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INFORMATION SYSTEMS RESEARCH
Articles in Advance, pp. 1–16
ISSN 1047-7047 (print), ISSN 1526-5536 (online)

User Competence with Enterprise Systems: The Effects of Work Environment Factors

Weiling Ke,[a] Lele Kang,[b,*] Chuan-Hoo Tan,[c] Chih-Hung Peng[d]

[a] Department of Information Systems and Management Engineering, Southern University of Science and Technology, Shenzhen 518055, China; [b] School of Information Management, Nanjing University, Nanjing 210023, China; [c] Department of Information Systems and Analytics, School of Computing, National University of Singapore, Singapore 117417; [d] Department of Management Information Systems, National Chengchi University, Taipei 116011, Taiwan, Republic of China

*Corresponding author

Contact: kewl@SUSTech.edu.cn, https://orcid.org/0000-0002-1645-0634 (WK); lelekang@nju.edu.cn, https://orcid.org/0000-0002-5939-6025 (LK); chtan@comp.nus.edu.sg, https://orcid.org/0000-0003-4031-6010 (C-HT); chpeng@nccu.edu.tw, https://orcid.org/0000-0002-7101-7999 (C-HP)

Received: February 24, 2017
Revised: May 31, 2018; March 15, 2019; November 1, 2019; August 4, 2020; September 26, 2020
Accepted: October 10, 2020
Published Online in Articles in Advance: February 10, 2021

https://doi.org/10.1287/isre.2020.0989

Abstract. An enterprise system (ES) is an organization-wide information technology system that embeds organizational policies and rules guiding operations. ES users need to not only gain proficiency in interacting with the system but also develop competence to obtain faithful representations of business processes from the system and act upon such information effectively. Thus, the extent to which an organization can extract value from ES depends on an employee's potential to use the ES to its fullest extent to accomplish job tasks, that is, user competence. Anchoring our study to the job demands-resources model, we examine how work contextual factors, namely, the job demands (i.e., work overload) and three job resources (i.e., leader–member exchange (LMX), traditional support structures, and peer support structures), can facilitate the development of user competence. Based on a longitudinal survey from users in six organizations that have implemented the same ES, we gained two insights. First, we found that all three job resource factors have positive relationships with user competence. Second, the results revealed that the relationship between work overload and user competence is moderated by LMX but not the support structures. Overall, this research contributes to the extant understanding of organizational information systems by moving from a use-focused model to a competence-development model and providing insights on work contextual factors that can foster competence in using the ES.

History: Yulin Fang, Senior Editor; Likoebe Maruping, Associate Editor.
Supplemental Material: The online appendix is available at https://doi.org/10.1287/isre.2020.0989.

Keywords: enterprise systems • job demands-resources model • user competence

1. Introduction

An enterprise system (ES) is a major organizational investment that digitally embeds organizational policies and rules guiding operations into a technological system, leading business processes to be intertwined with the system (Sykes et al. 2014). Unfortunately, many such investments have reportedly failed to deliver the purported benefits of enhanced performance (Jasperson et al. 2005). An often-cited reason is the complexity of ES usage (Gattiker and Goodhue 2005). Specifically, users are required to not only gain proficiency in interacting with the system but also be able to obtain faithful representations of the business processes from the system and take informed action based on these representations (Burton-Jones and Grange 2013). For example, because of this intertwined process–system, ES users often need to coordinate and collaborate with other users within a functional unit and across units in the organization to accomplish job tasks (Gattiker and Goodhue 2005, Liang et al. 2015). Thus, to realize the value of ES, the employees need to gain competence, which refers to an individual's "potential to apply technology to its fullest possible extent so as to maximize performance of specific job tasks" (Marcolin et al. 2000, p. 38).

The extant ES literature presents a scant understanding of user competence. The bulk of related individual-level studies have conventionally focused on employees' system use, with findings highlighting the general underutilization (Jasperson et al. 2005, Hsieh and Wang 2007, Hsieh et al. 2011), inadequate faithful appropriation (Liang et al. 2013, Bala and Venkatesh 2016), and importance of idiosyncratic applications of ES (Nambisan et al. 1999, Hsieh et al. 2011, Ke et al. 2012, Li et al. 2013, Maruping and Magni 2015). We extend this stream of studies with insights into how to overcome the challenge imposed by the ES that requires users to acquire, assimilate, and exchange business- and technology-related knowledge in communities of practice (Brown and Duguid 1991, Robey et al. 2002). We do so by anchoring our work to the view that the development of user competence to effectively use a complex system is socially constructed (Robey et al. 2002, Lewis et al. 2003, Burton-Jones and Grange 2013).

We apply the job demands-resources (JD-R) model as the theoretical framework and draw on the ES literature for contextual understanding. The JD-R model is a suitable lens for theorizing on how to promote ES user competence for three reasons. First, the JD-R model emphasizes that to understand employees' well-being and effective organizational functioning, it is important to recognize the forces that hinder and support them (Bakker and Demerouti 2017). Accordingly, it considers both forces in the form of demands that impede employees from effectively conducting their job tasks and resources that support employees in effectively executing their work. Second, the JD-R model guides our theorization by explicitly recognizing the demands imposed by ES. The ES implementation significantly changes how employees carry out their work. They are required to learn how to effectively use the system and be competent in executing a new set of work activities. The drastic change and great challenge induced by ESs create demands that hamper employees' competent work execution, which typically manifests in the shakedown phase of ES implementation (Markus and Tanis 2000, Sykes and Venkatesh 2017). Third, the JD-R model suggests that resources at the workplace can facilitate employees to adapt to changes and work effectively, and thus are instrumental to employees' work execution. Besides, resources, as buffers against demands, help employees competently deal with stress factors at work (Bakker and Demerouti 2007, Crawford et al. 2010). As such, the JD-R model provides the needed guidance in identifying resources and theorizing how resources would help employees develop user competence and overcome the barriers and demands introduced by ES.

Applying the JD-R model, we proposed and empirically validated how two types of work contextual factors, namely, job demands and job resources, are directly and interactively related to user competence. Job demands refer to the factors in the workplace that require sustained physical and mental effort following ES implementation. Our research treats work overload as a demand factor that hinders users from competently executing their work with the system. Job resources are factors in the workplace that facilitate users' ability to accomplish their job tasks and capability development. We consider three forms of job resources, namely, leader–member exchange (LMX), traditional support structures, and peer support structures, which allow users to acquire both the technical and business knowledge needed for effective application of the system for work.

Based on an empirical investigation involving multilevel analysis of survey data collected from users in six organizations that have implemented the same ES, this research contributes to both the ES literature and the referenced JD-R model. In terms of contribution to the ES literature, more and more scholars increasingly believe that focusing on whether and how employees "use" a system to accomplish work is no longer the best way to think about managing ES investments (Boudreau and Seligman 2005, Burton-Jones and Grange 2013, Bala and Venkatesh 2016). Instead, one appropriate and effective way is to think of employee competence as human capital that enables organizations to realize the purported benefits of ES. This is because user competence can directly affect an organization's efficiency and effectiveness in ways that promote its critical competitiveness. By moving from a use-focused model to a competence-development model, our research provides executable insights that can help organizations resolve the fundamental problem of employee competence, a necessary condition for achieving the strategic goal of adopting an ES. With such insights, we also open a new avenue for future research to investigate how to institutionalize work environments that can promote user competence. In terms of contribution to the referenced JD-R model, we extend the model by conceiving of job demands as manifested operationally as work overload, and job resources as LMX and support structures in an ES setting. Our findings on the interaction effects between work overload and LMX provide empirical support to the notion that job resources are effective in helping employees overcome barriers imposed by job demands.

2. Theoretical Foundations

The extant ES literature has conventionally been use focused, which is constituted by two streams of inquiries, namely, (1) how to promote employee use (e.g., Liang et al. 2013, Maruping and Magni 2015, Bala and Venkatesh 2016) and (2) how system use affects employee job outcomes, such as job performance and job satisfaction (e.g., Morris and Venkatesh 2010, Bala and Venkatesh 2013, Bala and Venkatesh 2016). Research on promoting employee use of ESs has studied the effects of organizational, team, and individual factors (e.g., leadership, team empowerment, job autonomy) on usage behavior, such as routine use, exploratory or extended use, and use avoidance (e.g., Ke et al. 2012, Li et al. 2013, Liang et al. 2013, Maruping and Magni 2015, Bala and Venkatesh 2016). An implied assumption from this stream of work is that system use can enable employees and an organization to realize a system's purported benefits.

Recent studies have further elevated this understanding by proposing that it is the effective use (rather than use per se) that helps to attain the desired goals of using the system (LeRouge et al. 2007, Burton-Jones and Grange 2013). To this end, user competence—a core constituent for effective use—is the central concept. The term "competence" first appeared in the literature as a concept for performance motivation (White 1959, p. 297) and has been causally related to performance improvement (Spencer and Spencer 1993).

In the rest of this section, we first elaborate on the concept of user competence in terms of its conceptualization and operationalization in the ES context. Next, we review the JD-R model, which suggests how job demands and job resources affect effective organizational functioning. Finally, we end this section with identification of demands and resources factors in the context of ESs.

2.1. User Competence

As defined earlier, user competence refers to an individual's potential to apply a system to its fullest possible extent to achieve the greatest task performance (Marcolin et al. 2000). Prior ES research on user competence is limited; an exception is the work of Markus and Tanis (2000), who recognized that inadequate user competence is one of the largest challenges in the ES postimplementation stage, whereas a lack of capability could constrain organizations from extracting maximum benefits from a system (Ross and Vitale 2000). Even worse, it could lead to user resistance, workaround, and sabotage behaviors that could cause significant problems and errors in ES-mediated operations (Hustad and Olsen 2013, Bala and Venkatesh 2016).

Among the limited research on how to develop user competence, several studies have focused on training methods and instructional strategies (e.g., Kang and Santhanam 2003, Yi and Davis 2003). These studies have identified different coaching methods for improving users' abilities, mostly in a formal system training setting. In a typical organizational setting, users first receive formal system usage training that enables them to "employ quite narrow feature breadths, operate at low levels of feature use, and rarely initiate technology- or task-related extensions of the available features" (Jasperson et al. 2005, p. 526). Beyond exploiting step-by-step processes prescribed by the management through training, users are expected to explore how to innovatively apply the system, find novel practices enabled by the system, and rationalize business processes (Hsieh et al. 2011, Ke et al. 2012, Li et al. 2013, Liang et al. 2015). This is based on the purview that knowledge about ES primarily comes from direct experience of using the system, which triggers learning and adaptation behaviors (Robey et al. 2002, Bala and Venkatesh 2016). Essentially, developing user competence with respect to ES use needs to go beyond formal training sessions and be situated in the actual work contexts (Robey et al. 2002, Hsieh et al. 2011, Sykes 2015).

Indeed, it is through the situational use of the ES that users develop competence to obtain faithful representations of business processes from the systems, accurately interpret the representations acquired, and take informed actions in their work contexts (Burton-Jones and Grange 2013). The representations obtained, however, are fallible, and whether users can achieve representation fidelity depends on users' experience, knowledge, and interpretation of situations (Hsieh et al. 2011, Burton-Jones and Grange 2013, Kettinger et al. 2013). In other words, to effectively act upon these faithful representations, users need be equipped with the knowledge, skills, and abilities to coordinate within the functional unit and across departments to conduct interdependent value-chain activities and develop/implement business strategies (Rai et al. 2006, Kettinger et al. 2013). Hence, user competence with ES reflects the employees' ability to apply the system to accomplish their work. We rely on the work of Marcolin et. al. (2000) to develop the concept of user competence. According to the authors, user competence needs to be considered in terms of its conceptualization and operationalization as well as the contextualized domain.

User competence can be conceptualized in three different ways that are associated with learning, namely, cognitive assessment, skill-based assessment, and affective assessment (Marcolin et al. 2000). Cognitive assessments of user competence focus on an individual's knowledge of a system and its use, which is also referred to as declarative knowledge (Kraiger et al. 1993). They are often operationally assessed based on a user's system proficiency and literacy of a system (e.g., Nelson and Cheney 1987, Munro et al. 1997). Skill-based assessments reflect a user's ability to go beyond the step-by-step use of a system to develop a more fluid use of the system (Webster and Martocchio 1993, Compeau and Higgins 1995). They are often conducted to gauge a user's efficiency in interacting with a system, such as a user's ability to do data retrieval from a database (Suh and Jenkins 1992). Building upon the concept of self-efficacy as the operationalization (Bandura 1986), affective assessments evaluate a user's perception of his or her potential to apply a system to execute specific tasks (Marcolin et al. 2000).

Marcolin et al. (2000) found affective assessments of user competence differ from cognitive assessments—individuals' confidence in their ability to use the system was higher than their current knowledge of the system. Such deviation of self-efficacy from actual knowledge can be explained by the fact that learning is an ongoing process and users "can still accomplish work-related tasks using the package, perhaps learning as they go" (Marcolin et al. 2000, p. 47). This explanation is aligned with the definition of user competence with respect to users' "potential" (Marcolin et al. 2000) and accords to the situational learning in ES context. The implication is that users may not have acquired the requisite knowledge and skills to execute a specific task, but they are confident about their ability to accomplish it as they can learn from their supervisors and colleagues as they go.

It is worth noting that both the conceptualization and operationalization of user competence need to take into consideration the domain in which user competence is contextually investigated. This research examines user competence in the ES context, and it can also be assessed in a variety of knowledge domains such as specific software applications, hardware technologies, and even task areas (Marcolin et al. 2000). Consequently, as explained earlier, ES users need to develop a holistic view of business processes embedded in the system and to recognize the interdependence between their job tasks and those of coworkers. For the former, employees need to acquire system-related knowledge and develop skills to interact with a system so that they can provide inputs, retrieve data, process data, and generate accurate reports to accomplish their job tasks (Burton-Jones and Grange 2013). For the latter, employees need to obtain business-related knowledge because the extensive integration of business processes and access to centralized real-time data across business environments create the interdependence of task-related inputs and outputs that users need to steer (Gattiker and Goodhue 2005, Liang et al. 2015). Therefore, users need to be equipped with both business- and system-related knowledge to be competent in obtaining faithful representations of business processes from the system and taking informed actions based on these representations (Gallivan et al. 2005, Burton-Jones and Grange 2013). As such, user competence with an ES goes beyond the users' understanding of the system and their skills to efficiently interact with the system. Through working with peers and leaders, employees obtain support and learn how to use the system to its possible fullest extent. To this end, the affective assessment (notably self-efficacy) provides a broader, more fitting conceptualization of user competence with an ES.

Previous studies have measured user competence with different methods, including self-reports, hands-on tests, paper-and-pencil tests, and observer assessments (Munro et al. 1997, Marcolin et al. 2000). Although these methods can be applied to measuring different types of conceptualization of user competence, self-reports are commonly used to measure affective assessments because only individuals can report on how they feel. In particular, prior research has used a self-report measure of self-efficacy to assess the extent to which a user perceives his or her ability, in the form of confidence, to apply a system to accomplish a job task (e.g., Nelson and Cheney 1987, Nelson 1991, Harrison and Rainer 1992, Rainer and Harrison 1993). In their experiment, Marcolin et al. (2000) found that self-report measures produced significantly higher estimates of competence than test measures. Although Marcolin et al. (2000, p.48) recognize that these measures are "not wrong, just different," they suggest that self-report measures could more accurately capture users' ability if the task is more broadly focused. In the view that employees apply ESs to perform a range of complex tasks, we use self-reports to measure user competence.

2.2. The JD-R Model

The JD-R model is a leading theoretical framework that is often applied to study job outcomes in general and effective organizational functioning in particular (Demerouti et al. 2001). The JD-R model suggests that there are two groups of factors in the work context that have a direct bearing on employees' performance, that is, job demands and job resources (Crawford et al. 2010).

Job demands are "those physical, social, or organizational aspects of the job that require sustained physical or mental effort" (Demerouti et al. 2001, p. 501), such as administrative hassles, emotional conflicts, role ambiguity, and work overload (Demerouti et al. 2001). The JD-R model posits that job demands require an employee to increase sustained effort to accomplish work tasks and therefore deplete employees' energy (Schaufeli and Bakker 2004, Halbesleben and Bowler 2007). In the context of ESs, work overload is the most acute problem in the workplace after ES implementation. Because of ES complexity, organization-wide changes, and misfit between deep structures of tasks and systems, users need to exert intensive sustained effort to acquire the knowledge, skills, and other attributes to apply such systems (Burton-Jones and Grange 2013, Bala and Venkatesh 2016). Even worse, employees may have to learn and perform simultaneously, unlearn obsolete business procedures, correct mistakes, and go back and forth between new and old systems and business processes (Bala and Venkatesh 2013). Such an effort demands time and energy as well as requisite job skills (Robey et al. 2002). Unfortunately, work overload prevails after ES implementation and is regarded as a critical factor causing ES failure (Ahuja and Thatcher 2005). Hence, the current research treats work overload as a demand factor and examines how the work overload hinders the development of user competence with ESs.

Job resources refer to those aspects of a job that facilitate work goal achievement and stimulate personal growth and development (Demerouti et al. 2001). Examples of job resources include social support and performance feedback. JD-R model suggests that job resources activate a motivational process in which perceived resources are instrumental in achieving work goals, which positively influences job performance (Rich et al. 2010). Specifically, job resources influence job outcome variables (e.g., performance) through two mechanisms. First, job resources initiate employees' willingness to dedicate their efforts and abilities to accomplish work tasks because job resources allow employees to perceive a higher possibility of attaining related goals (Schaufeli and Bakker 2004). Second, job resources play an intrinsic motivational role, as they fulfill basic human needs for autonomy, relatedness, and competence (Van den Broeck et al. 2008). For example, social support satisfies needs for relatedness and competence, thus motivating employees to be engaged at work and perform effectively (Rich et al. 2010). Besides, job resources at an employee's disposal may function as buffers against the undesirable effects caused by job demands (Bakker and Demerouti 2007, Xanthopoulou et al. 2007, Bakker and Demerouti 2017). For example, the undesirable impact of work overload can be alleviated by job resources such as social support, a quality relationship with the supervisor, and constructive performance feedback (Bakker and Demerouti 2017). In the context of ESs, the salient resources come from employees' proximal networks (e.g., leaders and colleagues) and other support structures (Ke and Wei 2008, Sykes et al. 2014, Sykes 2015).

Leader support is critical because the drastic change brought by ES implementation makes job specifications ambiguous, performance expectations unclear, and workflows chaotic. When employees' work roles are incompletely specified by an organization, leaders (supervisors) play a critical role in defining and clarifying their subordinates' work roles (Graen and Uhl-Bien 1995). A quality relationship with the leader will allow employees to obtain guidance, feedback, and resources required for effective work execution (Graen and Uhl-Bien 1995, Sparrowe and Liden 2005), which can facilitate employees to adapt to changes induced by ES implementation. LMX, reflecting the quality of relationships between supervisors and employees (Eisenberger et al. 2010), is a crucial construct that determines the amount of resources from leaders to support employees in dealing with an ES.

Support structures, which refer to a range of services providing user assistance after system implementation (Boudreau and Robey 2005, Sykes 2015), can be manifested in two forms, namely, traditional support structures and peer support structures (Sykes 2015). Traditional support structures include training, online support, help desk support, and change management support (Sykes 2015). They serve as critical resources that enable employees to understand the newly designed business processes and sophisticated software (Robey et al. 2002; Sykes et al. 2009, 2014; Bala and Venkatesh 2016). The information systems literature has highlighted the importance of traditional support structures in aiding employees to cope with the challenges imposed by a new system (Sykes 2015). Regarding peer support structures, it is suggested that peers can offer critical support to employees executing their work after ES implementation (Sykes et al. 2014, Sykes and Venkatesh 2017). The complexity and high interdependence of job tasks introduced by an ES make it difficult for employees to work independently. Instead, employees need to exchange information and knowledge with coworkers so that they can jointly tackle the technical and business issues encountered at work (Sykes et al. 2009, 2014; Sykes 2015).

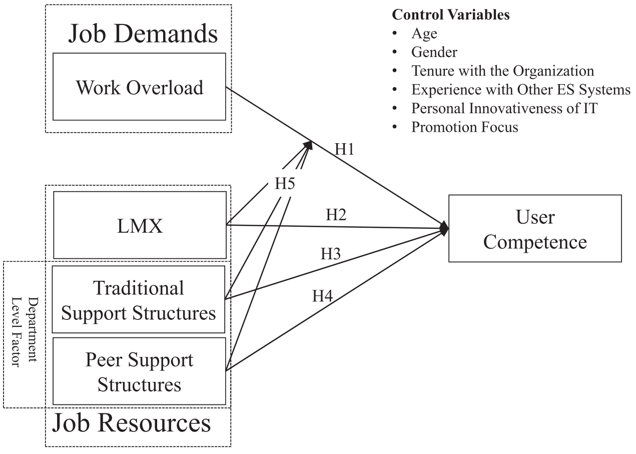
3. Research Model and Hypothesis Development

Drawing on the JD-R model, we propose that the development of user competence with an ES is affected by job demands (i.e., work overload) and job resources (i.e., LMX, traditional support structures, and peer support structures) in the workplace. Figure 1 depicts the research model.

3.1. Job Demands—Work Overload

According to the JD-R model, job demands exhaust employees' physical and mental resources and could

Figure 1. Research Model



Note. H, Hypothesis.

even evoke a health-impairment process (Bakker and Demerouti 2007, Crawford et al. 2010). Previous studies have found empirical support for the negative influences of job demands, such as burnout, decreased organizational commitment, and poorer job performance (Demerouti et al. 2001, Schaufeli et al. 2009, Crawford et al. 2010). Consequently, we argue that work overload, as the job demand, hinders the development of user competence with an ES. Work overload is defined as an individual's perception that he or she cannot perform a task because of a shortage of critical resources (Ahuja and Thatcher 2005). Work overload can be categorized into quantitative and qualitative aspects (Sales 1970). Quantitative overload refers to the perception that an individual is not able to do something because of constraints (e.g., time) imposed by the environment. In contrast, a qualitative overload occurs when a task exceeds an employee's capability, such as a lack of business- and system-related knowledge related to the ES (Ahuja and Thatcher 2005).

Work overload makes it difficult, if not impossible, for users to find the time and energy to acquire technical skills and business knowledge that constitute user competence with an ES. Work overload hampers user competence development as it hinders users from applying the system to a greater extent in terms of both breadth and depth of system functionalities and features (Ahuja and Thatcher 2005). It also depletes users' energy to study business processes embedded in the system, which makes users incompetent in evaluating the representations obtained from the system. Also, work overload after ES implementation, as job demands, has negative effects on job satisfaction and results in employees' negative attitudes toward the system (Bala and Venkatesh 2013). With an unfavorable attitude, employees could resist learning and adaptation to the system, and they may choose to work around the system, or even sabotage the system and tamper its integrity (Bala and Venkatesh 2016). As a result of these negative influences of work overload, users cannot develop the ability to apply the system to the greatest possible extent to achieve the best performance. As such, work overload impedes users from fostering competence with the ES.

Hypothesis 1. *Work overload is negatively related to user competence.*

3.2. Job Resources—LMX and Support Structures

Job resources are health-protecting factors in the workplace that facilitate the attainment of work goals and stimulate personal growth and development (Demerouti et al. 2001, Schaufeli and Bakker 2004). When they have job resources, employees can cope with the requirements imposed on them by their work roles (Crawford et al. 2010, Nahrgang et al. 2011). The positive effects of job resources on performance have gained empirical support (e.g., Bakker et al. 2004). In this research, we examine how LMX and support structures, as job resources in the workplace, affect user competence with ES.

LMX reflects the quality of relationships between supervisors (as leaders) and employees (Eisenberger et al. 2010). Supervisors differentiate their relationships with subordinates by developing different exchange relationships (Graen and Uhl-Bien 1995, Sparrowe and Liden 2005). These relationships range from those based solely on employment contracts (i.e., low LMX) to those characterized by mutual trust and respect (i.e., high LMX; Graen and Uhl-Bien 1995). With high LMX, supervisors may provide subordinates with the support that extends beyond what is specified in employment contracts, such as more constructive feedback, resources at work, and personal development opportunities (Graen and Uhl-Bien 1995, Chen et al. 2007).

Extending this notion to our research context, we expect users with high LMX to receive more support from their supervisors and develop a higher level of user competence with the ES than their counterparts with low LMX. Specifically, high LMX allows users to communicate more frequently with leaders who have a better knowledge of organizational structures and a high-level understanding of the work system, especially the interdependence of tasks within a functional unit and between departments. In turn, the information that leaders share can help users gain a more holistic view of the domain represented by the ES, which enables users to competently obtain faithful representations of business processes, acutely interpret the representations, and coordinate effectively with colleagues (Kettinger et al. 2013). Also, users with high LMX receive more responsive performance feedback and extra resources from leaders, which enables them to feel more confident about the representations of business processes they acquired from the system and thus become more capable of taking informed actions accordingly (Burton-Jones and Grange 2013). Furthermore, high LMX allows users to have clarity regarding their specifications and better opportunities for career growth, which motivates them to be engaged in exploring how to apply the system to a greater breadth and depth to achieve maximum performance. In this process, users will derive insights into the best way to acquire and act upon representations from the system to execute their job tasks. Hence, users with high LMX will have higher competence with ES, compared with their counterparts with low LMX.

Hypothesis 2. *LMX is positively related to user competence.*

Support structures are critical job resources for system users, which may differ across departments within an organization (Sykes 2015). Because of the modular design of ESs and high task interdependence concomitant with ES implementation (Gattiker and Goodhue 2005), departments may differ in how they deploy ESs and promote system use (Maruping and Magni 2015, Sykes 2015). For example, online support and user manuals, as traditional support structures, are often customized to meet different departmental needs. Also, peer support structures, which dictate to a large extent a user's access to advice from colleagues within his or her most proximal social network and with similar work experiences, would vary across departments. Accordingly, we conceptualize and operationalize support structures as a department-level construct.

Support structures are instrumental in helping users apply an ES competently to accomplish job tasks (Sykes et al. 2009, 2014; Sykes 2015; Sykes and Venkatesh 2017). When department support structures help users meet their needs for competence, users feel empowered. Therefore, they are motivated to strive for growth and development, which should lead to the development of competence (Schaufeli and Bakker 2004, Bakker and Demerouti 2007). Indeed, Maruping and Magni (2015) found that team empowerment can significantly affect individual users' intentions to explore an ES and learn how to innovatively use the system.

Traditional support structures help users understand the technology, the functions of specific features, and how the system should be used to conduct job tasks (Sykes 2015). For example, training and user manuals can help users learn what icons to click on a screen to start a procurement process and the data that they must enter into a system to generate a purchase order. Also, information technology (IT) staff have more knowledge about the technical details (Hsieh et al. 2011). Their support can help users interact seamlessly with the system and obtain appropriate representations of business processes to accomplish job tasks. Although different types of support differ in terms of communication conduits and content, they provide users with information and knowledge on how to effectively apply the system (Sykes 2015). Hence, traditional support structures enable users to gain better knowledge of the system and develop skills to the fullest extent, which is essential for user competence with the ES.

Hypothesis 3. *Traditional support structures are positively related to user competence.*

In supportive peer networks, users share information on how to effectively apply a system to perform a particular task (Desanctis and Poole 1994, Orlikowski 1996, Jasperson et al. 2005). Because peers provide advice in actual work contexts, the information and knowledge shared can effectively help users gain a nuanced understanding of the system, the demands of job tasks, and the context for using the system (Robey et al. 2002; Sykes et al. 2009, 2014). Such support helps users competently interact with the system and obtain faithful representations of business processes and their plausible interpretations (Burton-Jones and Grange 2013). Besides, with peer support structures, users collaboratively learn how to apply the system and examine how job tasks and the system can be mutually adapted for a better fit (Kang and Santhanam 2003). This should enhance the users' ability to obtain faithful representations of business processes and effectively act on these representations. Also, such intensive interactions and knowledge sharing help users understand both the input and output interdependence between job tasks and how their system use would relate to their peers' tasks (Kang and Santhanam 2003, Gattiker and Goodhue 2005). Consequently, users can gain a shared understanding that is essential for users to be effective and efficient in coordinating with each other when using the ES to execute their job tasks. Essentially, peer support structures allow users to develop the ability to effectively apply the system and explore the potential of leveraging the system to the fullest extent to support their work.

Hypothesis 4. *Peer support structures are positively related to user competence.*

3.3. Interaction Effects of Job Demands and Job Resources

The JD-R model suggests that job resources can serve as buffers against the negative impacts of adverse work conditions (Bakker and Demerouti 2007, Xanthopoulou et al. 2007). Applying this notion, we expect that job resource factors identified could moderate the effect of work overload (i.e., job demand) on user competence. In the presence of LMX and support structures, users have access to relevant technical and business knowledge to which they may not have been exposed otherwise (Grant 1996). Knowledge shared by leaders and the support structures will help users manage the cognitive challenges imposed by ES implementation, thereby diminishing the anxiety and energy depletion caused by work overload (Bakker and Demerouti 2007). Also, the harmonious relationship with leaders and peers represents an emotion-related resource that can enhance users' psychological well-being and suppress the negative feelings aroused by adverse work conditions (Schaufeli and Bakker 2004, Ilies et al. 2011). In other words, the supportive relationship between users and their leaders and peers can help users cope with the stress resulting from work overload imposed by ES implementation. Consequently, users may not experience high levels of exhaustion and cynicism. Furthermore, job clarity and personal development opportunities provided by leaders help to alleviate uncertainties and uplift the prospects of dealing with work overload. Users with high LMX can remain more hopeful and positive despite the adverse effects of work overload. Put simply, users who have job resources available can cope better with work overload.

Hypothesis 5. *Job resources moderate the impact of work overload on user competence, as*

a. *LMX moderates the negative effects of work overload on user competence,*

b. *Peer support structures moderate the negative effects of work overload on user competence, and*

c. *Traditional support structures moderate the negative effects of work overload on user competence.*

4. Research Method

We collected the data needed to test the research model through a two-wave survey from six electronics manufacturing companies that had implemented similar modules of an identical ES. Specifically, we approached a consulting firm that had helped the six organizations with their ES implementations. The top management of these organizations provided us with lists of employees. Of these employees, we randomly selected 800 respondents who had joined their organizations before the ES was implemented. Although the survey respondents were anonymous, we required them to generate their participation codes by following a coding procedure, which allowed us to link their responses for two waves of the survey. In addition, we conducted our first wave of the survey four months after the ES implementation based on the suggestion of the consulting team leaders who were involved in these projects. This four-month window provided sufficient time for ES users to try out features prescribed by the implementation teams and evaluate their support for related job tasks.

In the first wave of the survey, we sent each recipient the questionnaire along with a cover letter endorsed by senior management explaining our research objectives. We assured the respondents that their participation would be confidential and that their data would be used for research purposes only. Respondents were required to provide information on their demographics, as well as personal factors that included personal innovativeness of IT, promotion focus, perceived work overload, and relationships with their supervisors. Respondents also provided information regarding both traditional and peer support structures in their departments. We received a total of 286 questionnaires, which yielded a response rate of 35.75%. The department information is reported in Table A1 in Online Appendix A.

Two and a half months after we completed the first wave of the survey, we sent respondents both a thank-you letter for their participation and a second questionnaire so that we could collect data on their user competence. We received a total of 254 questionnaires, which yielded a response rate of 31.75%. Among the responses returned in these two rounds of surveys, we received 232 pairs of matched questionnaires from 52 departments of the six organizations, where each department had two or more respondents. Nonresponse bias was examined by *t*-tests of the key constructs. Assuming that the last 25% of respondents are most similar to nonrespondents, a comparison of the first and the last 25% of respondents provides a test to response bias in the sample (Armstrong and Overton 1977). Our results showed that there was no significant difference, which indicated that nonresponse bias was not an issue.

We developed an English questionnaire by adapting the measurement items from existing, validated, and well-tested scales in the extant literature. We used five-point Likert scales with options ranging from 1 ("strongly disagree") to 5 ("strongly agree"). As this study was conducted in China, the English questionnaire was then translated into the Chinese language by a team of four researchers with different majors. We also hired a professional translator, who was unfamiliar with our study, to translate the questionnaire in the Chinese language back to English. No semantic discrepancies were found when the translated questionnaire was compared with the original English version.

We operationalized work overload as a second-order reflective construct. Work overload consists of qualitative and quantitative measures, and its instrument was adapted from Ahuja and Thatcher (2005). We adopted system-related items of qualitative work overload because this construct reflects a lack of knowledge and skills about the system, and we also adopted general work-related items for quantitative work overload because it reflects the adverse work context (e.g., a lack of time). The wording of some of these items was framed around users' exploration of the system, for two reasons: (1) exploring activities allows users to learn how to use system features beyond what is prescribed by management, and (2) through exploration, users gain a better understanding of business processes embedded in the system.

In addition, to validate that it is appropriate to have work overload as a second-order construct for analysis, we conducted a comparative analysis of the second-order factor model with first-order models following the method of Lu and Ramamurthy (2011). We examined two models; one model was the first-order model upon which all measurement items of the construct load, and the other model was the second-order reflective model on work overload that combines both qualitative work overload and quantitative work overload as two first-order constructs. Our results show that the χ^2 in the second-order model was significantly reduced compared with the χ^2 in the first-order model ($\Delta\chi^2$ = 172.80). Additionally, the other fit indexes, including the comparative fit index (0.72 versus 0.96), Tucker–Lewis index (0.53 versus 0.93), and root mean square error of approximation (0.31 versus 0.12), are better in the second-order model than in the first-order model. These results suggest that a multidimensional model is superior to the unidimensional factor model. As shown in Online Appendix B, the first three items of work overload represent the qualitative dimension, whereas others indicate the quantitative aspect. We combine the qualitative and quantitative dimensions to measure work overload in the following analyses.

The measurement scale for LMX was adapted from Graen and Uhl-Bien (1995). We adopted the items reflecting the working relationship perceived by the respondent, which would affect the resources accessible to the user; these resources include constructive feedback and business-related knowledge. Traditional support structures were measured by the scale adapted from Sykes (2015) that measures the technical support accessible to respondents through different channels (e.g., help desk, IT personnel). The measurement items for peer support structures were adapted from Sykes et al. (2014). The scale measured the frequency and the extent to which business- and system-related knowledge are exchanged among coworkers in a respondent's department. The items for user competence were adapted from Marcolin et al. (2000) based on the self-reported self-efficacy measures. The measurement scale for personal innovativeness of IT was adopted from Agarwal and Prasad (1998), whereas the items for promotion focus were adopted from Liang et al. (2013). All the measurement items are listed on Online Appendix B.

To account for the differences among users, we included several control variables, such as users' age, gender, tenure with the organization, experience with other ESs, personal innovativeness of IT, and promotion focus. We selected these variables because they may have an impact on user competence. Users' age and tenure with the organization, to a certain extent, affect their ability to adapt to new business processes. As business process reengineering is an unavoidable component of ES implementation, users need to unlearn business knowledge that they have accumulated so that they may acquire new business and technical knowledge. As such, age and tenure with the organization may affect their competence to adapt to the requirements imposed by the ES. Also, when users have experience with a similar system, they can apply their knowledge to the current ES. Similarly, the personal innovativeness of IT is an important factor affecting users' expectations for system learning outcomes and their capacity to apply a system. Therefore, both experience with other ESs and personal innovativeness of IT could affect user competence. Furthermore, we controlled for promotion focus. According to regulatory focus theory, users with promotion focus strive for growth and are achievement oriented (Higgins et al. 1997), which motivates them to achieve user competence.

As our data are nested within departments where employees share similar support structures, we applied hierarchical linear modeling (HLM) for our analysis, which is appropriate for the multilevel structure of our model (Kozlowski and Klein 2000). HLM allows us to simultaneously study individual- and department-level relationships while correcting for standard errors at each level. Also, HLM allows for unbalanced data and does not require observational independence at different levels (Kozlowski and Klein 2000). Therefore, HLM helps address the issue that individuals and departments were not separate conceptually or empirically and had cross-level impacts on each other.

Before analyzing the aggregation, we tested whether there was convergence in the way employees within each department responded similarly to the scale and whether there was sufficient between-department variability in the responses to these scales. The details of the examination are reported in Online Appendix C. Collectively, our findings suggest that both traditional support structures and peer support structures are good indicators at the department level. In the following analyses, we used the department-level mean value of traditional support structures and peer support structures. Specifically, we averaged the traditional support structure and peer support structure scores within each department to compute a single department-level score.

5. Data Analysis and Results

5.1. Common Method Bias

Though we collected the survey in two waves, we nonetheless gathered data from a single source; as a result, common method bias could still be a concern for data validity. We adopted Harman's one-factor test to examine possible common method bias in this research. The resulting principal components of our factor analysis yielded seven factors with eigenvalues greater than 1.0 and accounted for 67.70% of the variance. Meanwhile, the first of these seven factors did not account for the majority of the variance (only 23.29%). These results indicate that common method bias was not a concern for our research.

5.2. Reliability and Validity of the Scales

To validate our research model, we examined all scales for construct validity and construct reliability. The results are shown in Tables 1 and 2. We examined the construct validity by using factor analysis. All items' loadings exceeded 0.60, except for the first two items of user competence, which had loadings of 0.41 and 0.46, respectively; in turn, they were dropped from our measure scales and all other related analyses, which narrowed our constructs to four items on user competence. The values of composite reliability ranged from 0.86 to 0.95. All our results, which we show in Table 1, indicate that the scales depict good convergent validity. In addition, we assessed discriminant validity based on average variance extracted (AVE) values and a correlation matrix. As Table 1 shows, the AVE scores ranged from 0.58 to 0.69. According to Fornell and Larcker (1981), discriminant validity can be established when the square root of AVE for each construct is greater than the correlations with other constructs. As shown in Table 2, we met this condition in all cases. We also examined the internal consistency

Table 1. Results of Confirmatory Factor Analysis

Construct	Items	Loading	*t*-value	Cronbach's alpha	Composite reliability	AVE
LMX	LMX1	0.71	7.49	0.83	0.88	0.66
	LMX2	0.80	17.27			
	LMX3	0.91	28.79			
	LMX4	0.82	14.36			
Work overload (WOL)	WOL1	0.74	22.27	0.85	0.89	0.58
	WOL2	0.74	23.57			
	WOL3	0.79	25.26			
	WOL4	0.78	28.18			
	WOL5	0.79	30.08			
	WOL6	0.72	19.64			
Traditional support structures (TS)	TS1	0.73	13.76	0.94	0.95	0.65
	TS2	0.74	14.04			
	TS3	0.79	19.70			
	TS4	0.83	23.97			
	TS5	0.82	30.07			
	TS6	0.85	26.90			
	TS7	0.88	41.17			
	TS8	0.82	24.19			
	TS9	0.83	24.81			
	TS10	0.78	21.82			
Peer support structures (PS)	PS1	0.71	10.25	0.88	0.90	0.58
	PS2	0.72	8.81			
	PS3	0.74	7.86			
	PS4	0.74	10.43			
	PS5	0.82	16.88			
	PS6	0.76	12.57			
	PS7	0.81	18.65			
User competence (COM)	COM1	0.79	23.00	0.80	0.87	0.62
	COM2	0.82	27.16			
	COM3	0.73	16.49			
	COM4	0.80	18.90			
Personal innovativeness of IT (PI)	PI1	0.90	64.95	0.85	0.90	0.69
	PI2	0.78	21.56			
	PI3	0.90	56.69			
	PI4	0.74	15.87			
Promotion focus (PF)	PF1	0.73	6.15	0.81	0.86	0.61
	PF2	0.75	6.47			
	PF3	0.87	9.63			
	PF4	0.75	7.54			

Table 2. Correlation Between Constructs

	LMX	*WOL*	*TS*	*PS*	*COM*	*PI*	*TA*	*AGE*	*GEN*	*YEA*	*EWE*
LMX	**0.81**										
Work overload (WOL)	−0.13	**0.76**									
Traditional support structures (TS)	0.30***	0.09	**0.81**								
Peer support structures (PS)	0.09	−0.01	0.13*	**0.76**							
User competence (COM)	0.16**	0.10	0.45***	0.14**	**0.79**						
Personal innovativeness of IT (PI)	−0.04	0.29***	0.32***	−0.07	0.42***	**0.83**					
Promotion focus (PF)	−0.13**	0.08	0.10	−0.06	0.17**	0.46***	**0.78**				
Age (AGE)	−0.03	0.05	0.10	0.04	0.12*	0.15**	0.07	—			
Gender (GEN)	0.07	−0.05	0.05	0.04	−0.03	0.04	0.00	−0.01	—		
Tenure with the organization (YEA)	−0.04	−0.02	0.00	0.02	−0.06	0.01	0.03	0.68***	0.12*	—	
Experience with other ESs (EWE)	−0.11*	−0.16***	−0.08	−0.06	−0.14**	−0.10	0.00	−0.10	0.15 **	−0.13**	—

Note. The bold values are the square roots of AVEs.
*Correlation is significant at the 0.1 level (two-tailed); **correlation is significant at the 0.05 level (two-tailed); ***correlation is significant at the 0.01 level (two-tailed).

(reliability) of the measurement instruments by Cronbach's alpha, from 0.80 to 0.94 (Kerlinger 1986), which indicates that all constructs have good reliability.

5.3. Hypotheses Testing

We used HLM to test our research model. Before examining the theoretical hypotheses, we evaluated whether there was variance in the dependent variable by the level 2 groupings (Woltman et al. 2012). Therefore, we (1) calculated the intraclass correlations in mixed-effect models (the ICC(1)s) of user competence (i.e., the dependent variables in the research model) and (2) evaluated whether the variance of the group intercept was significantly larger than zero when we used an unconditional means model.[1] The ICC of user competence was 0.15. To evaluate whether the variance of the group intercept was significant, we compared two log-likelihood values between a model with a random intercept and a model without a random intercept. For user competence, the difference between the two models was 6.24 ($p < 0.05$, df = 1). Our significant results suggest that some degree of variability with respect to user competence could be attributed to between-department differences, which further supports the use of HLM in our study. Next, we tested our proposed hypotheses with a multilevel model.

To examine the impact of job demands and job resources on user competence, we ran three models with user competence as the dependent variable, as we report in Table 3. Model 1 is the baseline model and contains only random intercepts. Next, we obtained Model 2 by adding the six control variables: age, gender, tenure with the organization, experience with other ESs, personal innovativeness of IT, and promotion focus. After that, we included all independent variables and control variables in Model 3. We used these three models to examine the main effects that we proposed in this study.

As we show in Model 2, four of the six control variables significantly affect user competence. Whereas age increases user competence ($\beta = 0.02$, $p < 0.05$), tenure with the organization reduces user competence ($\beta = -0.03$, $p < 0.05$). Also, experience with other ESs marginally reduces user competence ($\beta = -0.16$, $p < 0.1$), and personal innovativeness of IT significantly improves user competence ($\beta = 0.27$, $p < 0.01$). Our results in Model 3 indicate that work overload has no significant impact on user competence ($\beta = -0.00$, $p > 0.1$); thus, Hypothesis 1 is not supported by the empirical results. Our results also indicate that LMX has a significantly positive effect on user competence ($\beta = 0.12$, $p < 0.05$); therefore, Hypothesis 2 is supported by the data. Model 3 shows that the effects of traditional support structures on user competence are marginally significant ($\beta = 0.19$, $p < 0.1$), thereby supporting Hypothesis 3. In addition, peer support structures significantly enhance user competence ($\beta = 0.35$, $p < 0.05$); thus, Hypothesis 4 is supported.

The impact of work overload on user competence is insignificant in our empirical analysis. Notwithstanding this, moderating effects could exist when the main effects do not work in some situations, such as the independent variable exerts reverse impacts on the dependent variable in different levels of the moderating factor. With this in mind, we further explored the moderating effects of LMX, traditional support structures, and peer support structures on the relationship between work overload and user competence. In Model 4, we added three interaction terms to Model 3: the interaction between LMX and work overload, the interaction between traditional support structures and work overload, and the interaction between peer support structures and work overload. Our results show that only one interaction term (i.e., *LMX* × *work overload*) has a significant negative impact on user competence ($\beta = -0.15$, $p < 0.05$), and that neither *traditional support structures* × *work overload*

Table 3. Results of Models Predicting User Competence

Variables	Main effects (H1–H4) Model 1	Model 2	Model 3	Moderation (H5) Model 4
Individual-level variables				
Work overload			−0.00	1.11
			(0.05)	(0.78)
LMX			0.12**	0.57***
			(0.06)	(0.22)
Department-level variables				
Traditional support structures			0.19*	−0.10
			(0.11)	(0.40)
Peer support structures			0.35**	0.96
			(0.15)	(0.60)
Interactions				
LMX × work overload				−0.15**
				(0.07)
Traditional support structures × work overload				0.09
				(0.13)
Peer support structures × work overload				−0.20
				(0.19)
Control variables				
Age		0.02**	0.02**	0.02**
		(0.01)	(0.01)	(0.01)
Gender		0.00	−0.02	−0.00
		(0.07)	(0.07)	(0.07)
Tenure with the organization		−0.03**	−0.02*	−0.02
		(0.01)	(0.01)	(0.01)
Experience with other ESs (0/1)		−0.16*	−0.12	−0.14*
		(0.09)	(0.08)	(0.08)
Personal innovativeness of IT		0.27***	0.26***	0.27***
		(0.05)	(0.05)	(0.05)
Promotion focus		0.01	0.05	0.06
		(0.06)	(0.06)	(0.06)
Intercept	3.90***	2.45***	−0.17	−3.59
	(0.05)	(0.33)	(0.72)	(2.40)
Marginal R^2		0.21	0.30	0.32
Conditional R^2	0.15	0.33	0.42	0.45
Deviance (2 × log-restricted likelihood)	425.24	400.24	392.48	393.40

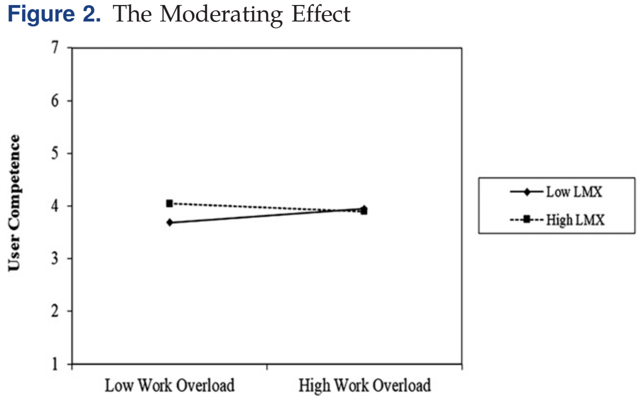
Notes. At the individual level, $n = 232$, and at the department level, $n = 52$. H, Hypothesis.
$^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

($\beta = 0.09$, $p > 0.1$) nor *peer support structures × work overload* ($\beta = -0.20$, $p > 0.1$) is significant. This suggests that LMX negatively moderates the relationship between work overload and user competence but not the support structures. Thus, Hypothesis 5a is supported by the empirical results, but not Hypothesis 5b or 5c. Figure 2 presents the pictorial view of the moderating effect of LMX on the relationship between work overload and user competence.

6. Discussion

This study reveals that job resource factors have significant positive effects on user competence, but work overload has no significant effect on user competence. A plausible explanation of the nonsignificant negative direct effects of work overload on user competence is that some users might have appraised work overload as a potentially challenging stressor. According to Crawford et al. (2010), when perceived

Figure 2. The Moderating Effect



as a challenge, a stressful demand has the potential to promote mastery and personal development, as it is regarded as presenting an opportunity to learn and demonstrate the competence that is rewarded. As such, in our research context, the relationship between work overload and user competence with the ES would depend on whether users appraise it as a challenge or hindrance factor. Our findings on the moderating effects of LMX on the relationship between work overload and user competence provide further evidence on this point (see Figure 2). A high level of LMX could weaken the potentially positive relationship, thereby implying that the relationship between work overload and user competence is more intricate than what is suggested by the JD-R model. Interestingly, however, our results reveal that support structures do not help to overcome the effects of work overload. To find an explanation for this surprising finding, we conducted post hoc interviews with respondents (see Online Appendix D for further details). We found that with work overload, some users chose not to engage in the development of their competence with the ES. Instead, they took advantage of the support structures by relying on peers and IT staff to resolve problems encountered, such as extracting data and generating reports, rather than learning how to execute these tasks by themselves. Overall, our theoretical and empirical exploration help to determine how work contextual factors influence user competence.

6.1. Limitations and Suggestions for Future Research

Before we discuss the contributions of our study, we must attend to its caveats. First, a limitation is our use of data collected from a single source. Although this data collection method is routine in research, it nonetheless raises a general concern about potential common method bias that could be caused by respondents' engaging in hypothesis guessing and social desirability when they complete questionnaires (Podsakoff et al. 2003). To mitigate this potential common method bias, we collected data at two points based on a mitigation suggestion of having "a temporal separation by introducing a time lag between the measurement of the predictor and criterion variables" (Podsakoff et al. 2003, p. 887). Our subsequent common method bias test shows that concerns for common method bias are not significant. That said, we believe it would still be valuable for future studies to put in more measures to address the issue of a single survey source by, for example, measuring the independent variables with objective indicators. This is not done in our study, as we promised respondents that they would remain anonymous to encourage user participation, and we also promised that any information they provided would be disclosed to management in aggregate, not at the individual level. As such, we could not get supervisors to evaluate users' competence.

Second, this study focused on job demands and job resources, which were seminal but not exhaustive. Although including an exhaustive list of antecedents of user competence is not our intention, incorporating more related factors would allow us to understand more fully what influences user competence. Hence, future research could incrementally explore the effects of other factors, such as organizational climate and performance feedback. By doing so, future studies could capture more clearly how factors at the organizational, departmental, and individual levels interrelate to promote user competence.

Third, we measured user competence by affective assessments, which is similar to the scale for user self-reported self-efficacy. As reviewed earlier, user competence can be conceptualized and operationalized based on cognitive assessments, skill-based assessments, and affective assessments (Marcolin et al. 2000). While we have outlined the rationale for focusing on affective assessment considering the contextual domain of ES, we would like to appeal for future works to develop richer scales for user competence in different contexts. Doing so would be helpful for the development of user competence as a concept.

Fourth, the companies we surveyed were fast-growing organizations in China that did not suffer from legacy system constraints in their IT infrastructure because of their relatively shorter IT adoption history. In many cases, the surveyed companies were implementing their first ESs during our data collection; hence, their employees could not compare old systems with new ones. Therefore, we urge caution in generalizing our research findings to organizations that have an extended history of IT implementation.

6.2. Contributions to Theory

Notwithstanding the caveats of the study, our research contributes to the literature in three important ways. Our first contribution is related to the motivation for this research, which is to advocate the central role that user competence plays with respect to system implementation. Our rationale is that the emerging research on effective use underscores the importance of paying attention to user competence, a critical factor that determines whether employees can apply the system to its fullest possible extent to achieve full performance (Marcolin et al. 2000, Burton-Jones and Grange 2013). By shifting our focus from use to user competence, our study productively extends prior research by opening a new avenue for both future theories and practices related to managing ES implementation. To this end, as explained in Section 2.1, we conceptualize and operationalize the user competence based on affective assessment and self-reported self-efficacy, respectively. The conceptualization and operationalization take explicit consideration of the ES domain, which enables us to extend the work of Marcolin et al. (2000) by emulating how the user competence can be adapted theoretically and empirically in complex systems such as ESs. As such, the current research sheds light on the concept of user competence in a context that requires not only gaining proficiency in interacting with the system but also the ability to get faithful representations from the system and leverage these representations to enhance job performance.

Our second contribution is related to the investigation of how work contextual factors, namely, the job demands and three job resources, affect the development of user competence in ES applications. Prior research has alluded to the importance of user competence for effective system use (Burton-Jones and Grange 2013). By focusing on how users overcome knowledge barriers imposed by ES implementation through engaging in on-the-job, situational learning (Brown and Duguid 1991, Robey et al. 2002), this research highlights the aspects of the work context that are salient for user competence, the core element for effective use. As such, our study extends studies on training strategies (e.g., Nambisan et al. 1999, Kang and Santhanam 2003) to emphasize that the motivational process activated by job resources is of prominence to users to become competent in applying a complex ES to its fullest potential.

Third, this study makes an essential contribution to the JD-R model. Previous empirical studies on the JD-R model have primarily focused on the additive effects of job demands and resources, but have neglected their possible multiplicative effects (Hockey 1993, Demerouti et al. 2001). By exploring the interaction effect of work overload and resource factors, we found that LMX moderates the relationship between work overload and user competence, whereas support structures do not moderate the relationship. In the view that LMX and support structures are at the individual and departmental level, respectively, this result reveals a promising area of research to explore further with respect to the intricacy of different forms of interaction effects between job demands and job resources in multilevel studies.

6.3. Practical Contributions

Our study has two important practical implications for organizations implementing an ES. First, our results suggest that the actual work environment is of critical importance for the development of user competence. In particular, our study reveals that management that wishes to reap the benefits of an ES should calibrate LMX to individual employees and support structures. These work contextual factors, as job resources, are conducive to the development of user competence. Therefore, managers can improve their relationships with subordinate users by cultivating mutual trust and lending support. When there is a high level of LMX, users understand their job expectations better, develop more accurate interpretations of the representations acquired from the system, and demonstrate a more positive expectancy with respect to outcomes of their application of the ES to its full potential. Also, by providing support through traditional channels (e.g., online support, help desk support) and peer advising networks at the department level, management can help users tackle technology- and business-related problems that are critical for the development of accurate knowledge structures of the system and work execution. Second, because of ES complexity and the practice of concurrently running old and new systems right after ES implementation, work overload is an inevitable, acute problem. To suppress its possible negative influence on user competence, managers can work to improve their relationships with individual employees. When users experience high LMX, they can better overcome barriers caused by work overload and, in turn, become competent in applying the ES.

Acknowledgments

The authors thank Senior Editor Yulin Fang, Associate Editor Likoebe Maruping, and three anonymous reviewers for their insightful comments and suggestions throughout the development of this paper.

Endnote

[1] The null multilevel model could be represented as $Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$. The null model shows that the dependent variable is a function of a common intercept, γ_{00}, the between-group error term u_{0j}, and the within-group error term r_{ij}. The intercept here refers to the group-level intercept, u_{0j}.

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