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Information Systems User Competency: A Conceptual Foundation

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Abstract:

Research has identified a variety of factors that influence people's intentions to use IS and their degree of IS use. However, what has not been well understood are the characteristics of competent IS users who are proficient in using IS and are able to achieve quality IS usage. Considering that improving IS users' abilities to more efficiently and effectively use IS has always been and remains a challenge, research that provides a comprehensive view of the characteristics associated with competent IS users is warranted. This paper addresses this research question by proposing a conceptual foundation for IS user competency. Based on social cognitive theory, this research also proposes an overarching framework for IS user competency that can serve as a theoretical foundation for future research in this domain.

Keywords: IS Users, IS User Competency, Social Cognitive Theory.

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I. INTRODUCTION

Becoming a competent information systems (IS) user is important for any business professional who uses IS in their job functions or responsibilities. However, research has cited the limited use or leveraging of IS to achieve effective outcomes (Sykes, Venkatesh, & Gosain, 2009). Although a relationship between computing competencies and task performance has previously been demonstrated (Yoon, 2009), IS user competency is not prevalent among business professionals for work-related tasks. For example, Jasperson, Carter, and Zmud (2005) suggest that "users employ quite narrow feature breadths, operate at low levels of feature use, and rarely initiate technology- or task-related extensions of the available features" (p. 526). Not surprisingly, people who use IS in a limited way may not be able to achieve maximum benefits from it. Hence, they and their organizations may not be able to fully realize competitive or strategic advantages, which may stifle growth and hamper innovation. Therefore, developing IS users' competency, which we define as the ability to realize the fullest potential and greatest performance from IS use, is important.

Proficient IS use depends on various factors, one being the IS user's individual characteristics. Hence, problematic IS use can be partially attributed to the IS user or any disparity between their current set of knowledge, skills, and abilities (KSA) and that required for a given task (Wang & Haggerty, 2011). In order to properly assess the presence or absence of these specific KSA, one first needs to identify the KSA related to proficient IS use. With a framework of KSA associated with competent IS users, we can offer guidance on IS user training to improve competent IS use and provide criteria for hiring competent IS users.

Given the continuous focus on enhancing IS use, we believe that the IS field requires a comprehensive account of IS user competency. Therefore, this paper: 1) develops a conceptual foundation and understanding of IS user competency, and 2) proposes a framework of IS user competency that can benefit both research and practice.

Competency

Although the term or construct competence can have various definitions, conceptualizations of competence in the literature include:

1. "Skills, behaviors, and capabilities that allow employees to perform specific functions" (Levy, 2006, p. 78)

2. "Measurable patterns of knowledge, skills, abilities, behaviors, and other characteristics (KSAOs) that differentiate high from average performance" (Lee, 2010, p. 434)

3. "Underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job situation" (Spencer & Spencer, 1993, p. 9), and

4. "Characteristics or abilities of the person enable him or her to demonstrate the appropriate specific action" (Boyatzis, 1982, p.12).

Competencies have been identified as motives, knowledge, skills, traits, and one's self-image or self-concept (Boyatzis, 1982; Spencer & Spencer, 1993). Competency has also been referred to as "the set of behaviour patterns that the incumbent needs to bring to a position in order to perform its tasks and functions with competence" (Woodruffe, 1993, p. 29) and "a job analysis may also reveal specific technical skills, knowledge and ability that are required" (p. 30). These competency definitions are consistent with definitions of expertise, which include knowledge, skills, abilities, traits, and cognitive capabilities (Nelson, Nadkarni, Narayanan, & Ghods, 2000). These expertise definitions also specifically reference the domain-specific nature of these attributes. Hence, competencies are identified as skills, knowledge, behaviors, abilities, and personal characteristics that permit superior performance in a given domain.

Various competency classifications have also been proposed. For example, competencies that represent rudimentary necessities to complete a task (i.e., threshold competencies) versus those that discern individuals that are more capable versus those that are not (i.e., performance competencies) (Spencer & Spencer, 1993; Woodruffe, 1993). Also, competencies can be classified according to the longevity and magnitude of their prominence—

decreasing, consistent, or increasing in importance. Therefore, defining competencies requires specifying the level of achievement permitted by the competencies defined, and their relative importance.

Because competencies reflect an individual's capabilities, identifying them in order to predict outcomes (e.g., actions) that may occur (Boyatzis, 1982) is important. Also, predicting outcomes with these competencies is more important in complex tasks and jobs (Spencer & Spencer, 1993). Hence, the development of competency models has emerged. Competency models identify the pivotal factors, skills, knowledge, and behaviors necessary for successful performance in a particular context (Lee, 2010). For example, leadership and managerial competency models have been developed to enhance the capabilities of an existing workforce to achieve greater organizational efficiencies and effectiveness (Naquin & Holton, 2006). Organizations are recognizing that critical success factors include a competent workforce, and these models can be used in training and development programs for organizations that want to build or re-develop their knowledge capital.

Competency models have been used in a variety of contexts, such as healthcare leadership (Calhoun et al., 2008) and human resource development (Chen, Bian, & Hom, 2005), and for a variety of people, such as technical managers in research and development (Rifkin & Fineman, 1999) and finance professionals (Scott, 1998). The identification of relevant leadership competencies, for instance, has facilitated the development of leadership training and the identification of candidates to potentially fulfill leadership roles (Yoon, Song, Donahue, & Woodley, 2010). However, the development of a similar model or framework for IS user competency has not been undertaken. Although competency models have been developed for a variety of positions, the competencies required for these positions may not transfer to IS users. For example, competencies for finance professionals include financial analysis (Scott, 1998), and competencies for human resource development professionals include interpersonal relationship building (Chen et al., 2005). Neither of these would necessarily be relevant in an IS user competency context.

Although Yoon (2009) has studied end user computing competency, based on the measurement items, Yoon's concept of competency refers to attitudes, knowledge, education, the value of computing departments, and the ability to use systems in the context of a business task. Considering that effective IS usage continues to be problematic, the development of an overarching framework for IS user competency would help to enhance our understanding of IS user competency and the IS user capabilities that are associated with it. Because other domain competency models are not entirely applicable to IS user competency, pursuing such an endeavor is warranted.

Competencies have been defined and conceptualized at both the organizational and individual levels. For instance, in an organizational context, core competence refers to an organization's capability that assists in creating value (Mooney, 2007). Also, distinct competence refers to an organization's capability that is salient, preeminent, and not easily duplicated. At an individual level, concepts such as individual virtual competence, or the knowledge, skills, and abilities to interact virtually in a collaborative task have been proposed (Wang & Haggerty, 2011). However, identifying competencies that are specific to a given context, such as the IS context, is important to provide guidance to research and practice (Wang & Haggerty, 2011). For example, measurement items for career competency include factors associated with established career plans and goals, which may not be relevant in an IS user competency context (Kong, Cheung, & Song, 2012). Therefore, we propose a conceptual foundation for IS user competency at an individual level.

IS User Competency

Understanding IS user competency is important considering that organizations may be able to capitalize on the benefits in IS investments by permitting and supporting IS users to enrich their IS usage (Jasperson et al., 2005). Jasperson et al. (2005) argue that "prior research has, for the most part, inhibited penetrating examinations of how individuals selectively adopt and apply, and then exploit and extend the feature sets of IT applications introduced to enable organizational work systems" (p. 531). The IS user competency construct represents an IS user's ability to exploit and extend IS applications to maximize task performance. Carte, Schwarzkopf, Shaft, and Zmud (2005) found project teams' performances to be enhanced by individuals who maintained both relevant business and technology capabilities. Considering the benefits that can be gained from such abilities and the dearth of research that exists in this domain, developing a conceptual understanding of IS user competency is warranted.

Providing perspectives on directions for IS research, Lee (2001, p. xiv) indicates:

> *Clearly, IT skills and competencies, as well as business acumen to creatively combine IT knowledge with business opportunities are representative of such critical assets and need to be acquired, developed, and nurtured appropriately. Against a backdrop of rapidly changing technologies that render existing competencies obsolete, and emerging business opportunities that have to be seized within a very short*

> *window, organizations face a considerable challenge in ensuring that they possess IT human capital that is current, relevant, and responsive.*

IT human capital is "the accumulated stock of tacit and explicit knowledge about IT that is resident not only within individuals who might typically be considered IT professionals, but also in other organizational members whose primary roles are outside the IT function" (Lee, 2001, p. xiv). As this paper refers to it, the IS user competency construct focuses on the latter group of organizational members who use IS on a regular basis in their jobs. Also, this paper adopts a human agency perspective, or one that recognizes that humans have the freedom to utilize and deploy technologies in various ways, including in novel and beneficial manners (Bandura, 1989; Boudreau & Robey, 2005). More specifically, the IS user competency construct encompasses non-IT professionals who have the capacity and capabilities of modifying technologies to achieve maximum performance in IS use.

Several constructs have been used to describe various forms of competence and highly performing IS users in the literature. Marcolin, Compeau, Munro, and Huff (2000) define user competence as "the user's potential to apply technology to its fullest possible extent so as to maximize performance of specific job tasks" (p. 38). Yoon (2009, p. 1208) defines end user competence:

> *as a total set of knowledge, technology, skills and attitudes that function as action characteristics of an organizational member who can accomplish tasks in an outstanding manner in a business environment heavily dependent on computing…indicates an individual's total ability to apply computing knowledge and computing systems to efficiently perform tasks in his or her working environment*.

Other user descriptions discuss superior IS usage as being able to "correctly exploit the appropriate capabilities of software in the most relevant circumstances" (Boudreau, 2003, p. 236). Therefore, adapting from Marcolin et al. (2000), Yoon (2009), and Boudreau (2003), IS user competency refers to the ability to realize the fullest potential and the greatest performance from IS use. Competency in the domain of IS is unique considering IS are continuously evolving, in development, and periodically upgraded (i.e., being updated, replaced, and modified). Hence, the competencies that an IS user has developed may need to be revised or expanded to accommodate IS modifications or innovations. Also, IS users may have several IS to use that may vary in complexity and uses, so competencies may be esoteric or generic. IS users may need to leverage existing competencies to adapt to modified IS or to similar but new IS. To gain further insights and perspectives on the development of competencies and factors associated with the conceptual development of IS user competency, social cognitive theory provides an appropriate theoretical framework to understand competencies.

II. SOCIAL COGNITIVE THEORY

Of existing theories that attempt to explain human competency and learning, Bandura's social cognitive theory (an extension to social learning theory) is well recognized in the literature (Bandura, 1977, 1986, 2012). According to Bandura's (1977, 1986, 2012) social cognitive theory (SCT), human behavior is not driven primarily by external influences or inner compulsions. Instead, the theory proposes an interactive model in which behavioral, environmental, and cognitive/personal factors are "triadic reciprocal determinants" of each other. As an example, an individual learning how to ride a bike can watch another individual ride a bike (environmental factor), envision themselves riding the bike (cognitive/personal factor), and then attempt to ride the bike on their own (behavioral factor).

Therefore, individuals' behaviors and competencies are determined by the interactions and influences that each of these factors has on one another. These influences or interactions are not necessarily simultaneous or equivalent in strength, but may vary by activity and circumstances.

Cognitive/Personal Factors

The SCT perspective advocates that individuals have a certain set of capabilities and cognitive regulators (e.g., symbolizing, forethought, self-regulation, and self-reflection) that contribute to one's competency development, which we discuss below (Bandura, 1986).

One of the capabilities that SCT proposes is the ability to symbolize or create mental models (Bandura, 1986). The ability to symbolize allows individuals to provide meaning to immediate experiences, and the models can be used as guides for subsequent behaviors. Hence, people can mentally develop and test solutions to problems before enacting them.

Another individual capability that SCT proposes is forethought (Bandura, 1986). Individuals do not consistently engage in a reactive nature to events, but also anticipate consequences and reactions to future events. Hence, individuals can cognize consequences of future behaviors, and then set goals or develop courses of action.

Self-regulatory mechanisms are another set of distinctive abilities that SCT advocates (Bandura, 1986). Individuals maintain personal standards that can be used to evaluate, monitor, and motivate their own behaviors. Individuals assess their performance against these standards, and then react to these evaluations, which guide subsequent behaviors.

Self-reflection or reflective self-consciousness is the final capability that SCT proposes (Bandura, 1986). Individuals are not only able to analyze their experiences, existing knowledge, and thought processes, but they can also generate new knowledge or understanding of themselves or their environment. This reflective process can also drive them to adjust their current thoughts or knowledge, based on their judgment of existing knowledge versus current situations or results of current actions.

Environment

Vicarious capability or observational learning is another ability individuals possess according to SCT (Bandura, 1986). Rather than individuals learning only from self-initiated actions or their own mental devices, individuals can also observe the behaviors and subsequent consequences of others' actions. Observational learning is more expansive than just imitating modeled behavior. Individuals can make inferences of the principles that govern the behavior conducted and outcomes achieved (Bandura, 2012). Therefore, individuals can create their own rule sets based on these observations. This capability is especially advantageous when learning novel behaviors that can be most effectively done through social modeling and cues. This capability can also enhance the efficiency with which individuals can learn or develop competencies considering learning entirely through one's own accord would be burdensome and inefficient.

Four processes are associated with observational learning: attentional, representational, behavioral production, and motivational processes (Wood & Bandura, 1989). Attentional processes are characterized by an individual attending to a certain phenomenon in their environment and the extraction of information from the observed activities. Representational processes entail the translation of the information gathered into rule sets and concepts. Behavioral production processes converts the rules and concepts into actions, and individuals with more developed skill sets can more easily enact new behaviors. Motivational processes are taking knowledge and skills and applying them or putting them into action. Motivators can be in the form of valuing outcomes that can be achieved by enacting modeled behaviors, by an individual's own standards and evaluations, or by identifying with the individual whose behavior was observed.

One effective application of observational learning is mastery modeling (Wood & Bandura, 1989). In the first step of mastery modeling, the desired skills are modeled, methods of adapting rules and strategies to dynamic situations are taught, and self-confidence in applying the desired skills is fostered. Second, the skills are applied and practiced in a simulated setting or environment, with informative and corrective feedback occurring to enhance the competencies being acquired. Third, transference of the newly acquired skills to the real environment occurs, with simple application occurring first to foster self-confidence and then levels of complexity increasing subsequently.

Individuals can develop principles associated with observed behaviors and outcomes achieved (Bandura, 2012). They can make inferences from these principles and use these principles as a guide to develop novel behaviors. These observations can be used as general abstractions that can be modified and adapted to dynamic situations. To assist in the acquisition process, a trainer, for example, can verbalize their thought processes and strategies while using IS (Todd & Benbasat, 1987). This method can be used to make the trainer's cognitive skill sets more readily apparent for the observer. The observer can then select sub-components of the verbalized processes and modeled behavior, adapt it to unique circumstances, combine it with other sets of sub-skills, or innovate and extend the modeled behavior in new directions.

Behavior

An individual's own enactive experiences are also contributors to their competency development (Bandura, 1986). As individuals attempt to use or experiment with novel behaviors, they are able to obtain feedback in regards to the positive, neutral, or negative consequences of their actions. With this feedback, they can modify their previous behaviors, abandon behaviors in their entirety, or formulate a completely novel set of behaviors. Behavioral consequences also provide information with which individuals can create rule sets for behaviors and identify environmental cues that are predictive of potential outcomes. Individuals are also able to develop conceptions that

can later be used when encountering a novel phenomenon by making inferences from previously acquired knowledge.

The ability to acquire competency from enactive learning is dependent on various factors or sub-skills, such as generating possible solutions and strategies, evaluating variables and associated outcomes, committing outcomes to memory, and then matching the concept to the behavior or action (Bandura, 1986). For instance, an individual's existing knowledge base provides insights into developing or selecting rules that govern one's behaviors. Also, if individuals have existing strategies to readily identify appropriate rule sets, this can influence competency development. One can apply the rules or concepts to the phenomenon to determine if it matches a preconceived outcome. Individuals can vary the circumstances and variables introduced in order to develop their own causal models, which requires the individual to not only synthesize the consequences that were generated for each variation, but to also commit the results to memory so the same experimentation does not need to be reiterated.

As individuals mature in their knowledge and skills associated with behavioral experiences, they can then become more proactive in preventing error occurrences because they can anticipate consequences of a given set of behaviors (Bandura, 1986). Also, sub-skills can be combined and integrated to develop higher-order sets of rules to govern the organization of sub-skills and add complexity to the organization of behavior and actions. As behaviors become more automatized, lower-level sensory-motor systems can coordinate better with higher-order rules and skills can be applied with less conscious effort. Previous research has demonstrated relationships between those of certain higher-intellectual abilities (i.e., figural intelligence) and more efficient utilization of cognitive resources, and between higher levels of skill or expertise and more specific cognitive resource utilization (Grabner, Neubauer, & Stern, 2006). Hence, the findings suggest that more extensive skill development can be associated with more effective cognitive strategies applied to complete a task and a more expansive knowledge base. However, when behaviors do not produce their expected consequences, control reverts back to higher-level cognitive systems to identify the issue and associated solutions (Bandura, 1986).

Interaction Among SCT Components

Competencies can also be influenced by the reciprocal interaction of cognitive/personal, environmental, and behavioral factors (Bandura, 1986). Although individuals can learn enactively, this can stem from observations of others' behaviors that they then enact. For instance, individuals can observe behavioral performances of others and then enact the behavior themselves to further their understanding. Alternatively, they could modify the observed behavior to enhance the initial knowledge they acquired through observation. Also, individuals engage in various cognitive processes (e.g., reflection, abstraction) as they engage in various behaviors to develop their competencies.

Summary

In summary, individuals can obtain certain skills and learn behaviors by observing the performance of others. In addition, individuals learn through their own actions, in which informative feedback is obtained, and through their own personal attributes and cognitive or meta-cognitive processes. SCT acknowledges that acquiring competencies entails an individual applying their own mental devices and developing competencies either through their own thought processes or experiences or by observing others.

Self-Efficacy

Social cognitive theory (SCT) also incorporates the influence of self-efficacy on behaviors and the development of competencies. In describing self-efficacy, Bandura (2007, p. 646, emphasis in original) notes:

> *Perceived self-efficacy is conceptualized as* perceived operative capability*. It is concerned not with what one* has *but with belief in what one* can do *with whatever resources one can muster….Individuals are not asked to rate the* ability they possess*, but rather the strength of their assurance that they* can execute *given activities under designated situational demand.*

Self-efficacy is not concerned about whether or not an individual *has* the capabilities or skills to perform a particular task, but is concerned about whether an individual *believes* that they can perform a particular task (Bandura, 2007). Hence, self-efficacy pertains to the beliefs that one can overcome various anxieties that may prohibit them from accomplishing a task. Self-efficacy can affect an individual's choice of activities to pursue, the amount of effort they will expend, the duration of their persistence, their levels of motivation, and their emotional reactions to, and thought patterns associated with, activities (Bandura & Schunk, 1981; Bandura, 1986). "People's beliefs about their operative capabilities function as one set of proximal determinants of how they behave, their thought patterns, and the emotional reactions they experience in taxing situations" (Bandura, 1986, p. 393).

Knowledge of one's self-efficacy can come from four sources: individual experiences, vicarious information (i.e., from observations of others), persuasion (which includes verbal and social), and attributions of physiological states (e.g., experiencing stress or tension may be read as cues of inability) (Bandura, 1986). Hence, self-efficacy can result from one's own experiences and experiences that they observed in equivalent others, from persuasive means, and through interpretations of physical reactions as indications of ability or inability. Self-efficacy has been proposed to influence various perceptions, behaviors, emotional responses, and cognitive processes (Bandura, 1986). For instance, self-efficacy is proposed to influence the effort that is expended and the persistence individuals will exert.

The more efficacious an individual is regarding their abilities, the more persistence they may exert and the greater the willingness to invest efforts, especially when encountering failures or mistakes, which can thereby lead to greater attainment of competencies. Self-efficacy is also proposed to influence thought patterns and emotive responses. Individuals who have low levels of self-efficacy may focus on their deficiencies, thus causing stress and diverting the focus from task completion to potential failures and issues. Alternatively, those with high levels of self-efficacy may apply themselves to address and overcome the situational demands, and increase their efforts to succeed at completing a task.

III. INFORMATION SYSTEMS USER COMPETENCY FRAMEWORK

Based on the propositions of social cognitive theory, we propose a framework for competency in an IS user context (see Figure 1). This framework provides a broad perspective of the components of IS user competency and addresses competency specific to the IS user domain.

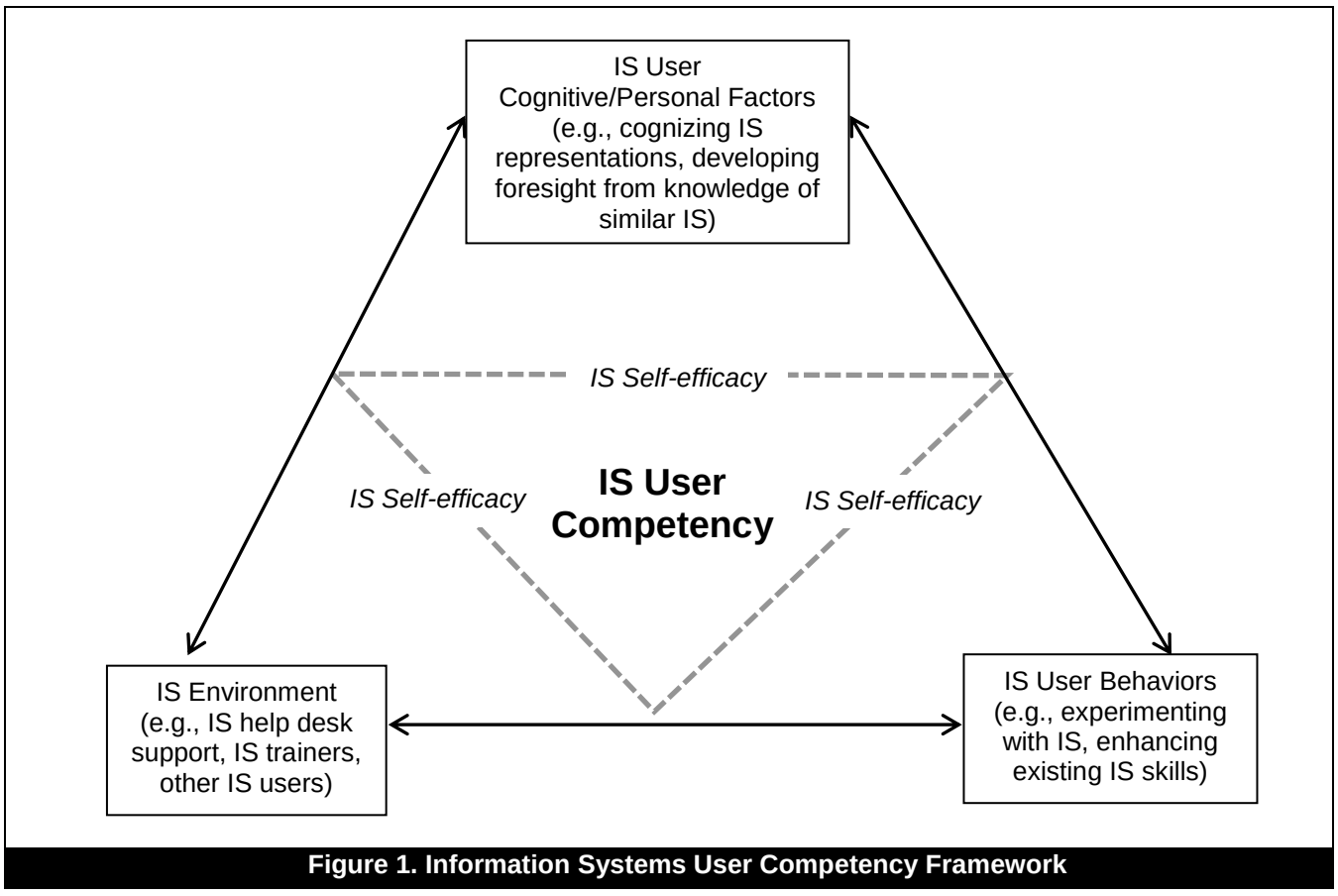

Figure 1. Information Systems User Competency Framework

IS User Cognitive/Personal Factors

SCT suggests that a competent IS user possesses not only capabilities associated with using IS (e.g., capabilities to understand how IS work based on one's mental model of how business information and processes are represented by IS) but also cognitive regulators that can help to enhance one's competency in using IS (e.g., interpreting IS responses to one's actions in the context of one's mental model and making adjustments to the representations and visualizations of these abstract information and processes in the mental model).

One cognitive capability that SCT highlights is the act of symbolizing, such as creating or enhancing mental models that provide meaning to phenomena (Bandura, 1986). In an IS user competency context, it could refer to the ability

to create mental structures of IS processes to understand IS functionality. Also, IS users may possibly solve problems by symbolizing the IS processes that are occurring or not occurring appropriately. IS users may be able to develop mental models of the proper way to perform certain functions, or mentally create models of alternative procedures that will improve performance with IS.

A unique characteristic of the IS domain is that IS users can develop competencies by creating representations that are embedded in IS. Individuals can develop competencies by understanding IS components and interrelationships among the components through cognizing them as IS representations. Hence, IS users can cognitively visualize the conceptual representation of an IS and the information and processes embedded in it in order to complete tasks or resolve issues. IS users can also innovate and modify representations of IS as they familiarize or gain experience with the system. Hence, IS users can develop conceptualizations or representations to develop or extend IS user competency.

Also, forethought can be associated with IS user competency, or the capability of anticipating outcomes of phenomena or certain actions. For example, IS users may contemplate the consequences of using alternative functions of an IS to create alternative procedures for a new event that has occurred in an organization. IS users may try to anticipate the reaction that may occur, either by other IS users, management, or the system itself, if a new IS is introduced or new procedures are proposed. IS users may try to proactively prevent problems that could occur by using forethought to consider an array of possible outcomes (or lack thereof) with IS use.

In the IS domain, IS users also have the opportunity to use existing IS knowledge to foresee outcomes associated with applications of alternate IS or regarding alternative uses of IS. For example, IS users familiar with databases can use their knowledge to predict outcomes from using similar but unfamiliar databases. As another example, IS users who have existing knowledge of a particular module in an enterprise resource planning system may be able to leverage this knowledge to use a novel module. IS users may also be able to use existing IS knowledge to adapt functionality to novel IS or create novel applications.

Self-regulated learning can facilitate an IS user's ability to monitor their knowledge and skill acquisition, and deploy necessary strategies to master new material. Hence, IS users can evaluate their understanding and, if they are not meeting preset standards, they can deploy strategies to enhance their comprehension. For example, IS users may consider using existing help desk support, IS help functions, or tutorials. Hence, IS users are self-judging and self-reacting to both their IS knowledge and their IS skills.

Self-reflection can also assist IS users in generating novel knowledge or skills. IS users can reflect on their current IS knowledge and adjust it according to new experiences or knowledge acquired. IS users may also self-reflect on their current IS skill sets and adjust them according to new interactions with an IS or new experiences garnered from alternative uses of IS. For example, IS users using novel or modified IS may reflect on their knowledge and skills using existing IS, consider the changes that were made or new features available, and develop new uses or leverage IS with new methodologies.

IS Environment

The IS environment is another component of IS user competency development. IS users can learn by observing others' actions and the subsequent consequences of these actions. From these observations, IS users can create rule sets of the observed behaviors. For example, the availability of training or IS support can influence the ability of an IS user to acquire the knowledge or skills they need. Trainers or other IS users can model certain behaviors through demonstrations of IS use. Also, the availability of other users to provide assistance when it is needed is another IS environmental factor. Alternatively, certain cues can be built into IS to help users with certain functionalities or to resolve issues.

Hence, training can be an effective environmental factor that can contribute to IS user competency. Training has been used extensively in the IS domain and it can not only contribute to the acquisition of requisite knowledge and skills, but also reduce the anxiety that may occur when a novel or modified IS is present. Therefore, training can provide the platform for building IS user competency. Training can also reduce the impact of impediments (such as stress) that could limit or prohibit the acquisition and development of IS knowledge and skills.

The IS domain is unique in that the IS artifact itself can be an effective mechanism facilitating the acquisition of IS user competency. IS can be used to train individuals in various domain areas, including increasing users' competency with IS. The continual adoption of web-based learning can be used to train users in developing the knowledge and skills to learn a new IS or improve their usage of an existing IS. Also, IS can be developed as a simulated system, or a prototype or beta version, that allows extensive experimentation and training with no or

limited repercussions. This experimental or simulated environment allows users the freedom to explore or extend their boundaries of knowledge without having to be concerned about negative ramifications.

Also, the format that IS training can be delivered is distinctive. Training may be structured such that instant feedback is given. For example, an IS user can attempt to use an IS and, if an error is made, they can receive an error message. The messages can be structured to explain the error and suggest how to remediate it. Alternatively, the messages may be more open-ended in which the IS user is provided resources to research the error and identify a solution.

Other environmental factors that may influence IS user competency development include the influence of top management support and peers. Top management may encourage individuals to extend their IS capabilities through various mechanisms. Top management may provide incentive structures or reward systems to encourage development of IS knowledge and skills. They may also be supportive by providing resources and time dedicated for training or experimentation and innovation with IS. Peers can influence one's IS user competency development by sharing unstructured IS knowledge. Also, peers may encourage extensive development of one's IS skills by providing peer-to-peer assistance in addressing an issue or developing innovative solutions.

Unique to the IS domain, IS support services can assist in IS user competency development. As IS users experience new demands on their IS knowledge or expertise, IS support services can assist in sharing their existing knowledge. They can also assist IS users in developing IS skills by providing guidance or instructions. IS users can observe IS support services remedy issues or create novel solutions such that IS users can acquire knowledge of IS problem-solving processes and extend their knowledge base of IS functionality and capabilities.

In an IS user competency context, four processes would be associated with observational learning. First, IS users would need to attend to the modeled IS usage behaviors and acquire information from the observation. Second, the IS user would need to translate the patterns of IS usage behavior into rules and concepts, such as the application of a particular set of IS features to achieve a desired outcome. Third, the IS user's rules and concepts would be converted into actual actions of IS usage. Finally, the IS user would be motivated to enact the IS usage behaviors. The IS user may be motivated because they see value in the outcomes that can be achieved through these IS usage behaviors. Alternatively, they may be motivated because of their own standards of achieving optimal IS proficiency, because of their ability to identify with an observed IS user (e.g., a co-worker), or due to goals or objectives set by management.

One potential application that could facilitate IS user competency development is IS mastery modeling. In this process, a trainer would demonstrate the IS skills to be learned and effective IS strategies and rules to facilitate flexibility in adapting to dynamic situations. Concurrently, IS users' self-confidence would be fostered. Then, IS users would be given an opportunity to apply their newly acquired skills and practice using IS in a simulated system environment. As they do so, either the system could provide feedback or another individual (e.g., trainer, another IS user) could assist in their IS skill development. Finally, IS users, starting with simple and limited use before gradually proceeding to more complex use, would be allowed to use IS in a live environment.

IS Behavior

Compared to competencies in other domain areas, behavioral experimenting with IS may possess less risks. For instance, an IS user can start experimenting with a novel IS with less risk than a novice interested in aviation who starts experimenting with flying an actual plane. Experimenting with IS is acceptable and reversible as long as the experimentation is temporary and not saved. Users can also be provided with a "development" or "training" module or version of an IS application to foster innovative use or experimentation.

The ability to engage in enactive learning is another potential contributor to IS user competency. As individuals use IS, they can experiment with new behaviors, such as using new functions. The IS user can then obtain feedback from their attempts to evaluate the positive or negative consequences of their behaviors. From this feedback, the IS user can create rule sets that can incorporate the application of given IS functions or features that can be used to achieve certain outcomes. This will also include developing conceptual knowledge that can be used in novel situations, such as using a novel IS or identifying solutions to novel problems. IS users can continue developing their IS user competency by making inferences from their existing knowledge—including existing IS concepts and the relationships among these various IS concepts. For example, IS users can predict an outcome that can be achieved with a novel combination of familiar sets of IS functions.

IS users can also develop IS user competency through various structured and unstructured behaviors. If a particular system is completely novel to the IS user, the IS user may learn to use the system through pre-determined scripts or pre-existing procedures. For instance, IS users can follow documented procedures to develop their IS knowledge

and skills. Alternatively, IS users may be more inclined to limit their reliance on documented procedures and approach the system in a more explorative and experimental manner. Hence, IS users may develop IS user competency through either the use of pre-defined or trial-and-error behaviors.

IS users will need to know how to develop possible IS solutions and strategies, evaluate IS factors and the related outcomes, remember the various outcomes that can be realized, and relate IS conceptual knowledge to the appropriate IS action. For example, an IS user can reflect on their existing IS knowledge to identify sequences of actions or rule sets to execute in order to obtain a certain outcome. IS users may have developed strategies to efficiently identify the appropriate rule sets to apply (i.e., sequence of IS functions to execute). As individuals use IS, they can continuously vary certain variables (such as the IS functionality used) to develop new models of IS use or capabilities. The IS user will then need to commit the outcomes to memory to continuously expand their IS knowledge repertoire.

As IS users develop their IS knowledge and skills, they can take a more proactive approach to IS use versus a reactive approach. More specifically, they can execute certain courses of actions to achieve positive outcomes and avoid errors that are known to occur. After certain courses of action have become routinized, IS users can execute certain IS tasks by rote. In addition, they can combine IS sub-skills to develop rule sets or carry out IS usage with greater complexity, thus enhancing the level of sophistication with which they can operate IS and their existing IS skill.

The IS domain is unique in that developing competency can be accomplished through continuous use and innovation with less serious consequences compared to some other domains that include performing medical procedures or experimenting with pharmaceutical innovations on humans. Also, the usability of IS continues to be improved such that more sophisticated use is easier to acquire or perform even for the novice IS user. With increased usability, even if modifications to existing IS are introduced, IS users can interact with the modified system to develop the needed skills to adapt to the modified system. Also, IS users who are familiar with a particular IS may be able to apply their existing knowledge to enact certain behaviors and explore another IS in the same domain (e.g., proprietary and open-source spreadsheets). Hence, IS behaviors can be adapted to similar IS to further develop one's IS user competency.

Interaction Among IS User Competency Components

As noted previously, IS user competency can be developed through the reciprocal interactions of the components of IS user competency. For instance, if an individual does not possess a *willingness* to experiment with IS (IS user cognitive/personal factor), then they will not engage in any IS behaviors to interact with and use the IS. Also, if an individual has a colleague or trainer who is able to model IS usage or application of various functions (IS environment), then this can also influence one's IS exploratory behaviors (IS behaviors).

IS users are not only able to learn how to use IS through their own enactive experiences (IS behaviors), but can also observe other IS users (IS environment). For example, individuals can observe other IS users execute certain courses of actions and achieve certain outcomes (IS environment), and then mimic the behavior themselves to enrich their conceptions (IS behaviors). They can also use their observations as a foundation with which to build IS user competency through additional experimental behaviors or actions (IS behaviors). As IS users engage in enactive learning, they can use their cognitive thought processes, such as abstraction, to the knowledge acquired through their actions to develop models, solutions, or scenarios (IS user cognitive/personal factor).

Summary

To summarize, IS user competency can be acquired through various IS factors and interactions among these factors. IS users can observe the performance of other IS users to acquire IS knowledge. Through their own enactive experiences, IS users can acquire IS skills through the informative feedback that is obtained from their actions. Also, IS users can use metacognitive capabilities to reflect and develop their own perceptions, abstractions, and conceptions of IS and IS use. IS user competency can then be obtained through all of the SCT factors, and through interactions of these factors.

IS Self-efficacy

All three IS factors in the IS user competency framework (i.e., IS user cognitive/personal, IS environmental, and IS user behavioral factors) are related to IS self-efficacy, which is also related to IS user competency (see Figure 1). In an IS user competency context, self-efficacy is associated with one's belief that they can proficiently and effectively use IS. Hence, when using an IS, IS self-efficacy can assist an individual in persevering through problems or issues that may arise and manage the anxiety the individual may experience. IS self-efficacy can influence the choice of IS

features to use (e.g., familiar versus unfamiliar IS features) and the level of effort and motivation with which one applies.

In the IS domain, one's IS self-efficacy can change due to the evolvement and innovation of IS. Because IS are modified to enhance usability and ease of use, IS users may also find that they have more positive beliefs in their ability to effectively use IS. If IS modifications are intended to facilitate greater integration with other applications or existing systems, then IS users may believe they are more capable of using IS to complete a given IS task or solve a problem with IS. However, the opposite or unintended impacts on IS self-efficacy can also occur. If IS are modified such that greater complexity is introduced or use is more problematic due to system errors, IS users' self-efficacy may decrease.

IS users' self-efficacy may vary across IS or technology. Although an IS user may feel greater levels of IS self-efficacy when using simple applications (e.g. word processing), the user may feel less self-efficacious when using more advanced or complex applications (e.g., database). Individuals may have less IS self-efficacy with applications that are more complicated or the methods of completing a task are less obvious. An IS user may have higher levels of self-efficacy regarding their general ability to use IS, but may have less self-efficacy regarding specific functions of IS (Marcolin et al., 2000). Alternatively, IS users may have high levels of self-efficacy regarding the ability to perform certain tasks (e.g., save, copy) with a familiar IS, which can then transfer to a novel IS requiring similar tasks to be performed (Marakas, Johnson, & Clay, 2007).

However, an IS user with a low level of IS self-efficacy may be able to improve their level of IS self-efficacy by additional training, practice, or experimentation with IS. Hence, IS self-efficacy is unique in that it can change with the rapid evolvement of technology in both a positive and negative manner, and it can vary across broad IS domains. IS users can obtain information through self-awareness of their own physiological states (e.g., tension felt during IS usage) and through persuasion from others (e.g., IS trainer or management). IS self-efficacy can, therefore, influence the amount of exertion an IS user is willing to put forth to develop IS user competency. These beliefs also influence the IS usage that one engages in and the IS functions or features that they are willing to use or experiment with. IS self-efficacy can influence the vigor that one applies to overcome challenges faced with IS use. Hence, IS self-efficacy can be a salient influence in the outcomes that one may realize and, ultimately, the IS user competency one is able to achieve.

IV. CONTRIBUTIONS AND RESEARCH IMPLICATIONS

Future research can use the proposed IS user competency framework that identifies IS factors associated with IS user competency (see Figure 1) as a foundation to explore these categories of factors and the impact they have on IS user competency. For example, although MIS research has identified some potential cognitive and personal factors, research is needed to identify other cognitive and personal factors that are relevant in an IS user competency context that have not yet been explored. Explorative or qualitative research may be needed to identify a comprehensive set of factors associated with IS user competency. For instance, suggestions have been put forth to study competency in high versus low performers (Lee, 2010; Spencer & Spencer, 1993; Woodruffe, 1993). Therefore, users with higher IS proficiency can be compared to those with lower IS proficiency.

IS User Cognitive/Personal Factors

Research is needed to develop a more thorough understanding of IS cognitive and personal factors in the context of IS user competency. For example, questions that warrant further research include the following: Which factors are most relevant? How do the factors interact or influence each other? Which of the factors are traits and need to be considered during interviews versus which are states that can be developed through interventions? Identifying the necessary characteristics associated with IS user competency can then be used as a template for hiring or developing IS users (Spencer & Spencer, 1993). Hence, fields outside of MIS, such as psychology, may need to be considered for identifying other relevant factors. For example, the five-factor model of personality suggests that personality traits can be organized along five dimensions: neuroticism, extraversion, openness, agreeableness, and conscientiousness (McCrae & Costa, 1997, 2004). According to trait theory, traits or personal dispositions are stable and consistent (Allport & Odbert, 1936). These generalized tendencies influence individuals' behaviors. The five-factor model could be used to identify personality traits that are associated with highly competent IS users and are relevant in an IS user competency context.

One's motivation is another potential personal factor that could be the topic of IS user competency research. The quality, versus quantity, and type of motivation are most relevant in influencing performance outcomes (Deci & Ryan, 2008). Self-determination theory proposes that, if an individual's need for competence, relatedness, and autonomy are fulfilled, the individual is more likely to be self-motivated (Ryan & Deci, 2000). Intrinsic motivation is an individual's intrinsic interest and desire to pursue challenging tasks, to learn, and to experiment. Intrinsic motivation

can be fostered if appropriate conditions are present. However, motivation that results in positive outcomes can also originate even if one is not initially intrinsically motivated. When external forces attempt to foster behaviors or facilitate certain actions to occur, an individual can either become unmotivated or become motivated if the individual adopts the value of the desired behavior or action as one's own (i.e., becomes self-determined).

Future research could explore the conditions needed to support intrinsic motivation in an IS user competency development context. Research could identify factors that influence feelings of competence, relatedness, and autonomy in an IS user competency context, which then fosters intrinsic motivation. Also, research could explore the potential for fostering self-determination, or adoption of the value of IS or its use, for individuals who are not initially intrinsically motivated to develop IS user competency.

As another example, future research could examine the influence of psychogenic needs in developing IS user competency (Schroth, 1985). Research could explore the role of need for power (e.g., IS users' desires to develop IS user competency in order to teach others or be promoted), need for achievement (e.g., IS users' desires to master the use of IS), and need for affiliation (e.g., developing IS user competency to increase one's sense of identity with a team of elite IS users or to connect with one's co-workers) in a IS user competency context. Research could also explore the potential of interdependence among these needs.

For IS user competency development-oriented research, future research could focus on relevant knowledge, skills, self-concepts, and beliefs. These factors may receive more intense focus considering that arguments have been made that other factors, such as traits and motives, are less likely to be modified through interventions (Wang & Haggerty, 2011). Also, a job-competency methodology could be employed in which no a priori characteristics that are associated with effective performance are identified (Spencer & Spencer, 1993). Instead, open-ended interviews could be conducted to identify context-specific characteristics.

Future research could employ some of the cognitive factors proposed by social cognitive theory specifically in an IS context to determine if appropriate interventions can improve IS user competency. For example, individuals can be taught self-regulated learning and self-reflection strategies when acquiring new IS skills through different modalities. The effectiveness of these strategies can be evaluated through various training modalities, such as online versus face-to-face setting. Research can explore interventions that foster forethought to solve problems or before learning to use novel IS. The focus can include transferring existing IS knowledge to a novel context, or reflecting on existing skill sets and the potential application to novel domains.

IS Environment

IS environmental factors have received much attention in MIS research in the context of IS use, such as top management support and facilitating conditions (e.g., Sabherwal, Jeyaraj, & Chowa, 2006). However, additional research is warranted to determine the impact of various environmental factors in the IS user competency context such as the type of incentive structures or reward systems that best promotes IS user competency. Research may explore variations such as explicit goals versus implicit expectations associated with job performance, team-based versus individual-based reward systems, and management-directed versus employee-directed IS user competency development efforts. These studies can also evaluate the impact on productive learning, in which performance improvements are fostered by appropriate incentive structures, and adverse learning, in which individuals develop strategies to obtain personal gains at the organization's expense (Obloj & Sengul, 2012). Individuals with high IS user competency may generate significant value for an organization when properly incentivized, but research could explore the possibility of negative outcomes. For example, individuals with high IS user competency can accurately predict time or resources to complete a task, but overstate one or both for personal gains such as completing the task below an overstated budget and reaping the financial gains provided by the incentive structures.

Also, research could explore the influence of learning from co-workers or third-party trainers on IS user competency. Fields outside of MIS, including theories from social psychology, could be referenced to explore the phenomenon. For example, IS users may voluntarily share IS knowledge and skills with other IS users. What is not clear is why they do so or what casual factors contribute to this phenomenon. Hence, research may explore theories such as norm of reciprocity that proposes that individuals who receive an act of kindness from someone feel an obligation to reciprocate (Strohmetz, Fisher, Rind, & Lynn, 2002). Hence, an IS user may help another because of feelings of obligation when they were once on the receiving end of assistance. Such altruistic behaviors could also arise or be explained by other reasons such as need for self-esteem (e.g., gaining respect from others), need for self-actualization (e.g., realizing personal potential), or transcendence needs (e.g., helping others to achieve self-actualization) that are associated with Maslow's hierarchy of needs (Maslow, 1943, 1954, 1970). Understanding such factors could help to increase IS user competency in an organizational context.

Research could explore other environmental factors that have the greatest salience in IS user competency, and the influence these environmental factors have on other components (i.e., IS personal/cognitive factors and IS behaviors). For instance, research could evaluate the impact that instant feedback provided by IS in an IS training environment can have on one's IS user competency. Considering the popularity of web-based training and self-paced tutorials, the nature of these training environments and the associated impact on IS user competency development could be explored. Also, research could investigate the nature of synchronous versus asynchronous learning environments in IS user competency development. This could be extended to evaluate IS users' propensity to engage in exploratory behavior with an IS when instant IS support is present versus when support is delayed. Research could evaluate the impact of using a prototype IS during training with restricted versus unrestricted tolerances for exploration and the resulting influence on IS user competency.

IS Behavior

Research could explore the impact of enactive learning in an IS user competency context. For example, the impact on IS user competency could be assessed when learning through scripted actions versus trial-and-error approaches. IS users could also be taught methods of developing IS solutions and strategies to deploy when learning IS or solving problems before they engage in enactive learning activities. They could be encouraged to develop their own rule sets when exploring IS and taught how to employ these rules when encountering a novel problem, with the resulting impact on IS user competency assessed.

Research could examine IS user behaviors from the perspective of exploration and exploitation. Exploration encompasses experimenting, taking risks, and generating new ideas (March, 1991; McGrath, 2001). Exploitation, on the other hand, entails implementing existing ideas, selecting and implementing known options, refining existing processes or ideas, and focusing on gaining efficiencies. Allocating resources towards one pursuit means sacrificing resources that could have been allocated to the other. If all resources are allocated to exploration, then the ability to capitalize on the new discoveries or developments would not come to fruition. However, if all resources are allocated to exploitation, then new developments and discoveries would be thwarted, and evolvement would be limited. Hence, identifying an optimal balance is essential.

In an IS user competency context, exploration could entail experimenting with and discovering new uses for an IS or new IS functions that were previously unknown. Exploitation could entail leveraging existing IS knowledge to implement IS functions, or refining existing IS skills to generate greater efficiencies in completing a task. Research could evaluate both behaviors and the contribution to IS user competency and explore the optimal balance needed to achieve IS user competency.

Interaction Among IS User Competency Components

Although the IS user is one component of achieving proficient IS usage, other components that influence proficient IS usage could be taken into consideration as well in future research. Boyatzis (1982) has proposed that effective performance is possible when there is coherence among three requisite components: an individual's competencies, the environment, and the task's demands. Hence, research could explore IS user competency and scrutinize the appropriate environmental influences and the structure of tasks on achieving proficient IS usage, and the interaction of these components.

IS Self-efficacy

Extensive research has explored the role of computer and IS self-efficacy in various contexts (e.g., Compeau & Higgins, 1995; Marakas, Johnson, & Clay, 2007; Thatcher & Perrewé, 2002), but additional research is needed to determine its role in an IS user competency context. Social cognitive theory highlights that self-efficacy, or the belief that one has in one's abilities to perform a task or activity, can be related to other personal/behavioral factors (Bandura, 1986, 1997). Previous social cognitive theory propositions and research in MIS have supported the relationships between self-efficacy and various perceptions and dispositions. Therefore, a related question to be addressed is the potential association that IS self-efficacy has with other IS-specific factors associated with IS user competency.

Also, the influence of IS modifications on IS self-efficacy could be evaluated along with the rate of change or expediency in which one's IS self-efficacy can be modified. For example, if a more complex IS is introduced to individuals, research could assess the potential decrease in IS self-efficacy and whether the decrease occurs at a more rapid rate for individuals with low levels of IS user competency versus those with higher levels. The research could be extended to also evaluate the method of introduction to IS modifications. For example, novel IS may be presented in its entirety (e.g., all IS modules at one time) versus incrementally (e.g., one IS module at a time) and the resulting impact on IS self-efficacy evaluated.

V. CONCLUSION

The need to identify factors associated with IS user competency is important in identifying and developing IS users who can proficiently use IS. This paper contributes to this endeavor by developing a conceptual foundation of IS user competency and proposing an IS user competency framework for future research. Future research could consider the relevant factors of IS user competency proposed here under the propositions of social cognitive theory that encompasses cognitive/personal, behavioral, and environmental factors. Also, future research could take into account the triadic reciprocal relationship among these factors and their impact on IS user competency development. In summary, defining and identifying a framework to study IS user competency is a first or inaugural step towards developing a comprehensive understanding of IS user competency.

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