Information Systems Frontiers
https://doi.org/10.1007/s10796-018-9870-7

Being useful: How information systems professionals influence the use of information systems in enterprises

Hadi Karimikia[1] · Narges Safari[1] · Harminder Singh[1]

Abstract
Organizations are keen to obtain as much value as they can from their information systems (IS) investments. While the first-order benefits of new information systems are usually obtained when they are used routinely, the full potential of new systems is only unlocked when they are used deeply. While the support of managers and peers can encourage individuals to use systems more deeply, the latter's lack of technical know-how means that they may not be able to allay fears or doubts that arise as they improvise and experiment with new systems to infuse them into their work processes. We use social cognitive theory to frame infusion as a learning process, where individuals model their behavior based on the behaviors of others they observe in the environment and the resources available. We argue that individual users succeed in infusing new systems into their work when they interact with IS professionals. This interaction allows users to observe the actions of IS professionals and receive knowledge and guidance from them. The results of our study show that the discretionary behaviors exhibited by IS professionals positively affect users' perceptions of the levels of usefulness and ease of use of new systems, encouraging them to use the systems as fully as possible. This study extends our understanding of the role that the discretionary behavior of IS professionals plays in enhancing the value that organizations obtain from their new IS investments.

Keywords Improvisation · IS infusion · IS professionals · Discretionary behaviors · Organizational citizenship behavior · Usefulness · Ease of use

1 Introduction

An information system is infused in a practice when it is used to its fullest potential (Cooper and Zmud 1990). When that happens, organizations receive a greater return on their investment in that system (Hsieh and Wang 2007). IS infusion is thus a much sought-after goal for many IS managers (Jasperson et al. 2005). However, while there has been extensive research on IS adoption and post-adoption (e.g. Hsieh et al. 2012; Li et al. 2013; Venkatesh et al. 2011), less is known about the determinants of IS infusion. While previous researchers have examined how system characteristics, such as the quality of the information in a system and the services it provides (DeLone & McLean, 2003), and managerial and peer support influence infusion (Saeed and Abdinnour-Helm 2008; Sundaram et al. 2007), less attention has been paid to other aspects of the social context of infusion.

Before a new system can be infused, there is often a process of adaptation, as users modify their routines or the components of the system itself (Fadel, 2012). As users experiment with the new system to come up with creative ways of using it, they become more confident about the system, making it more likely that the system will be infused into their work practices. However, as users improvise, doubts about the system may arise. This uncertainty may require technical expertise beyond the knowledge of their managers and peers, decreasing users' confidence in the system (Magni et al. 2010). This lack of confidence in a new system can be overcome by involving IS professionals, who have a blend of technical and non-technical skills, in the process of improvisation (Bassellier and Benbasat 2004; Reich and Benbasat 1996; Reich and Benbasat 2000).

In many of their roles, IS professionals often share their knowledge and skills when they interact with their business colleagues, especially when the latter encounter difficult-to-use technologies and face task-related conflicts from newly-adopted systems (Kettinger et al. 2013; Nelson and Cooprider 1996; Santhanam et al. 2007). Such sharing and helping behaviors are often supplementary to the duties specified in the

✉ Harminder Singh
hsingh@aut.ac.nz

[1] Auckland University of Technology, Auckland, New Zealand

Published online: 29 June 2018

roles of the IS professionals, that is, they are discretionary and 'extra-role', not prescribed and 'in-role', behaviors (Deng and Wang 2014; Yen et al. 2015; Rice et al. 1999). When IS professionals carry out such actions, they affect users' perceptions of an information system, influencing them to use the information system as fully as possible and in novel, improvised ways (Ghosh 2011).

Post-adoption studies, such as Venkatesh et al. (2003), often limit their focus to the actions of managers and users without examining the role of IS professionals in supporting and motivating IS use. By not considering the role of IS professionals, current research has simplified and narrowed the social milieu that users exist in. This paper asks: *how do the discretionary behaviors of IS professionals towards non-IS employees influence the latter's inclination to infuse information systems into their work practices?* This study has two contributions: i) explicating the impact of the discretionary behaviors of IS professionals on IS success beyond project implementation, and ii) defining additional mechanisms through which IS infusion takes place.

In the next section, we review the IS infusion literature and frame it using social cognitive theory (SCT). This theory enables us to conceptualize IS infusion as a learning process, where individuals engage in improvisation after being influenced by various actors in their work setting. Having established the important role played by IS professionals in encouraging infusion, we examine the literature to identify the discretionary behaviors that IS professionals engage in, and draw on the concept of organizational citizenship behavior (OCB) (Podsakoff and MacKenzie 1997) to categorize these discretionary behaviors. The paper then relates the discretionary behaviors of IS professionals to their impact on perceived usefulness, ease of use, and improvisation. Finally, we develop and test a model, and conclude the paper by analyzing and discussing its results.

2 Conceptual background

In this section, we discuss the concept of IS infusion and explain improvisation, ease of use and usefulness and their potential role in IS infusion.

2.1 Information systems infusion

Cooper and Zmud (1990) categorized the deployment and use of information systems (IS) in six stages: initiation, adoption, adaptation, acceptance, routinization, and infusion. The first stage, *initiation*, refers to the search for a match between information technologies and organizational requirements. The steps include managerial decisions on which IT changes are needed, and the selection and planning of new information systems projects, in the form of innovations being applied to organizational activities. This stage is followed by *adoption*, when the decisions in the previous stage lead to resources being invested to accommodate the implementation efforts. The third stage, *adaptation*, occurs when new IS systems are installed, developed, and maintained, while the *acceptance* stage refers to the direction of organizational effort toward using the new systems in organizational work processes and using them in a standardized way. The fifth stage, *routinization*, occurs when the new IS systems are used routinely and regularly, and are not perceived to be out of the ordinary.

Infusion, the last stage of IS implementation, refers to the achievement of a higher level of IS use that allows employees to exploit the full potential of new systems (O'Connor and O'Reilly 2016; Sundaram et al. 2007). Employees leverage and use the new systems beyond the standard or mandated ways they were being used for their usual daily activities (Saga and Zmud 1994; Sundaram et al. 2007). These attempts to go beyond the usual range of applications for a new information system; using it to its full potential is indicative of the notion of effective use (Sundaram et al. 2007). Other terms similar to infusion are extended IS use, integrative IS use, emergent IS use (Saga and Zmud 1994), individual feature extension (Jasperson et al. 2005), trying to innovate with IT (Ahuja and Thatcher 2005), and innovative IT use (Li et al. 2013).

Infusion occurs much later than the other types of IS use, with prior research showing that the use of an information system attains its fullest potential after 18 to 24 months (Hsieh and Wang 2007; Li et al. 2013). Infusion is important because it increases the return on investment (ROI) for organizations on their IT expenditure (Hsieh and Wang 2007; Jasperson et al. 2005). Without infusion, that is, when users are not fully engaged in using new systems to their full potential, IS implementations have been known to fail (Adam and O'Doherty 2003; Rivers and Dart 1999).

2.2 Improvisation as a pathway to infusion

During infusion, users modify their routines or the components of the system itself (Fadel, 2012). This is called improvisation, which is defined as a set of unplanned actions during the processes of adopting, adapting or implementing new systems (Ciborra 1996; Orlikowski 1996; Elbanna 2006; Massa and Testa 2005). These extemporaneous, situated, spontaneous and creative behaviors arise when individuals face unplanned scenarios, unexpected opportunities or unanticipated problems when information systems are being deployed (Magni et al. 2010; Orlikowski 2000). Improvisation takes place when existing and formal plans do not apply to novel situations, and where the required knowledge, and the resources and the ability to deploy them, exist (Ciborra 1999). Improvisation succeeds when it is supported by managers and

peers (Orlikowski 2000) and when formal and informal training is provided (Mendonca and Fiedrich 2006).

Users who improvise go beyond the formal processes of IT use, typically generating new processes to experiment with technology and implementing new ways of working with the technology. Users are more likely to improvise if the system is seen as benefiting them (high in usefulness) and does not require a high level of cognitive effort (high in ease of use) (Compeau and Higgins 1995). Systems with these attributes affect the level of engagement users have with their systems. Systems that are easier to use encourage users to experiment with new ways of using them, i.e. improvise with them. In the next section, we discuss these well-established concepts and investigate how social support can enhance them.

2.3 Perceived usefulness and ease of use

Various models and frameworks in the IS field, such as the IS continuance model (Jin et al. 2010; Venkatesh et al. 2011), the post-adoptive behavior model (Jasperson et al. 2005), the technology acceptance model (TAM) and the theory of reasoned action (Venkatesh and Bala 2008; Venkatesh et al. 2003), the post-acceptance IS usage behavior model (Lee and Lee 2010), and the extended use behavior model (Hsieh and Wang 2007; Saeed and Abdinnour-Helm 2008), hold the view that perceived usefulness and perceived ease of use are the strongest determinants of extended IS use. Thus, one way for organizations to infuse a particular information system into their work practices is to increase its perceived usefulness and ease of use.

A new system is more likely to be embedded into an organization's work processes if users are made aware of the system's usefulness for their current and future needs (Saeed and Abdinnour-Helm 2008). This could happen through, for example, informing them about the capabilities of the system beyond the specific module used for their tasks, and how other organizations use similar systems in novel ways. Such knowledge sharing provides users with a broader understanding of the features and potential of these systems (Santhanam et al. 2007). This type of knowledge may stimulate a desire for improvisation and even encourage a band-wagon effect, as novel uses of the technology in one sub-unit are shared with others, leading to broader gains at the organizational level (Bhattacherjee and Premkumar 2004; Jin et al. 2010).

A new system will be perceived as being easier to use if users receive help when they face uncertainty while using it (Deng and Wang 2014; Hsu et al. 2015; Rafaeli et al. 2008). Employees will view new systems as being easier to use if IS professionals provide the required information and pre-empt their needs. For example, IS professionals can provide a list of frequently asked questions (FAQs) about different functions of new systems that are not being used by employees at present but may be beneficial to them in the future (Deng et al. 2015). IS professionals can also improve the perceived ease of use of a system by voluntarily organizing meetings to clarify issues that users may have (Curtis et al. 1988; Walz et al. 1993). Similarly, users who receive continuous, ad hoc and convenient training will perceive that a new system is easier to use, and will thus be more likely to use it intensively and extensively (Li et al. 2013). Through these interactions, end-users often receive informal training or knowledge that makes the systems they use less intimidating and easier to use. At the same time, end-users use this interaction to better understand how these new systems can help them with their specific work processes, thereby making the systems more useful.

The preceding discussion highlights that a user's social environment matters in enhancing his/her perceptions of a new system's perceived usefulness and ease of use. Users are social actors (Lamb and Kling 2003), and they learn about a new system and become more comfortable with it by watching others, especially privileged actors such as IS professionals, who are viewed as experts. This relationship between users' perceptions of an information system and the social context allows the phenomenon of IS infusion to be framed as a question of learning: as users learn more about a new system, they become more comfortable and eager to improvise with it, beginning the process of infusing it into their work practices. Thus, understanding how the likelihood of infusion can be increased requires us to examine how users learn socially.

2.4 The social context of learning

Social cognitive theory (SCT) emphasizes that learning occurs in a social context through observation, and that behaviors, cognition, and environmental events influence each other reciprocally (Bandura 1977; Bandura 1988). A key mechanism in SCT is behavior modelling, in which individuals' perceptions of their ability to perform expected behaviors is influenced by their expectations of valued outcomes (Bandura 1986; Higgins and Bargh 1987). Individuals who observe a certain behavior and model it vicariously will adopt and sustain such behavior if it meets their expectations regarding the likely outcomes.

SCT has been applied and extended in both IS and non-IS contexts. Non-IS researchers have used SCT to examine how individual perceptions and beliefs influence actual behaviors. For example, employees who perceive high levels of organizational trust and respect from their colleagues are more likely to generate, disseminate, and implement new ideas (Ng & Lucianetti, 2016). Adults with visual impairment who receive social support from their peers are more physically active (Haegele, Brian, & Lieberman, 2017). Managerial decision-making skills (such as goal setting and analytic thinking) are enhanced by self-evaluation processes (Wood & Bandura, 1989). In the IS context, scholars have drawn on SCT to

explore how individuals' perceptions of information systems translate into their utilization (Compeau and Higgins 1995; Compeau, Higgins, & Huff, 1999) through the social support they receive from their peers. SCT has also been used to explain how the extent of internet use by individuals is influenced by the outcomes they expect (LaRose & Eastin, 2004), as well as variations in the quality and quantity of knowledge sharing in virtual communities (Chiu et al. 2006).

In the context of this study, SCT can be used to explain how the occurrence of improvisation is socially-driven in at least three ways. First, IS professionals carry out discretionary behaviors directed towards users, and these provide opportunities for individual users to observe and model such behaviors. Since IS professionals are seen by users as "experts", viewing their behaviors is akin to learning the "correct" actions. At the same time, observing the behaviors of IS professionals reinforces their expectations of the outcomes they might expect from improvisation, which could be an increase in their status or enjoyment (Bandura 1986). Second, the discretionary behaviors exhibited by IS professionals allow users to ask the IS professionals questions if they are unsure about any aspect of the new system. This removes doubts and encourage users to believe that the new systems are easy and useful to use. The presence of such a communication channel also provide assurance to the users that support is available if they encounter unexpected outcomes while improvising or experimenting with the system. This further enhances the perception that the system is easy to use.

Finally, users keen to become experts in using the system are motivated to interact more frequently and intensely with IS professionals because of the previous two points: i) using the system more deeply is easier because of the prevalence of IS professionals as models, and ii) using the system more intensely becomes a valuable practice because of the perceptions that it is useful. This sets up a self-reinforcing loop, deepening the interaction between these users and their IS colleagues: the users improvise, they are closely supported by their IS colleagues, encouraging them to improvise further, leading to the infusion of the information system.

The preceding discussion explains the social aspects of learning between users and IS professionals in the infusion phase of system implementation. Users learn more about a new system when experts in their social context provide them evidence of the valued outcomes that can be achieved by using the system and the effort required to achieve those outcomes. In the IS context, users view IS professionals as experts in the work environment. The next section examines the specific behaviors that IS professionals carry out to support users, and how these actions influence users' perceptions of systems.

2.5 The behaviors of IS professionals

Organizations are increasingly looking for IS professionals with technical IS skills and "soft skills" (Joseph et al. 2010; Sawyer et al. 1998). Soft skills include knowledge, skills, attitudes, and personal characteristics that can be improved with experience and/or training, and which influence the task-related performance of non-IS users or IS project success (Skulmoski and Hartman 2010). Soft skills deal with the human aspects (e.g., communication and interpersonal issues) of the jobs of IS professionals, and are used when technical information is shared with their non-IS colleagues or when communicating with them socially (Bassellier and Benbasat 2004; Keil et al. 2013; Ross et al. 1996; Tarafdar and Gordon 2007).

Soft skills also incorporate particular positive, discretionary behaviors. For example, IS professionals who share their experiences willingly with users enhance the effectiveness of IS projects (Bassellier Reich and Benbasat 2001). IS professionals have been found to support non-IS employees by troubleshooting, training, and voluntarily handholding them (Tarafdar and Gordon 2007). Overall, such discretionary behaviors improve organizational functioning (Podsakoff et al., 1997; Podsakoff MacKenzie et al. 2000; Podsakoff and MacKenzie 1997) by improving employee performance, freeing up organizational resources, improving coordination, and enhancing the work climate (Podsakoff MacKenzie et al. 2000). One set of discretionary behaviors that IS professionals can provide employees with is organizational citizenship behavior.

2.5.1 Organizational citizenship behavior (OCB)

In-role behaviors are predefined and prescribed in job descriptions (Williams & Anderson, 1991), while extra-role behaviors are discretionary, and performed beyond the formal requirements of roles (Van Dyne and Cummings 1990; Brief and Motowidlo 1986). Among extra-role behaviors, organizational citizenship behaviors (OCB) are individual behaviors that are discretionary, not explicitly recognized by formal reward systems, not prescribed in role requirements, and, in the aggregate, promote the effective functioning of the organization (Organ 1988). OCBs include all social and psychological activities that enhance one's job performance, whereas in-role behaviors are comprised of more technical activities that enhance one's task performance (Motowildo, 2000; Organ, 1997).

OCBs can be categorized into three domains (Podsakoff et al. 1997): helping behaviors, civic virtue, and sportsmanship. Helping behaviors include altruism, courtesy, keeping the peace, and cheerleading, with the goal of voluntarily supporting other employees and preventing work-related problems. Civic virtue refers to responsible, constructive participation in the overall organization; an example would be attending meetings regarding the organization. Sportsmanship indicates a tolerance of inevitable inconveniences without complaining.

In the context of the current study, *IS-specific OCBs* are the positive, discretionary behaviors IS professionals display when they assist non-IS colleagues additionally and beyond explicit requests for assistance (Santhanam et al. 2007), and in the process, promoting IS use behaviors (Lamb and Kling 2003). IS-specific OCBs are extra-role customer-oriented behaviors that occur during the infusion stage (Deng and Wang 2014; Deng et al. 2015; Rafaeli et al. 2008), and when they take place, IS professionals support business employees to gain technical knowledge of a new system and personalize their solutions, even when their roles are not focused on providing such support. Such assistance is often beyond the job requirements of IS professionals, and separate from explicit requests for assistance (Santhanam et al. 2007). Such behaviors improve the task efficiency of business users, the quality of customer service (Rafaeli et al. 2008), and the learning processes embedded in systems (Deng and Wang 2014; Deng et al. 2015). Below, three examples of IS-specific OCBs are outlined: IS helping, knowledge-sharing, and initiative-taking behaviors.

2.5.2 IS helping behaviors

In the infusion stage, IS helping behaviors are exhibited by IS professionals across an organization in a variety of ways. For example, even though the role of IT help desk professionals is to answer their users' queries, the level of support they provide can go beyond what is expected from them. For example, they may develop and distribute "how-to" guides if several users ask the same questions several times a day. They may also search for answers about ambiguities related to the adoption of a new information system, if the standard solutions provided to them do not work. Employees become more creative in their use of information systems after calling their IT help desk several times, and IT help desks play an important role in helping new employees adapt to the systems in use (Beaudry and Pinsonneault 2010). Indeed, helping behaviors directed towards business users by technical support staff working at a help desk influence the extent to which systems are used effectively (Santhanam et al. 2007).

IS helping behaviors offset the limited knowledge of individual users in using new applications, overcome problems arising from missing data, and provide some breathing space in the tightly-controlled and integrated workflows imposed by IT systems (Deng and Wang 2014). In addition to non-IS users, helping behaviors can also occur within IS departments when, for example, IS professionals share their IS security concerns among themselves, improving the effectiveness of their organization's IS security policies (Hsu et al. 2015). In non-IS customer support contexts, the display of discretionary behaviors by employees has been found to lower service costs, increase customer satisfaction, and improve customer evaluations of service quality (Gray and Durcikova 2006; Rafaeli et al. 2008).

2.5.3 Knowledge sharing

As an IS-specific OCB, knowledge sharing is not limited only to helping business users with IS solutions; it is also concerned with their learning processes. IS professionals share their know-how and know-why, and practices associated with system-related problems and technology use with IS users, leading to considerable learning (Santhanam et al. 2007). IS professionals share their knowledge partly because less expert IS users often search for informal sources when they are dissatisfied with formal sources (Rice et al. 1999), especially if there is a good fit between business and IS professionals in terms of attitudes, language, personality, or perceptions (Constant et al. 1994; Constant et al. 1996; Lee and Lee 2010). Indeed, IS professionals facilitate knowledge flow between IS and business units, supporting business units after systems implementation by sharing good technology use practices (Pawlowski and Robey 2004), solutions (e.g., help files), and knowledge about problems arising from insufficient information and data (Deng and Wang 2014).

Informal training between unit members from the same or different work units facilitates the sharing of knowledge in the use of IT-enabled work systems (Jasperson et al. 2005). As formal training is costly, informal training, such as informal mentoring, can be used as an equivalent alternative (Rice et al. 1999). In the IS context, peer mentoring refers to the matching of more experienced IS team members with less experienced non-IS team mates in a one-to-one relationship, so that the former can transfer their IT expertise to their junior colleagues (Bryant et al. 2007; Messersmith 2007; Rice et al. 1999). In fact, IS professionals provide business employees with hands-on training on technical features associated with reported problems and take the initiative to make sure that their non-IS colleagues correctly employ the appropriate technical practices (Deng et al. 2015).

2.5.4 Initiative taking

Initiative-taking behaviors are defined as task-related behaviors that employees engage in at a level beyond what is minimally required or generally expected (Podsakoff MacKenzie et al. 2000). Initiative-taking behaviors have been found in IS contexts too. For example, Walz et al. (1993) observed 19 meetings of a software design team over four months. At the meetings, only a few participants demonstrated certain discretionary behaviors, such as punctual attendance, providing constructive suggestions, voluntarily attending team meetings, paying attention to the broader scope of the project, and performing additional tasks outside their job scope (e.g., communicating with external experts). Had such behaviors been

exhibited by everyone else, the software that was designed would have been more effective and might have met the customer's satisfaction.

Initiative-taking behaviors are found when business employees lack knowledge (leading to low user efficiency) and technical malfunctions occur (an indication of low system efficiency) (Deng et al. 2015). In such situations, IS professionals could take the initiative by anticipating the need for additional information, providing personalized information and hands-on walkthroughs on technical features (e.g., workarounds), and offering extra explanations on the origins of problems. Initiative-taking behaviors are also important during IS implementation projects, where IS professionals have to tolerate inconveniences and work turmoil without complaining and maintain a positive attitude, even when things related to the information system do not seem to meet the IS team's interest (Yen et al. 2008).

The preceding subsections explored IS-specific behaviors directed towards IS peers and business employees by IS professionals. IS helping and knowledge-sharing behaviors are examples of helping behaviors (e.g., altruism, courtesy, peacekeeping, and cheerleading), and initiative-taking behaviors are analogous to the civic virtue and sportsmanship aspects of OCB. Also, the previous sections have explained how discretionary behaviors improve the perceived usefulness and ease of use of new information systems, and how these perceptions influence the occurrence of unplanned behaviors that lead to improvisation, making it more likely that the new systems would be infused in an organization. Users who received additional, relevant and wide-ranging knowledge and support would be more likely to view new systems as being helpful and easy to use. Such knowledge is often available among the IS professionals in organizations. The more frequently IS professionals communicate and collaborate with their non-IS colleagues to share IS solutions or IT-related knowledge, the more likely it would be that their non-IS colleagues invest additional time and effort in improvising with their information systems, leading to a fuller extent of deployment in their organizations. In the next section, we draw on these arguments to develop our research model.

3 Research model

This study focuses on how the positive, discretionary behaviors displayed by IS professionals affect users' perceptions of information systems, and encourage them to carry out improvised actions to infuse these systems into their work processes and organizations. Social cognitive theory argues that social interaction influences the actions that individuals perform, and that this performance is motivated by the achievement of hoped-for outcomes. Thus, when IS professionals interact with their non-IS colleagues to assist them with their IS needs and requirements, or when IS departments provide high-quality IS services to other business units, users are less likely to face difficulties and barriers in utilizing information systems. Users will perceive that the services they receive from the IS professionals in their organization make it easier to accomplish their tasks and reduce their uncertainty around IT-related knowledge.

Existing research models on the extended use of systems or their infusion have been relatively silent on the role of IS professionals, and this study draws on the OCB literature to identify the behaviors of IS professionals that support a higher degree of IS use among users. We propose that the term "IS-specific OCB" reflects the role of IS professionals in supporting their non-IS colleagues in either their job-related performance or non-job-related responsibilities with different forms of IT and non-IT support. Building on OCB and its dimensions, this research model proposes a corresponding IS-based construct based on the role of IS professionals (IS-specific OCB), which integrates all supportive activities they carry out to assist their non-IS colleagues, and conforms to the dimensions of OCB. Specifically, the different ways in which IS professionals support their users (e.g., helping, knowledge-sharing, informal training, and initiative-taking) align with the distinct aspects of OCB (namely altruism, courtesy, conscientiousness, civic virtue, and sportsmanship).

Figure 1 depicts the research framework tested in this study. Positive, discretionary behaviors carried out by IS professionals are hypothesized to positively affect perceptions among users about the usefulness (H1) and ease of use (H2) of systems. Therefore:

> H1: IS-Specific OCBs displayed by IS professionals are positively related to the perceived usefulness of IS systems among employees, and
> H2: IS-Specific OCBs displayed by IS professionals are positively related to the perceived ease of use of IS systems among employees.

Building on Bandura (2000), users who pick up IS adoptive behaviors easily through their interactions with other social actors are more likely to improvise with new systems. Drawing on social cognitive theory, informal interactions between IS professionals and users provide opportunities for the former to model behaviors to the latter, influencing their perceptions (Lamb and Kling 2003) and convincing them that using the new system is easy and that the systems is more useful than earlier ones (Venkatesh et al. 2003; Venkatesh and Davis 2000). These interactions also enable users to evaluate the potential consequences of their behaviors (Compeau and Higgins 1995); for instance, gaining expertise on using a particular system motivates users, because they can now become improvisers, rather than routine users (Orlikowski 1996). IS professionals who take an active interest in trends

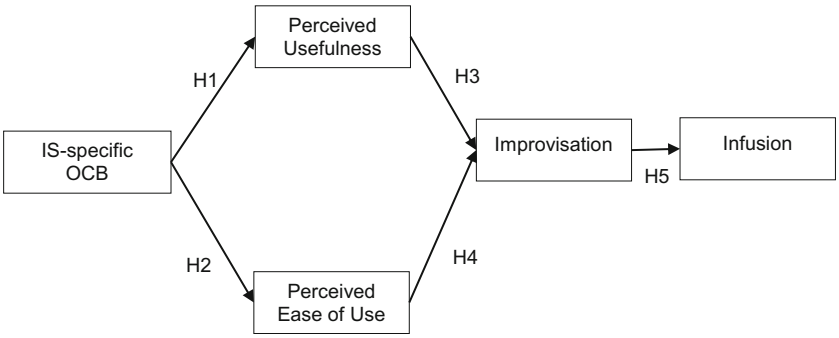


Fig. 1 Research framework

in the business processes of a unit they support so as to ensure that the systems can handle any changed requirements are making the system flexible and thus useful. These changes increase the self-efficacy of users, so that they are more likely to accomplish challenging goals (Bandura 1986).

Thus, the perceived level of usefulness and ease of use of a system influence the extent to which improvisation occurs. This leads to the following hypotheses:

> H3: The perceived usefulness of IS systems is positively related to the extent of employees' improvisational behaviors, and
> H4: The perceived ease of use of IS systems is positively related to the extent of employees' improvisational behaviors.

Bandura (2001) pointed out that behavior modeling influences play a prominent role in creativity, in which users are accustomed to thinking innovatively, and convey rules for generative, innovative, and improvisational behaviors. Following that, Compeau and Higgins (1995) explicated that individuals' level of computer use is likely to be improved through these behavior modeling influences. Users observe interactions between their colleagues and IS professionals and are encouraged to build relationships with their IS professionals when they are highly assured about the likely outcomes. Later, the confidence that non-IS professionals gain through informal training and additional interaction with IS professionals enables them to spontaneously come up with IS solutions that are needed, and to devise innovative ways of using their information systems (Jasperson et al. 2005; Li et al. 2013). This makes it more likely that they would use newly-adopted technologies to a greater extent than they had expected to, leading to the infusion of the new systems into the organization. Even in the mandatory use context, users often limit their use of new systems until they are routinized into their work processes, where the new technology becomes part of their workflow. However, obtaining the complete benefits of information systems requires users to go beyond what is required of them to achieve the infusion of the new system in their workplace (Sundaram et al. 2007).

In short, users enhance their level of knowledge and skills on how to improvise with a difficult-to-use technology and in turn, the level of improvisation influences the likelihood of the new system being infused into an organization (H5). Thus,

> H5: Employees' improvisational behaviors are positively related to infusing IS systems into work practices.

To date, several IS scholars believe that changes in users' beliefs, such as the perceived usefulness of an information system, motivate users to be more inclined to use certain systems (Bhattacherjee and Premkumar 2004). More specifically, a great number of research models have been proposed to argue that IS use is influenced by social interaction, via the cognitive processes of users' perceptions (Venkatesh and Bala 2008; Venkatesh and Davis 2000) or their behavioral intentions towards information systems (Venkatesh et al. 2003). Thus, we suggest in our research model that informal interaction between IS professionals and IS users leads to extended IS use, via changes in the cognitive processes of users that affect their perceptions of the usefulness and ease of use of an information system.

3.1 Control variables

Gender, age, and organizational tenure are identified as control variables for this study. Venkatesh et al. (2003) examined the role of gender and age in IS use. They reported that IS use at the acceptance stage was moderated by age and experience, meaning that IS use was more common among older workers and increased with greater experience. They also examined the moderating role of gender and age on the effect of social influence on the intention to use an IS. They pointed out that intentional IS use differed from females to males. Specifically, female and older workers who receive social influence (e.g., peer assistance) have a higher intention to use information systems. Venkatesh and Bala (2008) also argued that individual differences, such as demographics (traits or states of individuals, gender, and age), affect individuals' perceptions of perceived usefulness and ease of use. Therefore, in this study, the extent of perceived usefulness, perceived ease

of use, improvisation and infusion is controlled for gender, age, and organizational tenure.

4 Methodology

The model was evaluated using data collected from a survey of employees of electricity distribution companies, all of which use a similar information system. Before the survey was carried out, a series of interviews was conducted with managers of these firms to gather information about particular functions in the system and how employees use these functions to accomplish their tasks. This was the first phase of data collection, and the results were used to provide assurance about the appropriateness of the research setting and to contextualize the questions to fit the respondents' situation. In Phase 2, a survey was conducted to investigate the extent to which the employees used the system and how IS-specific behaviors carried out by IS professionals encouraged them to use it more deeply.

Phase 1:

The goal of this phase was to obtain information about the characteristics and capabilities of the information system. To do so, IT managers of six electricity distribution companies were approached and contacted via email. They were informed about the nature of the study, and an interview was requested with them. Three of them responded to the emails and agreed to be interviewed about the characteristics and utilization of the system. Nine semi-structured interviews with IT managers were carried out, and they provided a thorough explanation of different aspects of the system. The interviews each lasted between 1 and 1½ hours and used open-ended probes such as "what are the characteristics and capabilities of the existing information system?" The interviewees received questions in advance so that they had an opportunity to reflect on the best answers to describe the system and its functions. These results are presented in Appendix Table 10.

The interview results revealed that employees from all of the firms used a comprehensive web-based electricity billing system named "*Comprehensive Subscriber Services System*" to collect, save, analyze, restore, synchronize, and modify data about selling and installing electricity, and after-sales services. This system provides employees with high-level capabilities of analyzing bulk data and generating statistical/analytical web-based reports that managers use to make decisions. While the system is highly routinized, enabling employees to accomplish most of these activities, employees can also use the system to carry out non-routine activities. The capabilities and characteristics of the system that were surfaced from the interviews were used in the second phase to measure the extent to which employees engaged in extended IS use.

Phase 2:

A major task after the first phase was to assess the content validity of the measures. Once we learned how the particular system (called the *Comprehensive Subscriber Services System*) was infused into the employees' work practices and which of the system's functions were used by infusers, this information was used to adapt the survey items related to infusion, perceived usefulness and perceived ease of use. For example, an item that read "make the best use of [technology] to support my tasks" was reworded as: "make the best use of particular functions of the *Comprehensive Subscriber Services System*, such as analytical reports on electricity demand and sales or on suspended customers, to support my tasks". Furthermore, to ensure that items of each scale were understandable, the wording and readability of the items was assessed (Appendix Table 11). To do so, both a pre-test and a pilot test were conducted with three IT and business managers as well as three employees, including one electrician and two billing experts.

Following Hsieh and Wang's (2007) guideline that a two-year post-implementation period is needed for capturing extended IS use, electricity distribution organizations were selected for our sample only if they had used the *Comprehensive Subscriber Services System* for at least two years. The business managers of six such organizations were approached and asked to participate in a data collection exercise, which consisted of their employees completing either pen-and-paper or online surveys. The six organizations were branches of a large electricity distributor, had fewer than 50 employees each, and received the same level of formal training from their headquarters. Support from the business managers was sought face-to-face and they agreed to distribute the questionnaires and send out the link to the online survey to their employees themselves. The employees were informed that participation in this research was voluntary and that their responses would remain confidential.

A total of 278 questionnaires were distributed among electricians, managers, billing experts, and other employees. Managers encouraged their employees to complete them, leading to 183 questionnaires being collected, representing a response rate of 65%. Sixty responses were also received online from distinct branches. Out of the total of 243 responses, 227 were acceptable after unusable responses were deleted. The responses of employees who had no experience with using this system for their work or had not interacted with their firm's IS professionals regarding this system were also excluded from the dataset. When the demographic characteristics (gender, age, and tenure) of the responses from the online and pen-and-paper surveys were compared (Appendix Table 12), little difference was found.

4.1 Sample demographics

Sample demographics are illustrated in Table 1. There are slightly more males than females in the sample (51.1% versus

Table 1 Sample demographics

Gender	Frequency	Percentage	Cumulative Percentage
Male	116	51.1	51.1
Female	111	48.9	100
Total	227	100	
Age	Frequency	Percentage	Cumulative Percentage
20–30	24	10.6	10.6
30–40	160	70.5	81.1
40–50	38	16.7	97.8
More than 50	5	2.2	100
Total	227	100	
Tenure	Frequency	Percentage	Cumulative Percentage
Between 2 and 5 years	122	53.7	53.7
Between 5 and 10 years	69	30.4	84.1
More Than 10 Years	36	15.9	100
Total	227	100	
Employee Role	Frequency	Percentage	Cumulative Percentage
Billing	70	30.8	42.7
Customer Service	10	4.4	47.1
Electrical Engineering	34	15.0	62.1
Electrical Power Engineering	7	3.1	65.2
Human Resources	6	2.6	67.8
Management	10	4.4	72.2
Professional Electrical Power Engineering	42	18.5	90.7
Supporting Systems	21	9.3	100.0
Missing	27	11.9	11.9
Total	227	100.0	

48.9%). The sample is mostly populated by employees between 30 and 40 years old, with this group being about three times the size of the number of respondents of other age groups. All employees have worked for more than two years. Most of them, around 53.7%, have between 2 and 5 years of work experience with their current organizations. It is also worth knowing that most of them are well educated. Almost 31% of the respondents are experts at electricity billing, and nearly 34% of them have a degree in electrical power engineering.

4.2 Measures

This research analyses the relationships among IS-specific OCB behaviors, perceived usefulness, perceived ease of use, improvisation, and infusion. The measures for the survey were taken from existing scales in the literature and the items are listed in Appendix Table 11. All items were measured on a 7-point Likert scale, ranging from 1 "strongly disagree" to 7 "strongly agree", except for improvisational behaviors, whose items used a different scale format from "very inaccurate" to "very accurate".

To measure IS-specific OCB behaviors, a widely-used 13-item scale was adapted from Podsakoff et al. (1997). A unit-referent scale measured three forms of OCB: helping behavior (e.g., altruism, courtesy, peacekeeping, and cheerleading) assessed with 7 items, civic virtue measured with 3 items, and sportsmanship evaluated with 3 items. In this study, business employees from different departments rated their IS departments in terms of the quality of helping behaviors, and the engagement of IS professionals (civic virtue and sportsmanship). The coefficient alphas for the three dimensions of OCB used in this study were 0.91 for helping behavior, 0.84 for civic virtue, and 0.79 for sportsmanship. A confirmatory factor analysis (CFA) was twice tested to examine whether the three-dimensional factor model or the unidimensional model of OCB better fit the data. First, all 13 items were loaded on the OCB construct, serving as indicators for the latent OCB construct. The fit indices reflected a good fit ($\chi^2/df = 1.535$, SRMR = 0.040, IFI = 0.945, NNFI = 0.940, CFI = 0.945, and RMSEA = 0.049). Second, the 13 items were loaded on the three OCB dimensions (helping behavior, civic virtue, and sportsmanship) and then the three dimensions were loaded on the higher-order OCB construct, serving as first-order indicators for one higher order factor (OCB). The resulting fit indices also showed a good fit ($\chi^2/df = 1.470$, SRMR = 0.039, IFI = 0.952, NNFI = 0.948, CFI = 0.951, and RMSEA = 0.046), accepting the null hypothesis that there is no difference

between these two models (ΔCFI <0.05 and < 0.01). Thus, OCB ($\alpha = 0.942$) was treated as a global construct (unidimensional) in this study. This is consistent with prior OCB research (Carter et al. 2013; Hoffman et al. 2007; LePine et al. 2002; Webster and Beehr 2013).

Improvisation was measured using a 12-item scale adapted from Hmieleski and Corbett (2006). The scale represents the improvisational behaviors that individuals could possibly display, such as producing novel solutions for unpredictable situations. Business employees rated the degree to which each item described their job-related behaviors. The level of IS use has been measured at various post-adoption stages, for example, acceptance (Venkatesh et al. 2003) or infusion (Saeed and Abdinnour-Helm 2008; Hsieh and Wang 2007). In this study, infusion refers to extended IS use at the infusion stage. To measure extended IS use, a 4-item scale was adapted from Jones et al. (2002), asking about the extent to which users exploited the full potential of their existing IS systems. Both usefulness and ease of use were measured using a 4-item scale from Venkatesh and Davis (2000). Employees were asked to rate their perceptions of the usefulness and ease of use of the information system in question and the extent to which they effectively improvised with the system and infused it into practice.

AMOS (Arbuckle 2014) was used for data analysis, using a two-step analytic approach. First, the measurement model was assessed in terms of the validity and reliability of the measures. Second, once the results of the measurement model were accepted, the structural model was evaluated to assess the strength of the relationships between the constructs.

4.3 Reliability and validity analysis

The measurement model was assessed for internal consistency, and convergent and discriminant validity. The results are presented in Table 2, which shows the means, standard deviations, factor loadings, and reliabilities (Cronbach' Alpha (α)) of the constructs. All items that loaded on respective factors exhibited values of about 0.70 or greater than 0.70, except for three items. The three items with low loadings were: one item that was part of the OCB construct with a loading of 0.63, one item from the infusion construct with a loading of 0.69, and one item from the improvisation measure with a loading of 0.68. As a guideline, Chin (Chin 1998) states that standardized loadings should be greater than 0.707, but also noted that this rule of thumb should not be as rigid at early stages of scale development. Loadings of 0.5 or 0.6 may be acceptable if additional indicators in the block could serve as a basis for comparison.

The results of the correlations and standardized regression weights were used to calculate the Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Squared Variance (MSV), and Average Shared Squared Variance (ASV) for each construct (see Table 3). All constructs satisfied the criteria for reliability and convergent and discriminant validity. For all constructs, internal consistency reliabilities (Cronbach' Alpha (α)) were greater than the recommended cut off of 0.70 (Nunnally and Bernstein 1994) and composite reliabilities (CR) were about 0.90 or even higher than 0.90, indicating the accurate composite reliabilities resulted from the avoided assumption of equal weighting of items. The average variance extracted (AVE) for the variables was greater than 0.50, meaning that 50% or more variance of the observed variables were to be accounted for variance of their own latent variables (Chin 1998; Fornell and Larcker 1980). To claim discriminant validity among the constructs, the square root of the average variance extracted (AVE) should exceed the square of the correlations (see Table 4) among the latent variables, or AVE should be greater than MSV and ASV. This would mean that more variance was shared between the latent variables and the block of observed variables than with different observed variables of other latent variables (Chin 1998).

Composite Reliability (CR), Average Variance Extracted (AVE), Maximum Shared Squared Variance (MSV), Average Shared Squared Variance (ASV).

The square roots of the construct's AVE value are presented on the diagonal. Significance of Correlations: $^{**}P < 0.01$; $^{*}P < 0.05$.

The reliability of the infusion measure was reported by Sundaram et al. (2007) and Eli et al. (2002) as 0.93 and

Table 2 Factor loadings and reliabilities

Construct	Scale Anchor	Mean	Standard Deviation	No. of Items	Confirmatory Factor Loadings Range	Reliability (alpha) α
IS-Specific OCB	1-Strongly Disagree 7-Strongly Agree	5.34	0.96	13	0.63–0.81	0.942
Perceived Usefulness	1-Strongly Disagree 7-Strongly Agree	5.59	1.00	4	0.81–0.86	0.895
Perceived Ease of Use	1-Strongly Disagree 7-Strongly Agree	5.33	1.04	4	0.80–0.86	0.896
Improvisation	1-very Inaccurate 7-Very Accurate	5.41	0.98	12	0.69–0.93	0.934
Infusion	1-Strongly Disagree 7-Strongly Agree	5.55	1.10	4	0.68–0.78	0.911

Table 3 Convergent and discriminant validity

Construct	CR	AVE	MSV	ASV
Infusion	0.914	0.728	0.537	0.26
IS-Specific OCB	0.942	0.556	0.537	0.487
Perceived Usefulness	0.896	0.682	0.487	0.122
Perceived Ease of Use	0.897	0.685	0.408	0.102
Improvisation	0.934	0.543	0.514	0.254

0.928, respectively. The composite reliability of infusion in this study value was fairly close at 0.914. The reliabilities of the perceived usefulness (0.896) and perceived ease of use (0.897) constructs in this study are similar to the reliabilities for similar constructs reported by Venkatesh and Bala (2008), which ranged from 0.90 to 0.94. There were no similar studies of OCB and improvisation in the IS context, which we could use to compare our reliabilities of these measures.

Multiple analyses were conducted to evaluate the threat of multicollinearity. The highest correlation was 0.692 (less than 0.70, see Table 4), the highest score of variance inflation factor (VIF) was 2.518, and the highest conditioning index was 11.667 (less than 30). Each of these statistics fall within an acceptable range (Tabachnick and Fidell 2001), indicating that multicollinearity is not a threat to the results of this study.

4.4 Common method variance testing

To examine the extent to which common method bias influences behavioral research results, researchers have recommended procedural remedies to be used during the design of studies and statistical remedies for different types of research settings (Podsakoff et al. 2003; Podsakoff and Organ 1986). During the design of this study, we used several techniques to avoid, for example, social desirability. Those techniques are:

1- We psychologically separated the measurements of predictors and criterion variables by using a cover story as presented in Table 5.
2- We protected respondent anonymity and reduced evaluation apprehension by ensuring respondents that their answers would remain anonymous and that there were no wrong or right answers. Respondents were asked to answer questions as honestly as possible.
3- We avoided using vague concepts, "double-barreled" questions, and complicated syntax in the scales. We tried to keep questions simple, specific, and concise.
4- We also avoided using bipolar numerical values and the same endpoints in the scales formats.

Statistical remedies recommended by Podsakoff et al. (2003) have been used in the IS field, such as Ahuja et al. (2007) and Ayyagari et al. (2011). One of the most widely statistical tests used by IS researchers is Harman's single-factor test. This method examines how a single factor accounts for the majority of the covariance among the measures. The result of the Harman's single-factor test in an unrotated factor solution yielded a variance of 47%, which is less than 50%, showing that no dominant single factor explains significant covariance among variables. In addition, in a rotated factor solution, five factors were identified, with variances ranging from 9 to 13%.

One of the disadvantages of Harman's single-factor test is that it is a diagnostic technique and rarely provides evidence that measures are free of common method bias. Because of that and following the recommendations of Podsakoff et al. (2003), an unmeasured latent method factor was modelled in this study to control for any systematic variance among the items (observed variables), which is independent of the variance due to the constructs (latent variables). In this model, all items were loaded on their own constructs as well as on a latent common method variance factor. To minimize the disadvantages of this method, the model constrains the measurement factor loadings on the latent common variance factor to be equal (Podsakoff et al. 2003). The square of all measurement factor loadings on the latent common variance factor indicates the percentage of common method variance bias (Williams et al. 1989).

Table 4 Correlation among constructs

Construct	IS-Specific OCB	Perceived Usefulness	Perceived Ease of Use	Improvisation	Infusion	Gender	Age	Tenure
IS-Specific OCB	**0.746**							
Perceived Usefulness	.640**	**0.826**						
Perceived Ease of Use	.593**	.695**	**0.828**					
Improvisation	.675**	.674**	.643**	**0.737**				
Infusion	.682**	.635**	.558**	.659**	**0.853**			
Gender	.208**	.191**	0.000	.146*	.230**			
Age	0.36	−0.026	−0.023	0.018	0.034	0.004		
Tenure	−0.117	−0.245**	−0.133**	−0.186**	−0.171**	−0.023	0.321**	

Table 5 Procedural remedies

Separation statements within the questionnaire	Comments
Did you know? A young Isaac Newton discovered the notion of gravitation when an apple was descending from the top of an apple tree to the ground. The apple tree still exists in Newton's garden in Lincolnshire.	Introduced between the OCB scale and perceived usefulness
Did you know? The United States has never lost a war in which mules were used.	Introduced between OCB scale and perceived ease of use
Did you know? The only two nations whose name begins with an "A," but doesn't end in an "A," are Afghanistan and Azerbaijan.	Introduced prior to improvisation
Did you know? Letters 'a', 'b', 'c' and 'd' do not appear if you spell any of the numbers between 1 and 99.	Introduced between improvisation and infusion
You have almost done answering the survey! Only 4 questions left! Thank you for helping us gain knowledge about technology use.	

The commonly accepted percentage for common method bias variance is up to 25% (Williams et al. 1989); however, in this study, the unmeasured latent method factor was 4%, which is less than the recommended percentage. Furthermore, the measurement model was tested twice. First, the unconstrained measurement model was tested in terms of how the model fits data (Model A), and second, the constrained measurement model was built by adding the latent method factor (Model B). Significant method bias exists if the constrained model (Model B) fits data significantly better than the unconstrained model (Model A) (Widaman 1985; Williams et al. 1989). In other words, if the model fit improves when a latent method factor is introduced, we can deduce that common method bias accounts for most of the covariance observed in the variables. The results of these two tests are presented in Table 6.

Although the chi-square difference test has also been suggested to decide which model should be accepted or rejected, this method is sample-size sensitive. Researchers have thus recommended a test that examines differences in comparative fit indices (CFI) (Cheung & Rensvold, 2002; Little 1997). Common method bias can be said to be absent if the difference in CFI between two models is less than 0.05 (Little 1997) or less than 0.01 (Cheung & Rensvold, 2002). In this study, the chi-square difference test was significant, and the difference in CFIs from Table 6 yielded a value of 0.001, which is less than the recommended cut-off. Overall, the results obtained from different tests for the presence of common method bias in this study lead to the conclusion that common method bias is not a serious threat to this study.

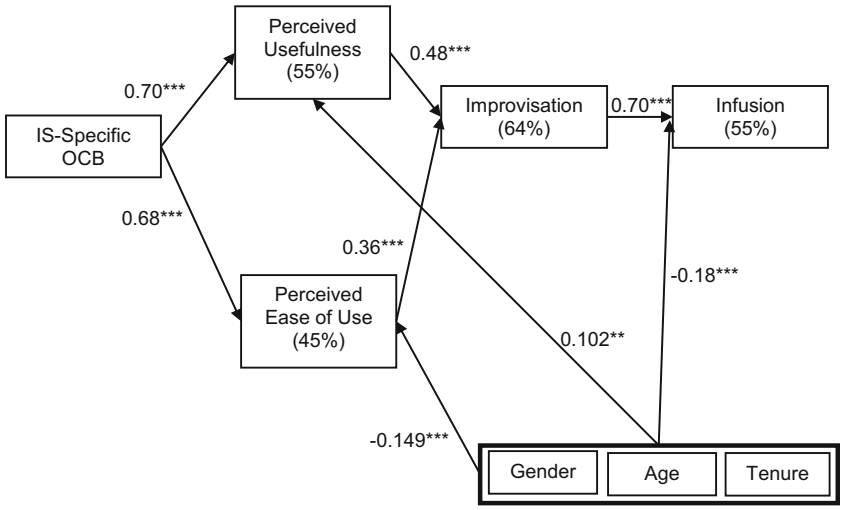
4.5 Measurement and structural models

Tabachnick and Fidell (2001) defined both measurement and structural models. The measurement model includes the measured variables and the factors, where the measured variables (indicators) are connected with the factors (constructs). The structural model consists of the hypothesized relationships among the constructs, where paths connect the constructs with each other (Fig. 2). Comparing the measurement model fit indices in Table 7 to the cut-offs recommended for the perfect-fitting models in Appendix Table 13, the data is a good fit with the model. The results show that χ^2/df is 1.535, which falls between 1 and 2, SRMR yields a value of 0.040, which is less than 0.08, the values of IFI, TLI and CFI are 0.945, 0.940, and 0.945, respectively, which are close to 0.95, and the obtained value for RMSEA is 0.049, which is less than 0.05. The obtained value for RMSEA shows a correct specified factor loadings at the exploratory factor analysis (EFA) and an assumption of the appropriate number of variables in this research (Kenny and McCoach 2003).

To evaluate the proposed hypotheses, the factor covariances were removed and structural paths were added to the structural model. Control variables were also entered as

Table 6 Method bias test

Model	Chi-Square	CFI	RMSEA	Comment
Model A: All Items load on respective factors	949.914 with 619 df	0.945	0.049	Significant method bias exists if Model B fits significantly better then Model A (Widaman 1985).
Model B: All items load on respective factors and also a latent method factor	949.914 with 618 df	0.944	0.049	The null hypothesis of common method bias variance should not be rejected if the difference between CFIs (ΔCFI) is less than 0.01, indicating lack of method bias (Cheung and Rensvold 2002).



- Control Variables (Gender, Age, and Tenure) were simultaneously added to the model with other variables
- Significance levels: ***P<0.01; **P<0.05 ; *P<0.1
- Only significant correlations are indicated

Fig. 2 Structural model with results

determinants of infusion and improvisation. Compared with Table 13 in Appendix D, the fit indexes results from the structural model illustrated in Table 7 reveal that the data is a reasonable fit with the model. Further, the results of the path coefficients shown in Fig. 2 were used for testing hypotheses. For each hypothesis, the standardized estimates (β) and their levels of significance are reported in Fig. 2.

5 Results

The objective of this study was to investigate the role of IS professionals in enhancing employees' propensity to infuse information systems into their work practices. The study argued that employees who infuse an information system into their work do so by improvising with them based on their perceptions of the usefulness and ease of use of the system. This study then asserted that employees' perception of the usefulness and ease of use of systems depends on the extent to which IS professionals assist them by using IS-specific OCBs. Such support enables employees to display improvisational behaviors by utilizing their IT-related knowledge and better deploy their IS resources, and thus infuse a system into their work practices. Table 8 summarizes the results of the hypotheses testing, and the results are interpreted below.

5.1 Predictors of IS infusion

In this study, improvisation was proposed as a determinant of IS infusion. The link between these two variables was extremely significant ($p < 0.01$) and highly correlated ($\beta = 0.70$). 55% of the variance in IS infusion can be explained by improvisation, supporting H5 and the proposition that accomplishing tasks more innovatively leads to deeper use of an information system among employees.

The significant role of improvisation in supporting IS infusion could be because improvisation provides employees with opportunities to explore the various features of an information system in a range of conditions. For instance, while routine use will be suitable during normal operations, the ability to improvise is valuable when individuals have to use a system in an emergency situation or when they face a tight deadline. Their experiences with a system during such situations makes them more confident about its strengths and limitations, and if it performs to their expectations, makes them more willing to use it deeply and infuse it into their work processes.

This finding offers a broader understanding of the predictors of infusion. Infusion has generally been regarded as an outcome of individual and environmental factors, such as individual personality traits, attitudes, and perceptions of job environments (Ahuja and Thatcher 2005). Other individual-level predictors that have been studied include user

Table 7 Fit statistics

Model	Chi-Square	SRMR	IFI	NNFI(TLI)	CFI	RMSEA
Measurement Model	949.966 with 619 df (χ^2/df = 1.535)	0.040	0.945	0.940	0.945	0.049
Structural Model	1230.184 with 719 df (χ^2/df = 1.711)	0.072	0.917	0.910	0.917	0.056

Table 8 Summary of the proposed hypotheses

Hypotheses	Supported?
H1: IS-Specific OCB displayed by IS professionals are positively related to the perceived usefulness of IS systems among employees ($\beta = 0.70$, $P < 0.01$)	Yes
H2: IS-Specific OCB displayed by IS professionals are positively related to the perceived ease of use of IS systems among employees ($\beta = 0.68$, $P < 0.01$)	Yes
H3: The perceived usefulness of IS systems is positively related to the extent of employees' improvisational behaviors ($\beta = 0.48$, $P < 0.01$)	Yes
H4: The perceived ease of use of IS systems is positively related to the extent of employees' improvisational behaviors ($\beta = 0.36$, $P < 0.01$)	Yes
H5: Employees' improvisational behaviors are positively related to infusing IS systems into work practices ($\beta = 0.70$, $P < 0.01$)	Yes

satisfaction (Hsieh and Wang 2007), perceived IS usefulness and the intrinsic contentment that users experience when they use an information system to solve problems, overcome difficulties, learn new things, or generally interact with it (Li et al. 2013). Environmental factors that have been investigated as determinants of infusion include system attributes, such as information quality and system integration (the extent to which an information system offers access to multiple systems through a unified interface) (Saeed and Abdinnour-Helm 2008). In terms of task attributes, the routinization and frequency of IS use (Sundaram et al. 2007) have been found to influence IS infusion. This study expands on the latter group of predictors by asserting that individual experimentation and exploration activities are also essential for explaining the level of deep IS use in an organisation. Future researchers could attempt to test a multi-level model of IS infusion that integrates predictors from the environment, individual and task levels.

5.2 Predictors of improvisation

Both perceived usefulness and ease of use were found to be positively ($\beta = 0.48$ and 0.36 respectively) and significantly related ($p < 0.01$) to improvisation, supporting H3 and H4. Both perceived usefulness and ease of use contribute to 64% of the explained variance in improvisation, and the impact of perceived usefulness is stronger than perceived ease of use.

The impact of improvisation has been studied in various topics, such as technology implementation (Orlikowski and Hoffman 1997), organizational learning (Miner et al. 2001), and new product development (Kamoche and Cunha 2001). While researchers have addressed the impact of improvisation at different levels of analysis: individual (Magni et al. 2009a; Nisula and Kianto 2016), group (Crossan et al. 2005; Vera and Crossan 2004), and organization (Moorman and Miner 1998), less research has been conducted on the antecedents of individual improvisation. Nisula and Kianto (2016) found only 1 study (Magni et al. 2009a) on the determinants of individual improvisation. The results showed that team behavioral integration, including timely information exchange among team members, communication norms, and team members' constructive-cooperative behaviors, positively affects individual improvisation. Magni et al. (2009b, 2010) proposed a multi-level research model in which personality traits (e.g., personal innovativeness) and cognitive factors (e.g., self-efficacy) act as determinants of individual improvisation.

Applied to our study, perceived usefulness and ease of use are the cognitive factors in our model. Importantly, the perception of an IS system's usefulness and ease of use are shaped by the IS-specific behaviors exhibited by IS professionals when they interact with other users. This is because users observe how other users benefit from interacting with IS professionals, which motivate them to engage in such interaction to receive the same benefits. These cognitive processes enhance the likelihood of improvisation in two ways. First, individuals become more familiar with an IS, and find out other users they can ask if they face any problems. Access to a network of users makes it easier for individuals to decide to engage in improvisation because they can rely on alternative sources of knowledge to find out about different ways of

Table 9 Control variables

Control Variable Relationship	Standardized Coefficient (β)
Gender	
Perceived usefulness	0.42(NS)
Perceived Ease of Use	−0.15***
Improvisation	0.05(NS)
Infusion	0.10**
Age	
Perceived usefulness	0.00(NS)
Perceived Ease of Use	−0.03(NS)
Improvisation	0.06 (NS)
Infusion	0.03 (NS)
Tenure	
Perceived usefulness	−0.18***
Perceived Ease of Use	−0.05 (NS)
Improvisation	−0.04 (NS)
Infusion	−0.054 (NS)

carrying out their work tasks. Second, when individuals observe others using a system adeptly to achieve their goals, any uncertainty they may have over the system's ability to be useful for their purposes is reduced.

5.3 Impact of IS-specific OCB on perceived usefulness and ease of use

The results indicate that the discretionary behaviors of IS professionals, which are termed IS-specific OCB in this paper, positively and significantly affect employee perceptions of the ease of use and usefulness of a particular information system. The relationship between IS-specific OCB and employees' perceptions of system usefulness was highly significant ($p < 0.01$) and strongly positive ($\beta = 0.70$). The relationship between IS-specific OCB and perceived ease of use was also positive and significant relationship ($\beta = 0.68$, $p < 0.01$). IS-specific OCB explains approximately 55% of the variance in perceived usefulness and almost 45% for ease of use. These results support H1 and H2.

Employees improvise with their current information systems and infuse them into their practices when they receive additional support from IS professionals. Interacting with IS professionals makes employees more technically knowledgeable about their information systems, and they learn how to respond to unplanned-for situations, using knowledge and experiences obtained from past situations (Mendonca and Wallace 2007; Orlikowski 2000). The results of this study indicate that interacting with IS professionals provides potential improvisers with a source of technical knowledge so they can react to unpredicted situations according to the experiences gained in the past interactions with IS professionals.

Previous studies have discussed the definitions of OCBs and the effect of these behaviors on different organizational aspects in the IS context (Deng and Wang 2014; Deng et al. 2015; Hsu et al. 2015; Rafaeli et al. 2008). This study presents a positive effect of IS-specific behaviors which contrasts with Deng and Wang (2014), who found that IS professionals' OCB behaviors had a negative effect on their (IS professionals) task efficiency, but is consistent with Rafaeli et al.'s (2008) study on the positive effect of IS professionals' OCB on customer service quality in call centers.

5.4 Control variables

Significance levels: $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Gender, age, and tenure were tested as controls for perceived usefulness, perceived ease of use, improvisation and infusion. The results are shown in Table 9. Age is not a determinant of any construct in this study. The correlation between gender (where male = 0 and female = 1) and infusion is significant ($p < 0.05$), indicating that females used the information system at a deeper level than males ($\beta = 0.10$). Gender also had a significant effect on employees' perception about how easy the information system might be ($p < 0.05$ and $\beta = -0.15$). This means that, in contrast to males, females did not perceive the information system as being easy to use. The links between tenure and all variables are not significant, besides perceived usefulness ($p < 0.01$ and $\beta = -0.18$). It indicates that the longer an individual has been with an organization, the less likely s/he is to perceive that the current information system as being useful.

6 Discussion

The infusion of information systems into an organization's work processes is seen as necessary for obtaining the full value of such investments. However, the deeper use of many information systems is often inhibited by uncertainty over the systems' usefulness and ease of use. We have argued that these hurdles can be surmounted by the discretionary behaviors of IS professionals. These behaviors support the learning of users in ambiguous situations by providing models of behavior and cognition which they can model. Such behaviors also motivate users to deepen their use of the technology by helping them evaluate potential consequences of their behaviors, thus encouraging improvisation and infusion. The prior section reported that strong support was obtained for this research model. In addition to providing empirical support for the hypothesized research model, the results also suggest some theoretical and practical contributions.

6.1 Theoretical implications

This study makes a number of contributions. First, it uses social cognition theory to extend our understanding of the role that IS professionals play in improving the value that enterprises obtain from their IS investments. IS use occurs in a social context (Lamb and Kling 2003), and various aspects of the interaction between IS users and IS professionals have been studied. These include: the importance of a shared understanding between IS and business staff to enhance IS-business alignment (Bassellier Reich and Benbasat 2001), their role as social influencers of IT use in the post-adoption stage (Venkatesh et al. 2003), and designing and directing formal and informal training sessions as their post-adoptive behaviors (Jasperson et al. 2005;

Venkatesh and Bala 2008). This study deepens this analysis of their role by focusing on how they support the learning of users through their discretionary behaviors. Our results extend robust insights into users' IS extended use resulted from a set of IS-specific OCBs performed by IS professionals. The increasing pervasiveness, embeddedness and complexity of information technology implies that users are frequently in situations where they face uncertainty. By explaining how IS professionals engage in certain types of behaviors, the study highlights how they can act as conduits of specialized knowledge and skills to make users feel more at ease with new systems and consider infusing them into their work.

Second, by studying the role of IS professionals in IS infusion, we are highlighting the need to consider the actions of the various actors in the social context surrounding information systems and their value. As IS professionals analyze, plan, deploy, maintain or retire systems, their activities can influence the perceptions that users have of individual systems and the overall portfolio. Users make decisions to invest further time and effort in using new systems based on the availability of support in the organization, beyond the encouragement of their managers. Studies of IT value attempt to incorporate such possibilities by using real options analysis (Jasperson et al. 2005). However, this approach, while complex and robust, is often limited to incorporating the decisions of managers and users, setting aside the role of IS professionals. This paper provides evidence that the long-term value that organizations receive from their IT investment decisions is strongly influenced by the actions of their IS professionals in supporting the learning of their users.

It is important to note that the paper focuses on only the positive aspects of IS professionals' post-adoption activities. While IS professionals can help users by offering technical support and facilitating knowledge sharing, IS professionals may also limit the post-adoption success of information systems. For example, if they are resistant to a new system and provide only superficial support, it is unlikely that the system will be infused in an organization. Moreover, IS-specific OCB may be seen by IS professionals as an addition to their workload. They already face pressure to update their skills to prevent professional obsolescence (Tsai et al. 2007), and may find it difficult to allocate time, effort and attention to engage in IS-specific OCB in addition to their regular work and the need to update themselves. As IT becomes more pervasive and new systems are introduced more frequently, the informal relationships between users and their IS colleagues have a strong influence on their ability to use new systems. This study demonstrates the importance of discretionary collaboration in enhancing users' engagement with new systems and their ability to make full use of the opportunities inherent in them.

A relevant issue here is the context in which IS professionals play a more significant role in supporting different types of IS innovations. The results of this study point to the impact of IS professionals in educating users informally, so as to make information systems easier to use and more useful for their purposes. Furthermore, the results demonstrate that additional interaction with IS professionals help IS users to become better at thinking more creatively ("outside of the box") to find technical solutions to unpredictable IS-related problems. We can extrapolate from this and infer that IS-specific OCB is more important when the costs and benefits of new systems are ambiguous than when they are obvious (Rahrovani et al. 2015). As more firms shift from adopting, automating and informating systems towards transformative innovations (Zuboff 1988), there is a corresponding increase in the uncertainty of the benefits that will accrue to firms from such technologies. When automating and informating systems are adopted, their consequences and implications for work processes are fairly straightforward, visible, and restricted within certain organizational boundaries (Burton-Jones 2014). In contrast, the outcomes of transformative IS investments are much more difficult to predict and are usually more extensive, both in terms of organizational scope and time. Individual users exposed to transformative information systems will require more assistance from their IS colleagues in learning how to use such systems, as they may be unfamiliar and prior knowledge may be not relevant. In such contexts, IS professionals may need to engage in IS-specific OCB more extensively to help users lower the uncertainty over using.

6.2 Implications for practice

Investments in IT projects have been increasing to reduce costs and improve decision-making, productivity, sales, profits, market efficiency, customer welfare, creation jobs and economic development (Petter et al. 2008). A top concern for business executives has been to estimate the impact of IS on business profitability or the return on investments, and to distinguish contribution of IS to individual, group, and organizational successes (Kim and Kishore 2018; Petter and McLean 2009; Urbach et al. 2009). Consequently, how expenditures and investments on IS should be made is a key issue debated by top management, with no guarantee that these decisions will be successful, as evidenced by the large number of failed and abandoned IT projects

(Ewusi-Mensah 1997; Gopalakrishna-Remani et al. 2018; Roberts et al. 2004).

The success of the IS function depends on how IS and business employees are aligned in terms of IT's impact on the business' strategic direction, operations, and its relationships with business units. The study provides top IT and business managers with a suggestion for enhancing the outcomes of IT projects at the post-implementation stage. The results point to the importance of creating scenarios to encourage frequent occurrence of discretionary behaviors between IS professionals and business employees. This will reduce miscommunication, increase their level of shared knowledge, and provide better support overall. Broadly, the goal will be to shift away from conceptualizing "IS support" as a rigid, structured activity toward a more organic, free-flowing process. This will enhance users' learning and the informal engagement will provide examples of behaviors they can model.

Orlikowski (2000) stated that technology use among employees is not a matter of how difficult or simple technologies are, but how users are socially influenced and encouraged to use technologies. The model in this study unveils an approach that top managers can put in place to non-mandatorily advertise the enhanced use of IT systems among employees. Our results demonstrate the role of IS professionals in developing users' IT-required skills by leveraging a set of IS-specific behaviors among them, leading to deeper levels of IT system use. Therefore, the focus on s between IS professionals and business employees will provide the latter with a channel to develop their IT requirements and become familiar with the various features of new IT systems. Top IS and business managers should recognize the importance of IS professionals' positive discretionary behaviors in enhancing employees' IT-related knowledge and expertise, so as to improve the value they obtain from their investments.

6.3 Limitations

Before offering potential avenues for future research, we present the limitations of our research. First, as a cross-sectional design, there may be a lower level of certainty in our conclusions, compared to a longitudinal design that is better able to demonstrate causality in the relationships between the predictor and outcome variables. Second, the model does not account for differences across organizations that could influence the level of information systems infusion. Each firm could have a different level of infusion because of organizational-level attributes, such as the extent of senior management support, level of experience with IT systems, and rigorousness of system documentation. Ideally, these attributes could be measured and their impact could be assessed by using a multi-level model, which we encourage others to attempt in the future. Third, this study elaborates how users' perceptions of IS usefulness and ease of use are shaped by discretionary behaviors directed by IS professionals, leading to attaining a set of IT capabilities that prompt users to effectively improvise with IS and to infuse IS into their work practices. This study does not control for the effect of users' computer self-efficacy (e.g., using a software package for data analysis) on IS infusion and improvisational behaviors. Compeau and Higgins (1995) found out that users' perception of being capable of using IS at a deeper level can be shaped by their own individual efforts. Evaluating the effects of users' computer self-efficacy in similar contexts may be of interest to other scholars. Finally, while recommended cut-off values are used in this study to assess the fit of the model, it is important to keep in mind that such cut-offs have an arbitrary nature. For example, the reasonability of a cut-off value for RMSEA is affected by the study's sample size and variations in the degrees of freedom (Kenny et al. 2015).

6.4 Future research

Notwithstanding these limitations, this study evaluates the effect of the OCBs of IS professionals on higher-level IS use at the individual, rather than group level. However, the literature is silent on benefits these behaviors have when practiced across units (Podsakoff et al. 2009). An interesting topic for future research is group-level OCBs by IS departments and their impact on outcomes relevant for business departments. For example, a researcher could study the aggregate effect of OCBs displayed by an IS department on the overall IS infusion of a business department.

While this paper investigates the positive effect of IS-specific OCBs, IS scholars should also undertake further research on any possible 'dark side' of IS-specific OCBs. It is foreseeable that IS professionals may perform more OCBs and overlook their own task performance (Deng et al., 2014). Performing the discretionary behaviors detailed in this paper may also have detrimental effects on individuals in terms of their progress towards their work goals (Koopman et al., 2016), the long-run development of their careers, and task performance (Bergeron 2007; Rapp et al., 2013; Rubin et al., 2013). Future researchers could examine how IS professionals trade off the benefits and costs when deciding whether or to what extent they should carry out IS-specific OCBs.

Most studies have predominantly focused on the antecedents of IS infusion (Hsieh and Wang 2007; Venkatesh and Bala 2008; Venkatesh et al. 2003; Venkatesh et al. 2011), but have not paid much attention to its consequences. Building on this study, future studies could focus on the advantages that may emerge from using information systems more extensively. To sustain the infusion of information systems into work practices, business employees will frequently enquire about IS services and obtain IT-related knowledge, which in turn compels IS departments to provide them with better IS services. Indeed, after frequent responses from IS professionals to business employees' IT needs, IS departments become more effective in delivering high-quality IS services, such as predicting situations where IT is facing high levels of demand or by providing IT workarounds using ad hoc sub-systems. Thus, another avenue for future research could be to examine the impact of IS-specific OCB and IS infusion on the effectiveness of IS departments.

Technology has transformed employees' traditional workplaces, with their physical boundaries, into virtual workplace, where employees interact with each other through information and communication technology. A challenge here is whether the appropriate level and extent of IS support needed for IS infusion can be provided virtually. IS researchers have suggested online IT helping behaviors as part of IS-specific OCB (Lee and Lee 2010), and future researchers could examine how the location (local/distant) and type (online/face-to-face) of IS-specific OCB affect IS infusion and other relevant outcomes.

Another environmental change that is relevant in this context is the shift towards IS outsourcing and more broadly, the growth in the use of cloud-based systems. Both of these changes represent occasions where organizations become more reliant on vendors for providing support for IT systems used internally. These changes have led to organizations employing fewer IS professionals in roles such as infrastructure management, technology deployment, application development, and maintenance (Bailey and Becker 2014). The move away towards a greater proportion of IT support coming from external, as opposed to internal, sources has ramifications for the model presented in this paper. This is because most of the interaction between internal users and IS professionals employed by vendors takes place in formal channels (Sultan 2010), limiting the scope for discretionary behaviors to occur. Moreover, the incentives for vendor-employed IS professionals to engage in IS-specific OCB are limited, as it is likely that they would not share the objectives of the organization in encouraging IT infusion to maximize the value of their IT investments (Ko et al. 2005).

Therefore, one question for future researchers to consider is the applicability of this model to contexts where external IT support for users is more dominant. What other sources of knowledge and skills would users rely upon in such situations? Would they attempt to build deeper bonds with vendor-employed IS staff, so as to establish a channel they could rely on when faced with uncertain situations? Another issue is whether the dominance of externally-sourced IS professionals affects the morale, commitment and satisfaction of the remaining internal IS staff. The IS professionals who remain in an organization after it has shifted to a cloud computing environment or outsourced the majority of its IS functions may have little motivation to display IS-specific OCBs towards their users. This may potentially lead to a negative spiral, where poor IS-business relationships reduce the perceived usefulness of IS investments, further engendering a move towards the use of IS vendors. Researchers should undertake to study how IS-specific OCB occurs among the IS professionals who remain in such organizations, and whether the newly-appointed external IS professionals view the provision of such discretionary behaviors as part of the service they are providing.

7 Conclusion

This study examines the role of the discretionary behavior of IS professionals in motivating their non-IS colleagues to use information systems more deeply. Drawing on OCB concepts and dimensions, IS-specific OCBs which support the ability of users to infuse the features and functions of information systems into their work practices have been identified and categorized. The results of this study show that IS-specific behaviors influence IS infusion through employees' perceptions of the usefulness and ease of use of the systems, and their improvisational behaviors. Interpreting the results of this study and comparing them to the results of other studies, this study supports the perspective that the occurrence of IS-specific OCBs that lead to positive outcomes is not dependent upon the type and complexity of the tasks or the extent of time and effort IS professionals spend. Instead, IS-specific OCBs are outcomes of the behavioral and cognitive processes which occur when users observe discretionary behaviors derived from interactions between IS professionals and their non-IS peers and decide to immerse themselves in these interactions in attempt to overcome obstacles and carry out their work. Furthermore, the advantages and constraints of this study are discussed and issues for future research are highlighted.

Appendix A

Table 10 Details about comprehensive subscriber services system

System name	Comprehensive Subscriber Services System	
System role description	Collecting, analyzing, retaining, synchronizing, modifying data of selling electricity Enrolling subscribers, arranging agreements, and installing the electrical supply. Calculating subscribers' electricity bills (subscribers are categorized into five types: residential, commercial, industrial, agricultural, and general). Issuing electricity bills for 6,000,000 subscribers Arranging financial reports of consumptions and controlling reports on the last situations of the supplied electricity and electricity debts Generating statistical reports on subscribers electricity consumption by different types of subscribers After-sales services (changing general information of subscribers, issuing bills Generating analytical reports on: kilowatt hours (KwH) of energy consumption, the percentage of electrical bills paid with online banking and mobile banking or the percentage of bills paid at bank branches, electricity demand, selling electricity or subscribers' information based on electricity suspension	
User type	Routine users	Infusers
Role description	For example, Selling electricity, after-sales services	For example, Comprehensive statistical-analytical reports on bulk data, with a web-based system

Appendix B

Table 11 Items and loadings

Constructs	Items		Factor loadings	Reliability (alpha) α
OCB (Podsakoff et al. 1997)	Helping behavior	IS professionals …		0.94
		…help employees out if they fall behind in their work.	0.78	
		…willingly share their expertise with other employees from other departments.	0.77	
		…try to act like peacemakers when other employees have disagreements.	0.77	
		…take steps to try to prevent problems with employees.	0.81	
		…willingly give of their time to help employees who have work-related problems.	0.70	
		…touch base with employees before initiating actions that might affect them.	0.74	
		…encourage employees when they are down.	0.75	
	Civic virtue	…provide constructive suggestions about how employees can improve their effectiveness.	0.76	
		…are willing to risk disapproval to express their beliefs about what's best for the organization.	0.76	
		…attend and actively participate in team meetings.	0.73	
	Sportsmanship	…always focus on what is wrong with our situation, rather than the positive side.	0.75	
		…consume a lot of time complaining about trivial matters.	0.74	
		…always find fault with what employees are doing.	0.63	
Perceived Usefulness Venkatesh and Davis (2000)	Using the system improves my performance in my job.		0.81	0.89
	Using the system in my job increases my productivity		0.86	
	Using the system enhances my effectiveness in my job.		0.81	
	I find the system to be useful in my job.		0.82	
	("system" here refers to the Comprehensive Subscriber Services System)			
Perceived Ease of Use (Venkatesh and Davis 2000)	My interaction with the system is clear and understandable.		0.80	0.90
	Interacting with the system does not require a lot of my mental effort.		0.83	
	I find the system to be easy to use.		0.81	

Table 11 (continued)

Constructs	Items	Factor loadings	Reliability (alpha) α
	I find it easy to get the system to do what I want it to do.	0.86	
	("system" here refers to the Comprehensive Subscriber Services System)		
Improvisation (Hmieleski and Corbett 2006)	I…		0.93
	improvise solutions to problems	0.77	
	learn quickly	0.75	
	identify ways in which resources can be recombined to produce novel products	0.68	
	Take any opportunity if possible	0.78	
	think outside-of-the-box	0.75	
	take risks in terms of producing new ideas in completing projects	0.71	
	identify opportunities for new services/products	0.72	
	think well on my feet	0.73	
	act spontaneously	0.73	
	find new uses for existing methods or equipment	0.70	
	am creative when required to work with limited resources	0.74	
	deviate from plans in order to take advantage of opportunities in the moment	0.76	
Infusion (Jones et al. 2002)	I make the best use of particular functions of the Comprehensive Subscriber Services System (e.g., generating analytical reports on electricity demand, selling electricity or subscribers information by electricity suspension) to support my tasks.	0.90	0.91
	Use of the Comprehensive Subscriber Services System has been integrated and incorporated at its fullest potential to perform my tasks.	0.87	
	I use all the capabilities of the Comprehensive Subscriber Services System in the best fashion to complete my tasks or to help me on the job.	0.93	
	I doubt that there are any better ways for me to use the Comprehensive Subscriber Services System to support my work.	0.69	

Appendix C

Table 12 Demographic characteristics of online and offline survey respondents

Sample Demographics	Online Responses		Pen-and-paper Responses	
Gender	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Male	36	60.0	80	47.9
Female	24	40.0	87	52.1
Total	*60*	*100*	*167*	*100*
Age	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Between 20 to 30 years old	8	13.3	16	9.5
Between 30 to 40 years old	40	66.6	120	71.9
Between 40 to 50 years old	9	15.0	29	17.4
More than 50 years old	3	5.0	2	1.2
Total	*60*	*100*	*167*	*100*
Organizational Tenure	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Between 2 and 5 years	35	58.3	87	52.1
Between 5 and 10 years	18	30.0	51	30.5
More Than 10 Years	7	11.6	29	17.4
Total	*60*	*100*	*167*	*100*

Appendix D

Table 13 Recommended cut-offs of goodness-of-fit indexes

Goodness-of-fit Indexes	Recommended Cut-offs	
	Reasonable Fit	Perfect fit
Chi-Square/degrees of freedom	$1 \leq \chi^2/df \leq 3$	$1 \leq \chi^2/df \leq 2$
Standardized Root Mean Square Residual (SRMR)	$0 < SRMR < 0.1$	$SRMR \leq 0.08$
Incremental Fit Index (IFI)	$IFI \geq 0.9$	$IFI \geq 0.95$
Non-Normed Fit Index (NNFI) or Tucker-Lewis Index (TLI)	$TLI \geq 0.9$	$TLI \geq 0.95$
Comparative Fit Index (CFI)	$CFI \geq 0.9$	$CFI \geq 0.95$
Root Mean Square Error of Approximation (RMSEA)	$RMSEA \leq 0.08$ or $RMSEA \leq 0.06$	$RMSEA \leq 0.05$

Fit indexes

Maruyama (1998) categorized different fit indexes into the main three types: absolute, relative and adjusted indexes. The absolute fit indexes indicate the degree to which an estimated model closely fits the sample data. Some of the commonly used absolute fit indexes include root mean squared error of approximation (RMSEA), the goodness-of-fit Index (GFI), and the root mean square residual (RMR).

RMSEA is the most popular fit index and has been reported a number of times by researchers (Kenny et al. 2015). Research on RMSEA cut-off points has distinguished between different values that are indicators of how closely models with estimated parameters fit the population's covariance matrix (Byrne 2006). Hu and Bentler (1999) recommended that good-fitting models should yield RMSEA values of less than 0.06, while MacCallum et al. (1996) categorized fit quality based on three cut-off points of 0.01, 0.05, and 0.08, indicating excellent, good, and mediocre fit, respectively. A stricter threshold suggested by (Browne and Cudeck 1992) was that RMSEA values of about 0.05 or less are indicative of a close model fit and RMSEA values of about 0.08 or less indicate reasonable error of approximation. They also do not recommend an RMSEA value of greater than 0.1.

The goodness-of-fit index (GFI) ranges from 0 to 1, where 1 indicates a close or perfect fit. Chau (1997) recommended that good-fitting models yield GFI values of at least 0.90 or greater than 0.90, while other researchers have suggested GFI values ranging from 0.80 to 0.89 as demonstrating reasonable fitting models (Lai and Li 2005; Tarafdar et al. 2007). The root mean square residual (RMR) is the third fit index and should be small for good-fitting models (Tabachnick and Fidell 2001). RMR values less than 0.1 should indicate good-fitting models (Chau 1997). As it may sometimes be difficult to interpret an unstandardized residual since the scales of the variables affect the size of the residual, a standardized root mean square residual (SRMR) can be used (Tabachnick and Fidell 2001). The SRMR has a value of 0 to 0.1, where lower values are preferred. Hu and Bentler (1999) mention that values of about 0.08 or even less are desired.

Relative fit indexes, known as comparative fit indices, include the normed fit index (NFI), the non-normed fit index (NNFI) (or the Tucker Lewis Index (TLI)), the incremental fit index (IFI), and the comparative fit index (CFI) (Maruyama 1998). Generally, the recommended range for all relative fit indices for good-fitting models is between 0.90 and 1 (Chau 1997; Hair et al. 1998; Tabachnick and Fidell 2001). In addition, rules of thumb for good-fitting models are that cut-off values for CFI and TLI should be close to 0.95 or even higher (Hu and Bentler 1999). Adjusted indexes, known as parsimonious fit indexes and labelled as adjusted goodness-of-fit index (AGFI), can be adjusted for the number of parameters estimated in a model. The most common recommended AGFI ranges for good-fitting models are greater than 0.80 (Chau 1997; Segars and Grover 1993).

In terms of which fit indices should be reported, researchers have argued that it would be better to select fit indices from different categories, and they have thus suggested a variety of optional/categorical fit indexes. The recommended cut-offs for reasonable and good-fitting models are listed in Appendix Table 12. McDonald and Ho (2002) recommend that the most common fit indexes are the CFI, GFI, NFI, and the TLI. Hu and Bentler (1999) suggested a two-index presentation, always including SRMR with TLI, RMSEA, and the CFI. Kline (2015) strongly believes in reporting the Chi-Square test, RMSEA, CFI, and the SRMR.

Our research reports χ^2/df, SRMR, IFI, NNFI (TLI), CFI, and RMSEA. It is important to note that the chi-square value is sensitive to the sample size and number of variables. Studies with large sample sizes rarely report a nonsignificant chi-

square value, which would indicate a perfect fit, while conversely, significant chi-square values indicate a poor fitting model) (Tabachnick and Fidell 2001). Therefore, this study uses χ^2/df, where the χ^2/df values of good-fitting models ranges between 1 and 3 (Kline 2015) or 1 and 2 (Tabachnick and Fidell 2001). SRMR is the index that is the most sensitive to models with misspecified factor covariance(s) or latent structure(s) (Hu and Bentler 1999). IFI and NNFI (TLI) are chosen because they are relatively unaffected by sample size, which is useful since some fit indices are high merely because of the large sample sizes (Gerbing and Anderson 1992; Hu and Bentler 1999). In addition, NNFI (TLI) is not affected by the number of parameters of the model. Finally, CFI and RMSEA are the most frequently reported fit indices (Tabachnick and Fidell 2001). RMSEA is the index that is the most sensitive to models with misspecified factor loadings and varies with the number of variables (Kenny and McCoach 2003).

References

Adam, F., & O'Doherty, P. (2003). *ERP projects: Good or bad for SMEs*. Cambridge: Cambridge University Press.

Ahuja, M. K., McKnight, D. H., Chudoba, K. M., George, J. F., & Kacmar, C. J. (2007). IT road warriors: Balancing work-family conflict, job autonomy, and work overload to mitigate turnover intentions. *MIS Quarterly, 31*(1), 1–17.

Ahuja, M. K., & Thatcher, J. B. (2005). Moving beyond intentions and toward the theory of trying: Effects of work environment and gender on post-adoption information technology use. *MIS Quarterly, 29*(3), 427–459.

Arbuckle, J. L. (2014). *AMOS (Version 23.0) [Computer Program]*. Chicago: IBM SPSS.

Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly, 35*(4), 831–858.

Bailey, E., & Becker, J. D. (2014). A comparison of IT governance and control frameworks in cloud computing. *Paper presented at the 20th Americas Conference on Information Systems* (AMCIS), America.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1986). *Social* foundations *of* thought *and action: A social cognitive* theory. Prentice-Hall, Inc.

Bandura, A. (1988). Organizational applications of social cognitive theory. *Australian Journal of Management, 13*(2), 275–302.

Bandura, A. (2000). Social cognitive theory of mass communication. *Media Psychology, 3*(3), 265–299.

Bassellier Reich, B. H., & Benbasat, I. (2001). Information technology competence of business managers: A definition and research model. *Journal of Management Information Systems, 17*(4), 159–182.

Bassellier, G., & Benbasat, I. (2004). Business competence of information technology professionals: Conceptual development and influence on IT-business partnerships. *MIS Quarterly, 28*(4), 673–694.

Beaudry, A., & Pinsonneault, A. (2010). The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly, 34*(4), 689–710.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *MIS Quarterly, 28*(2), 229–254.

Brief, A. P., & Motowidlo, S. J. (1986). Prosocial organizational behaviors. *Academy of Management Review, 11*(4), 710–725.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research, 21*(2), 230–258.

Bryant, S. E., Moshavi, D., & Nguyen, T. V. (2007). A field study on organizational commitment, professional commitment and peer mentoring. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems, 38*(2), 61–74.

Burton-Jones, A. (2014). What have we learned from the smart machine? *Information and Organization, 24*(2), 71–105.

Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts applications and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

Carter, M. Z., Armenakis, A. A., Feild, H. S., & Mossholder, K. W. (2013). Transformational leadership, relationship quality, and employee performance during continuous incremental organizational change. *Journal of Organizational Behavior, 34*(7), 942–958.

Chau, P. Y. K. (1997). Reexamining a model for evaluating information center success using a structural equation modeling approach. *Decision Sciences, 28*(2), 309–334.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*(2), 233–255.

Chin, W. W., (1998). The partial least squares approach to structural equation modeling. Modern Methods for Business Research (295(2), 295–336.

Ciborra, C. U. (1996). The platform organization: recombining strategies, structures, and surprises. *Organization Science, 7*(2), 103–118.

Ciborra, C. U. (1999). Notes on improvisation and time in organizations. *Accounting, Management and Information Technologies, 9*(2), 77–94.

Compeau, D. R., & Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research, 6*(2), 118–143.

Constant, D., Kiesler, S., & Sproull, L. (1994). What's mine is ours, or is it? A study of attitudes about information sharing. *Information Systems Research, 5*(4), 400–421.

Constant, D., Sproull, L., & Kiesler, S. (1996). The kindness of strangers: The usefulness of electronic weak ties for technical advice. *Organization Science, 7*(2), 119–135.

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research: A technological diffusion approach. *Management Science, 36*(2), 123–139.

Crossan, M., Cunha, M. P. E., Vera, D., & Cunha, J. (2005). Time and organizational improvisation. *Academy of Management Review, 30*(1), 129–145.

Curtis, B., Krasner, H., & Iscoe, N. (1988). A field study of the software design process for large systems. *Communications of the ACM, 31*(11), 1268–1287.

Deng, X., & Wang, T. (2014). Understanding post-implementation support for enterprise systems: An empirical study of IT personnel's customer-oriented citizenship behaviors. *Journal of Information Systems, 28*(2), 17–39.

Deng, X. N., Wang, T., & Galliers, R. D. (2015). More than providing 'solutions': Towards an understanding of customer-oriented citizenship behaviours of IS professionals. *Information Systems Journal, 25*(5), 489–530.

Elbanna, A. R. (2006). The validity of the improvisation argument in the implementation of rigid technology: The case of ERP systems. *Journal of Information Technology, 21*(3), 165–175.

Eli, J., Suresh, S., & Wynne, C. (2002). Factors leading to sales force automation use: A longitudinal analysis. *The Journal of Personal Selling & Sales Management, 22*(3), 145–156.

Ewusi-Mensah, K. (1997). Critical issues in abandoned information systems development projects. *Communications of ACM, 40*(9), 74–80.

Fornell, C., & Larcker, D. F. (1980). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

Gerbing, D. W., & Anderson, J. C. (1992). Monte Carlo evaluations of goodness-of-fit indices for structural equation models. *Sociological Methods & Research, 21*(2), 132–160.

Ghosh, B. (2011). Teaching tip GlobePort faces global business challenges-assessing the organizational side of information systems projects. *Journal of Information Systems Education, 22*(2), 87–94.

Gopalakrishna-Remani, V., Jones, R. P., & Camp, K. M. (2018). Levels of EMR adoption in US hospitals: An empirical examination of absorptive capacity, institutional pressures, top management beliefs, and participation. *Information Systems Frontiers*, 1–20.

Gray, P. H., & Durcikova, A. (2006). The role of knowledge repositories in technical support environments: Speed versus learning in user performance. *Journal of Management Information Systems, 22*(3), 159–190.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis.* Upper Saddle River.

Higgins, E. T., & Bargh, J. A. (1987). Social cognition and social perception. *Annual Review of Psychology, 38*(1), 369–425.

Hmieleski, K. M., & Corbett, A. C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. *Journal of Small Business Management, 44*(1), 45–63.

Hoffman, B. J., Blair, C. A., Meriac, J. P., & Woehr, D. J. (2007). Expanding the criterion domain? A quantitative review of the OCB literature. *Journal of Applied Psychology, 92*(2), 555–566.

Hsieh, J. J. P.-A., Rai, A., Petter, S., & Zhang, T. (2012). Impact of user satisfaction with mandated CRM use on employee service quality. *MIS Quarterly, 36*(4), 1065–1080.

Hsieh, J. J. P.-A., & Wang, W. (2007). Explaining employees' extended use of complex information systems. *European Journal of Information Systems, 16*(3), 216–227.

Hsu, J. S.-C., Shih, S.-P., Hung, Y. W., & Lowry, P. B. (2015). The role of extra-role behaviors and social controls in information security policy effectiveness. *Information Systems Research, 26*(2), 282–300.

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55.

Jasperson, J., Carter, P. E., & Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly, 29*(3), 525–557.

Jin, X.-L., Lee, M. K., & Cheung, C. M. (2010). Predicting continuance in online communities: Model development and empirical test. *Behaviour & Information Technology, 29*(4), 383–394.

Jones, E., Sundaram, S., & Chin, W. (2002). Factors leading to sales force automation use: A longitudinal analysis. *Journal of Personal Selling and Sales Management, 22*(3), 145–156.

Joseph, D., Ang, S., Chang, R., & Slaughter, S. (2010). Practical intelligence in IT: Assessing soft skills of IT professionals. *Communications of the ACM, 53*(2), 149–154.

Kamoche, K., & Cunha, M. P. E. (2001). Minimal structures: From jazz improvisation to product innovation. *Organization Studies, 22*(5), 733–764.

Keil, M., Lee, H. K., & Deng, T. (2013). Understanding the most critical skills for managing IT projects: A delphi study of IT project managers. *Information Management, 50*(7), 398–414.

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research, 44*(3), 486–507.

Kenny, D. A., & McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 10*(3), 333–351.

Kettinger, W. J., Zhang, C., & Chang, K.-C. (2013). Research note - the view from the top: Integrated information delivery and effective information use from the senior executive's perspective. *Information Systems Research, 24*(3), 842–860.

Kim, J. U., & Kishore, R. (2018). Do we fully understand information systems failure? An exploratory study of the cognitive Schema of IS professionals. *Information Systems Frontiers*, 1–35.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. New York: The Guilford Press.

Ko, D.-G., Kirsch, L. J., & King, W. R. (2005). Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *MIS Quarterly, 29*(1), 59–85.

Lai, V. S., & Li, H. (2005). Technology acceptance model for internet banking: An invariance analysis. *Information Management, 42*(2), 373–386.

Lamb, R., & Kling, R. (2003). Reconceptualizing users as social actors in information systems research. *MIS Quarterly, 27*(2), 197–236.

Lee, G., & Lee, W. J. (2010). Altruistic traits and organizational conditions in helping online. *Computers in Human Behavior, 26*(6), 1574–1580.

LePine, J. A., Erez, A., & Johnson, D. E. (2002). The nature and dimensionality of organizational citizenship behavior: A critical review and meta-analysis. *Journal of Applied Psychology, 87*(1), 52–65.

Li, X., Hsieh, J. J. P.-a., & Rai, A. (2013). Motivational differences across post-acceptance information system usage behaviors: An investigation in the business intelligence systems context. *Information Systems Research, 24*(3), 659–682.

Little, T. D. (1997). Mean and covariance structures (macs), analyses of cross-cultural data: Practical and theoretical issues. *Multivariate Behavioral Research, 32*(1), 53–76.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*(2), 130–149.

Magni, M., Proserpio, L., Hoegl, M., & Provera, B. (2009a). The role of team behavioral integration and cohesion in shaping individual improvisation. *Research Policy, 38*(6), 1044–1053.

Magni, M., Provera, B., & Proserpio, L. (2009b). Individual improvisation in information systems development. In *Handbook of research on modern systems analysis and design technologies and applications*. USA: IGI Global.

Magni, M., Provera, B., & Proserpio, L. (2010). Individual attitude toward improvisation in information systems development. *Behaviour & Information Technology, 29*(3), 245–255.

Maruyama, G. M. (1998). *Basics of* Structural Equation Modeling Thousand Oaks, Calif: Sage Publications.

Massa, S., & Testa, S. (2005). Data warehouse-in-practice: Exploring the function of expectations in organizational outcomes. *Information Management, 42*(5), 709–718.

McDonald, R. P., & Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychological Methods, 7*(1), 64–82.

Mendonca, D., & Fiedrich, F. (2006). Training for improvisation in emergency management: Opportunities and limits for information technology. *International Journal of Emergency Management, 3*(4), 348–363.

Mendonca, D. J., & Wallace, W. A. (2007). A cognitive model of improvisation in emergency management. *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, 37*(4), 547–561.

Messersmith, J. (2007). Managing work-life conflict among information technology workers. *Human Resource Management, 46*(3), 429–451.

Miner, A. S., Bassof, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. *Administrative Science Quarterly, 46*(2), 304–337.

Moorman, C., & Miner, A. S. (1998). Organizational improvisation and organizational memory. *Academy of Management Review, 23*(4), 698–723.

Nelson, K. M., & Cooprider, J. G. (1996). The contribution of shared knowledge to IS group performance. *MIS Quarterly, 20*(4), 409–432.

Nisula, A.-M., & Kianto, A. (2016). The role of knowledge management practices in supporting employee capacity for improvisation. *International Journal of Human Resource Management, 27*(17), 1920–1937.

Nunnally, J. C., & Bernstein, I. R. (1994). *Psychometric theory*. New York: McGraw-Hill.

O'Connor, Y., & O'Reilly, P. (2016). Examining the infusion of mobile technology by healthcare practitioners in a hospital setting. *Information Systems Frontiers*, 1–21.

Organ, D. W. (1988). *Organizational citizenship behavior: The good soldier syndrome*. Lexington, MA: Lexington.

Orlikowski, W., & Hoffman, D. (1997). An improvisational model for change management: The case of groupware technologies. In T. Malone & R. Laubacher (Eds.), *Inventing the organizations of the 21st century* (pp. 265–282). Boston, MA: MIT.

Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. *Information Systems Research, 7*(1), 63–92.

Orlikowski, W. J. (2000). Using technology and constituting structures: A practice lens for studying technology in organizations. *Organization Science, 11*(4), 404–428.

Pawlowski, S. D., & Robey, D. (2004). Bridging user organizations: Knowledge brokering and the work of information technology professionals. *MIS Quarterly, 28*(4), 645–672.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*(3), 236–263.

Petter, S., & McLean, E. R. (2009). A meta-analytic assessment of the DeLone and McLean IS success model: An examination of IS success at the individual level. *Information Management, 46*(3), 159–166.

Podsakoff MacKenzie, S. B., Paine, J. B., & Bachrach, D. G. (2000). Organizational citizenship behaviors: A critical review of the theoretical and empirical literature and suggestions for future research. *Journal of Management, 26*(3), 513–563.

Podsakoff, M., & MacKenzie, B. (1997). Impact of organizational citizenship behavior on organizational performance: A review and suggestion for future research. *Human Performance, 10*(2), 133–151.

Podsakoff, N. P., Whiting, S. W., Podsakoff, P. M., & Blume, B. D. (2009). Individual- and organizational-level consequences of organizational citizenship behaviors: a meta-analysis. *Journal of Applied Psychology, 94*(1), 122–141.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12*(4), 531–544.

Rafaeli, A., Ziklik, L., & Doucet, L. (2008). The impact of call center employees' customer orientation behaviors on service quality. *Journal of Service Research, 10*(3), 239–255.

Rahrovani, Y., Addas, S., & Pinsonneault, A. (2015). Exploring the long shadow of IT innovation adoption decisions on IT value. *Systèmes d'information & Management, 19*(4), 31–87.

Reich, B. H., & Benbasat, I. (1996). Measuring the linkage between business and information technology objectives. *MIS Quarterly, 20*(1), 55–81.

Reich, B. H., & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly, 24*(1), 81–113.

Rice, R. E., Collins-Jarvis, L., & Zydney-Walker, S. (1999). Individual and structural influences on information technology helping relationships. *Journal of Applied Communication Research, 27*(4), 285–309.

Rivers, L. M., & Dart, J. (1999). Sales technology applications: The acquisition and use of sales force automation by mid-sized manufacturers. *Journal of Personal Selling & Sales Management, 19*(2), 59–73.

Roberts, T. L., Cheney, P. H., Sweeney, P. D., & Hightower, R. T. (2004). The effects of information technology project complexity on group interaction. *Journal of Management Information Systems, 21*(3), 223–247.

Ross, J. W., Beath, C. M., & Goodhue, D. L. (1996). Develop long-term competitiveness through IT assets. *Sloan Management Review, 38*(1), 31–42.

Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. *Information Management, 45*(6), 376–386.

Saga, V. L., & Zmud, R. W. (1994). The nature and determinants of IT acceptance, routinization, and infusion. *Proceedings of the IFIP TC8 Working Conference on Diffusion, Transfer and Implementation of Information* Technology 1994 (pp. 67–86). Elsevier Science, Inc.

Santhanam, R., Seligman, L., & Kang, D. (2007). Post implementation knowledge transfers to users and information technology professionals. *Journal of Management Information Systems, 24*(1), 171–199.

Sawyer, S., Eschenfelder, K., Diekema, A., & McClure, C. (1998). IT Skills in the Context of BigCo. *Proceedings of the 1998 ACM SIGCPR Conference on Computer Personnel Research,* pp. 9-18. Boston, Massachusetts, USA.

Segars, A. H., & Grover, V. (1993). Re-examining perceived ease of use and usefulness: A confirmatory factor analysis. *MIS Quarterly, 17*(4), 517–525.

Skulmoski, G. J., & Hartman, F. T. (2010). Information systems project manager soft competencies: A project-phase investigation. *Project Management Journal, 41*(1), 61–80.

Sultan, N. (2010). Cloud computing for education: a new dawn? *International Journal of Information Management, 30*(2), 109–116.

Sundaram, S., Schwarz, A., Jones, E., & Chin, W. W. (2007). Technology use on the front line: How information technology enhances individual performance. *Journal of the Academy of Marketing Science, 35*(1), 101–112.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Harlow: Pearson Education Limited.

Tarafdar, M., & Gordon, S. R. (2007). Understanding the influence of information systems competencies on process innovation: A resource-based view. *Journal of Strategic Information Systems, 16*(4), 353–392.

Tarafdar, M., Qiang, T. U., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems, 24*(1), 301–328.

Tsai, H.-Y., Compeau, D., & Haggerty, N. (2007). Of races to run and battles to be won: Technical skill updating, stress, and coping of IT professionals. *Human Resource Management, 46*(3), 395–409.

Urbach, N., Smolnik, S., & Riempp, G. (2009). The state of research on information systems success – A review of existing multidimensional approaches. *Business & Information Systems Engineering, 1*(4), 315–325.

Van Dyne, L., & Cummings, L. (1990). Extra-Role Behaviors: The need for construct and definitional clarity. *Paper presented at 50th Annual Meeting of the* Academy of Management, San Francisco, CA.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273–315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186–204.

Venkatesh, V., Morris, M. G., Davis, F. D., & Davis, G. B. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478.

Venkatesh, V., Thong, J. Y. L., Chan, F. K. Y., Hu, P. J. H., & Brown, S. A. (2011). Extending the two-stage information systems continuance model: Incorporating UTAUT predictors and the role of context. *Information Systems Journal, 21*(6), 527–555.

Vera, D., & Crossan, M. (2004). Theatrical improvisation: lessons for organizations. *Organization Studies, 25*(5), 727–749.

Walz, D., Elam, J., & Curtis, B. (1993). Inside a software design team: knowledge acquisition, sharing, and integration. *Communications of the ACM, 36*(10), 63–77.

Webster, J. R., & Beehr, T. A. (2013). Antecedents and outcomes of employee perceptions of intra-organizational mobility channels. *Journal of Organizational Behavior, 34*(7), 919–941.

Widaman, K. F. (1985). Hierarchically nested covariance structure models for multitrait-multimethod data. *Applied Psychological Measurement, 9*(1), 1–26.

Williams, L. J., Cote, J. A., & Buckley, M. R. (1989). Lack of method variance in self-reported affect and perceptions at work: Reality or artifact? *Journal of Applied Psychology, 74*(3), 462–468.

Yen, H. R., Hu, P. J.-H., Hsu, S. H.-Y., & Li, E. Y. (2015). A multilevel approach to examine employees' loyal use of ERP systems in organizations. Journal of Management Information Systems, 32(4), 144–178.

Yen, H. R., Li, E. Y., & Niehoff, B. P. (2008). Do organizational citizenship behaviors lead to information system success? *Information Management, 45*(6), 394–402.

Zuboff, S. (1988). *In the age of the smart machine: The future of work and power*. New York: Basic Books.

Hadi Karimikia received his PhD in Business Information Systems from the Auckland University of Technology in 2017. His research focuses on the role of IT professionals in enhancing the effectiveness of IT departments, smart cities, the negative effects of ICT use, and multi-level methods. His research has appeared in the proceedings of the Hawaii International Conference on Systems Sciences, the Australasian Conference on Information Systems, and the ACM SIGMIS Conference on Computers and People Research.

Narges Safari is studying for a PhD in Business Information Systems at the Auckland University of Technology. Her research interests are Creativity in Software Development, IS Use in Business and IT Innovation. She has presented her work at various information systems conferences, and participated in the 2017 ICIS Doctoral Consortium.

Harminder Singh (Ph.D., Michigan State) is a senior lecturer in the Faculty of Business, Economics and Law at the Auckland University of Technology, where he teaches courses in information systems startegy, governance, and analytics. Harminder's research examines the governance of IT-enabled work environments, especially from an ethical perspective. His research has been published in Information & Management, the Journl of Information Technology, the Journal of Computer Information Systems, and elsewhere.