was interesting to note that work support did not lead  
21 to significantly higher levels of relative and absolute learning self-efficacy. This  
22 finding is consistent with prior research (e.g., Al-Eisa et al., 2009) indicating that  
23 work support (e.g., supervisor support) acts as stronger predictor of the motivation to  
24 learn than of self-efficacy. In contrast, non-work support influenced extrinsic and  
25 intrinsic learning motivation and both types of learning self-efficacy. Our knowledge  
26 is insufficient to explain this difference. One possible reason, however, might be  
27 related to the different types of support an individual receives from work versus  
28 non-work domains. It is possible that IS developers receive different types of social  
29 support (e.g., network support, emotional support, instrumental support) with higher  
30 quality from their non-work networks. Since we measured only the perceived amount  
31 of support from different domains, it would be interesting for future researchers to  
32 examine the effects of different types of support on learning intention.  
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## 41 **7. Practical implications**

42 In today's hypercompetitive business environment, fundamental business  
43 changes have compelled IT organizations to value managerial, business, and social  
44 skills (i.e., the sub-categories of b-skills) along with technical skills, among other  
45 imperatives (Byrd & Turner, 2001). Previous studies have emphasized that, since  
46 users' system needs change frequently, b-skills are highly important for IS developers  
47 as they design and implement innovative IT for the organization. In order to  
48 successfully serve their organization, manage ISD performance, and gain a  
49 sustainable competitive advantage for the company, IS developers need to learn  
50 important skills in both IT and business. For these reasons, we investigated the  
51 determinants of IS developers' behavioral intention to learn b-skills within an  
52 organizational ISD context, based on the MARS model. The findings of this study  
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3 provide several critical implications for practitioners seeking to encourage IS  
4 developers to learn b-skills.  
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6 Role perception was found to have a significant positive relationship with the  
7 behavioral intention to learn b-skills. When IS developers perceive their role as that of  
8 an advocate (as opposed to a traditionalist or facilitator), they are more likely to learn  
9 b-skills. Thus, organizations should strongly encourage IS developers to take on the  
10 advocate role in ISD projects, and urge them to acquire b-skills through formal  
11 education and on-the job training. Each developer in the ISD project should have an  
12 equal opportunity to learn to be an advocate who is responsible for the success or  
13 failure of the system, and be motivated to combine b-skills with technical skills to  
14 facilitate better coordination with users.  
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19 The significant positive relationship between intrinsic learning motivation and  
20 the behavioral intention to learn b-skills suggests that IS developers' learning  
21 intention is mainly motivated intrinsically rather than extrinsically. Thus,  
22 organizations should pay greater attention to providing suitable personal career  
23 development opportunities, which will motivate workers by matching their needs with  
24 the organization's needs (Petroni, 2000). Organizations should also help IS developers  
25 understand how learning b-skills is important for their future work and potential  
26 self-growth, rather than focusing solely on extrinsic benefits such as promotion or  
27 remuneration. We also recommend that, in order to enhance IS developers' intrinsic  
28 motivation to learn b-skills, organizations should foster a learning-oriented culture  
29 instead of a performance-oriented culture.  
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35 Both relative and absolute learning self-efficacy were found to have a significant  
36 positive relationship with the behavioral intention to learn b-skills. Previous studies  
37 have suggested that mastery experiences (e.g., prior successful development  
38 experiences), vicarious experiences (observation of similar development models),  
39 persuasion (support and encouragement, perceived access to resources and  
40 experiences), physiological influences (situational anxiety and arousal), social  
41 comparison (goals and comparative information), performance feedback, and role  
42 modeling are important ways to enhance relative and absolute learning self-efficacy  
43 (Bandura, 1977; Schunk, 1985; Gist & Mitchell, 1992; Marakas, Yi, & Johnson, 1998;  
44 Maurer, 2001). Organizations can also make use of these strategies to enhance IS  
45 developer's learning self-confidence and beliefs, which will, in turn, increase their  
46 intention to learn b-skills.  
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52 Both work and non-work support were found to have a significant positive  
53 relationship with both extrinsic and intrinsic learning motivations. Support from  
54 others is influential in the formulation of positive work attitudes and behaviors, so  
55 organizations will benefit when employees are well supported (Heaney, Price, &  
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3 Rafferty, 1995). Work support has received a great deal of research attention in the  
4 literature. Suggestions of ways in which an organization can offer work support  
5 include providing valuable resources (e.g., mentors and information), offering  
6 instrumental and emotional assistance (sympathy, caring, comfort and  
7 encouragement), developing supportive policies (e.g., flexible schedules) and  
8 practices (e.g., training in supervisor supportive behaviors), sharing skills and similar  
9 experiences, demonstrating the usefulness of knowledge provided by the effort,  
10 answering employees' questions, giving suggestions, guiding career development, and  
11 listening to concerns and complaints (Ng & Sorensen, 2008). IS developers' intrinsic  
12 and extrinsic learning motivations will be enhanced to the extent that the developers  
13 know they have access to work support which can help them improve their b-skills.  
14 On the other hand, prior research has noted that non-work support (e.g., family) may  
15 diminish the conflict between work and non-work roles, along with its attendant stress  
16 (Williams & Alliger, 1994; Ng & Sorensen, 2008). Furthermore, employees may need  
17 non-work support to motivate them to maintain a positive work attitude, which the  
18 organization can facilitate by providing time off, setting reasonable work expectations,  
19 providing opportunities to perform well at work, sharing similar experiences,  
20 providing care and encouragement, and providing opportunities for work tasks to  
21 enrich self-growth—all of which might help the employee meet the demands of the  
22 work role (Wayne, Casper, Matthews, & Allen, 2013). Different forms of non-work  
23 support in the prior research, such as instrumental, informational and emotional support,  
24 appear relevant in the context of work-life balance (Schwarzer & Knoll, 2007).  
25 Instrumental support, which refers to providing tangible help such as money, material  
26 objects or services; information support is regarded as giving advice, information,  
27 necessary or useful knowledge; and emotional support is related to displaying interest,  
28 friendship, reassurance, listen empathetically, affirmation of affection, and caring about  
29 a person in need (Greenhaus & Parasuraman, 1994; Parasuraman & Greenhaus, 2002).  
30 Therefore, IS developers who receive these kinds of non-work support may find greater  
31 enrichment and be more motivated, both extrinsically and intrinsically, to learn  
32 job-related skills, including b-skills.

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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 & Tarulli, 1996). Also, Parasuraman, Purohit, and Godshalk (1996) suggested that high levels of non-work support may enhance the employee's feeling of self-efficacy and thereby

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3 keep work-life balance. The perception that learning opportunities are available may  
4 also help persuade workers that they are capable of developing their skills (Maurer et  
5 al., 1996). Thus, people within the IS developer's social circle who are not related to  
6 work can use these various ways to enhance the developer's belief that he or she can  
7 develop b-skills which can be put to use in the ISD project.  
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10 These practical suggestions can contribute to promoting b-skills learning among  
11 IS developers. Since business strategies, corporate culture, and available resources  
12 differ, each organization will likely pursue the specific direction that suits it best.  
13 Determining the best direction for supporting b-skills learning based on the  
14 organization's culture and strategy is one of several interesting topics that might  
15 provide fodder for future research.  
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## 20 **8. Limitations**

21 Based on the MARS model, we included a broad range of factors and considered  
22 their influences on IS developers' behavioral intention to learn business skills. While  
23 we exhausted these factors, the study might not be comprehensive; there are several  
24 limitations that could be addressed in future studies. First, there may be other  
25 predicting factors which can affect individuals' behavior, and other relationships  
26 between them might be discovered by using a moderator or mediator. For instance,  
27 the MARS model suggests that individual characteristics including personality,  
28 self-concept, and values are likely to be stimulating elements. Future research could  
29 establish other relationships within the MARS model by integrating potential  
30 predictors.  
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36 Moreover, this study included only three demographic variables (i.e., gender, age,  
37 and work seniority) as the control variables. The results failed to show any significant  
38 relationship between these variables and the behavioral intention to learn business  
39 skills. Given prior research (Morgeson, Delaney-Klinger, & Hemingway, 2005), other  
40 kinds of individual characteristics, such as cognitive ability and job-related skills, may  
41 perhaps be suitable as control variables. Cognitive ability not only reflects an  
42 individual's all-around competence at work, but also directly affects the performance  
43 of job-related tasks and learning. Similarly, employees who have higher levels of  
44 job-related skills will have a deeper understanding of the specific tasks and learning  
45 associated with the job. Future research might also examine how these factors affect  
46 IS developers' behavioral intention to learn b-skills.  
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52 Finally, a more detailed investigation or a different operationalization of each of  
53 the four MARS factors may be necessary. For example, we measured the perceived  
54 level of support from work and non-work domains to represent situational factors, and  
55 used individuals' behavioral intention (rather than actual behavior) to represent the  
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3 MARS model's behavior and results factor. Longitudinal evidence might enhance our  
4 current understanding of the relationships among the factors of the MARS model.  
5 However, other questions remain. What resources do companies provide to support  
6 learning? Do companies formally require employees to have b-skills? Do employees  
7 have enough time and financial resources to learn? Future research can answer these  
8 important questions and provide specific recommendations.  
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## Appendix A. 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.

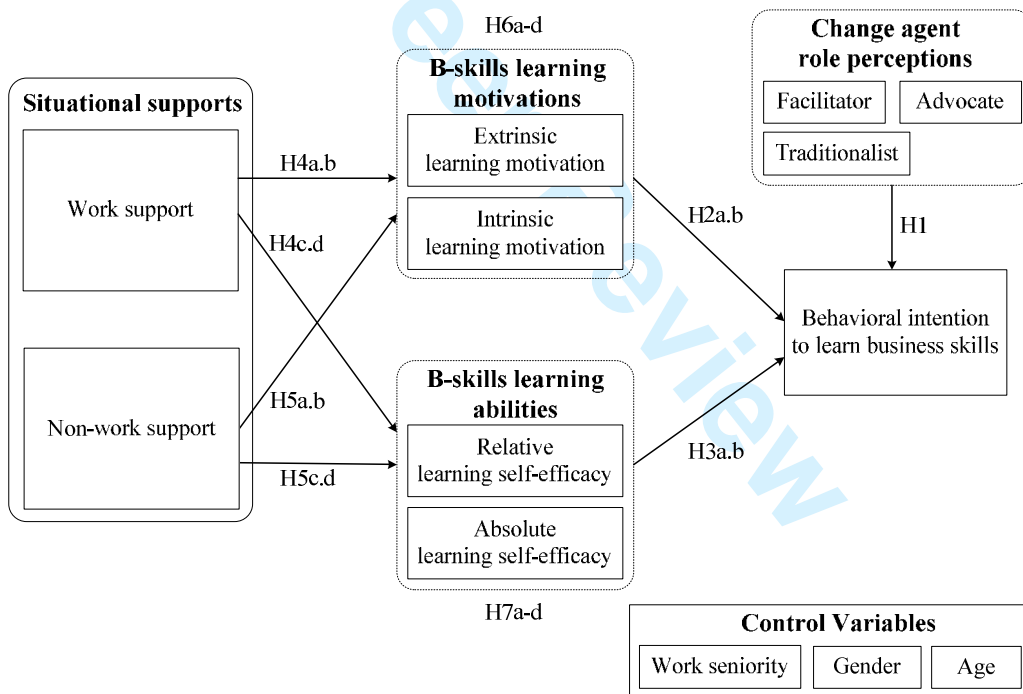
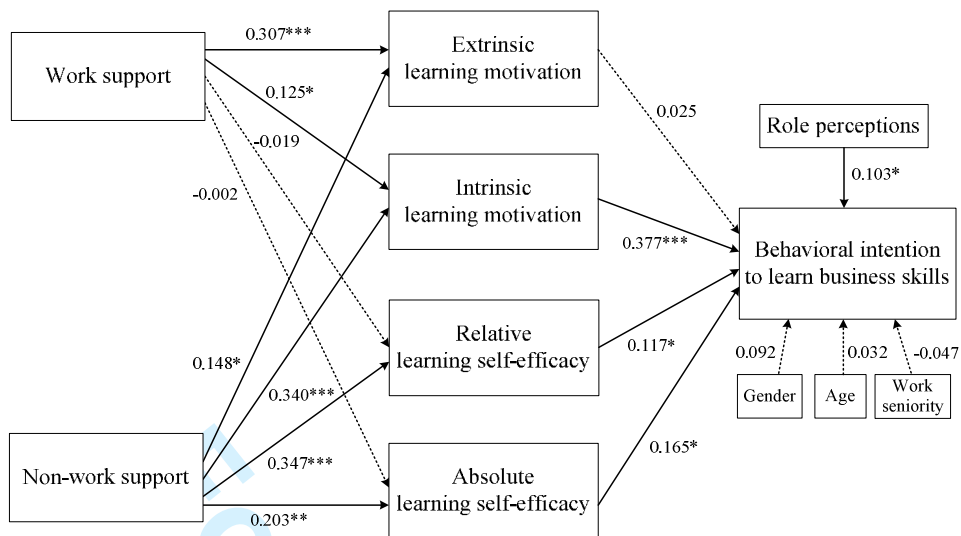


Figure 1. Research model





**Figure 2.** Standardized path coefficients

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$  — Significant --- Not significant

**Table 1**

Respondent characteristics by role.

	Traditionalist ( <i>n</i> = 72)	Facilitator ( <i>n</i> = 148)	Advocate ( <i>n</i> = 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)			

	Traditionalist (n = 72)	Facilitator (n = 148)	Advocate (n = 34)
<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
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 2**Cronbach's  $\alpha$ , item loadings and cross loadings.

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

**Table 3**

Inter-construct correlations and reliability measures.

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

Notes: 1. CR: composite reliability. 2. 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. 3. Diagonal elements are the square roots of the average variance extracted (AVE) values; off-diagonal elements are correlations among constructs.

**Table 4**

Statistical results of the structural model.

Dependent variable	Independent variable	Path coefficient	<i>t</i> -value	<i>R</i> <sup>2</sup>
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**	

Notes: 1. \**p*<0.05, \*\**p*<0.01, \*\*\**p*<0.001. 2. 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.

**Table 5**

ANOVA results.

Dependent variable: BITL	Sum of squares	<i>df</i>	Mean square	<i>F</i>	<i>P</i>
Between Group	6.842	2	3.421	3.143	0.045
Within Groups	273.233	251	1.089		
Total	280.075	253			

**Table 6**

LSD multiple comparisons results.

Dependent variable: BITL					
(H1) RP [I]	RP [J]	Mean Difference [I-J]	Std. Error	<i>P</i>	
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 7**

Results of mediating effect tests.

IV	MV	DV	IV→DV	IV+MV→DV			Z-value	VAF
				IV→MV	MV→DV	IV→DV		
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

Notes: 1. \*\* $p < 0.01$ , \*\*\* $p < 0.001$ . 2. IV: independent variable; MV: mediate variable; DV: dependent variable. 3. 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.