7-21-2010

# Towards a Model of Information Systems User Competency

Brenda Eschenbrenner
*University of Nebraska at Lincoln*

# TOWARDS A MODEL OF INFORMATION SYSTEMS USER COMPETENCY

**by**

**Brenda Eschenbrenner**

**A DISSERTATION**

**Presented to the Faculty of**

**The Graduate College at the University of Nebraska**

**In Partial Fulfillment of Requirements**

**For the Degree of Doctor of Philosophy**

**Major: Interdepartmental Area of Business (Management)**

**Under the Supervision of Professor Fiona Fui-Hoon Nah**

**Lincoln, Nebraska**

**August, 2010**

# TOWARDS A MODEL OF INFORMATION SYSTEMS USER COMPETENCY

Brenda Eschenbrenner, Ph.D.
University of Nebraska, 2010

Advisor: Fiona Fui-Hoon Nah

The ability to utilize information systems (IS) effectively is becoming a necessity for business professionals. However, individuals differ in their abilities to use IS effectively, with some achieving exceptional performance in IS use and others being unable to do so. Therefore, developing a set of skills and attributes to achieve IS user competency, or the ability to realize the fullest potential and the greatest performance from IS use, is important. Various constructs have been identified in the literature to describe IS users with regard to their intentions to use IS and their frequency of IS usage, but studies to describe the relevant characteristics associated with highly competent IS users, or those who have achieved IS user competency, are lacking. This research develops a model of IS user competency by using the Repertory Grid Technique to identify a broad set of characteristics of highly competent IS users. A qualitative analysis was carried out to identify categories and sub-categories of these characteristics. Then, based on the findings, a subset of the model of IS user competency focusing on the IS-specific factors – domain knowledge of and skills in IS, willingness to try and to explore IS, and perception of IS value – was developed and validated using the survey approach. The survey findings suggest that all three factors are relevant and important to IS user competency, with willingness to try and to explore IS being the most significant factor.

This research generates a rich set of factors explaining IS user competency, such as perception of IS value. The results not only highlight characteristics that can be fostered in IS users to improve their performance with IS use, but also present research opportunities for IS training and potential hiring criteria for IS users in organizations.

# ACKNOWLEDGEMENT

Many individuals contributed their time, effort, and support to assist me in completing this dissertation. To every one of them - I am eternally grateful!

I would like to especially acknowledge my advisor, Dr. Fiona Nah. Her support and guidance were absolutely priceless. Also, her dedication and expertise in research has made it a great honor for me to work with and learn from her. I am grateful for both her mentorship and friendship. Thank you!

I would also like to thank the members of my dissertation committee, Dr. Keng Siau, Dr. Sid Davis, and Dr. Linda Ruchala. I appreciate the valuable time they spent reviewing my manuscript, as well as their perspectives and added insights which contributed to the development of the dissertation. It has been a wonderful opportunity to work with them.

Finally, I would like to thank my family and friends for all of their support and encouragement. Special thanks go to my husband, Wade, for his unconditional love and willingness to always pick up the "extra load" while I was busy with my research endeavors. Also, special gratitude goes to my children, Brooke and Matthew, for being very patient and understanding while I was busy with my "school work," and for always knowing when and how to make me laugh.

# TABLE OF CONTENTS

# CHAPTER 1

# INTRODUCTION

Chapter one introduces the research motivation, question, and approaches used in the dissertation. It also highlights the expected contributions and provides an overview of the organization of the dissertation. The research question – *What are the relevant factors of IS user competency?* – is addressed by carrying out both inductive and deductive data analyses. More specifically, the Repertory Grid technique and survey research methods are utilized to identify the factors associated with IS user competency and to test the proposed relationships. The findings will highlight important factors for achieving IS user competency.

## 1.1 Research Motivation

The ability to utilize information systems (IS) in an effective manner that capitalizes on the opportunities that IS can provide is becoming increasingly important for business professionals. However, some users are less likely than others to experience such benefits from using IS. Although these individuals may be able to utilize IS for routine tasks or apply IS in manners previously demonstrated to them, they are not able to effectively use IS such that they can get the maximum benefits from IS use. For example, Jasperson, Carter, and Zmud (2005) found 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).

Ineffective use can lead to issues such as low return on investment of IS or inabilities to develop competitive advantages using IS. For example, less competent

users may not be able to adapt IS to novel situations or know how to utilize IS to address problems that arise. They are also less likely to be able to apply subject-matter knowledge if their IS skills are lacking. For instance, Mackay and Elam (1992) found that in the application of a decision aid to resolve a problem, users needed to develop a certain level of expertise before they could apply their subject-matter knowledge. As the need for proficient and quality IS usage continues to grow, it is important to examine and understand key characteristics of those who are able to achieve effective IS usage, and foster these characteristics among IS users to increase their proficiency in using IS. In this research, the objective is to identify user characteristics that can contribute to competent IS usage.

Achieving this objective is important because intentions to use or adopt IS, which has been studied extensively in the MIS literature, does not necessarily translate into effective IS use. Hence, the findings from this dissertation to understand characteristics of highly competent IS users can provide insights into specific characteristics and skills that could be fostered in potential training interventions to improve IS competencies. Successfully training users in IS requires identifying those characteristics which are relevant and trainable, and then developing training programs that reflect those particular characteristics (Shanteau, 1989). Therefore, the findings from this dissertation can help to address current issues with IS usage by identifying factors that contribute to competent IS usage and that can potentially be fostered among users.

## 1.2 Research Question

The specific research question for this dissertation is: *What are the relevant factors of IS user competency?*

Competency relates to "skills, behaviors, and capabilities that allow employees to perform specific functions" (Levy, 2006, p. 78). Although competencies have been identified in other contexts such as leadership competencies (Goleman, Boyatzis, & McKee, 2002), the context of this research is IS user competency, which refers to competency achieved by individuals who are not only able to efficiently and effectively complete routine tasks, but are also able to accomplish novel tasks using IS. IS user competency focuses on proficiency in using IS, which is different from other competencies, such as leadership competencies, where characteristics such as transparency and empathy towards others are important (Goleman et al., 2002).

IS user competency is not well understood or researched (Marcolin, Compeau, Munro, & Huff, 2000; Yoon, 2008). Studying competency specifically in an IS context is warranted because of its uniqueness in human-computer interactions, as compared to other types of competencies. In this research, the focus is on studying characteristics of highly competent IS users who utilize IS within organizational boundaries to accomplish specific tasks in order to identify factors that are relevant to IS user competency.

## 1.3 Research Approaches

In order to develop an in-depth understanding of IS user competency and its relevant factors, a literature review is first conducted followed by a review of relevant theories. In this dissertation, an IS user competency model is developed and the IS-

specific factors in the model are then validated. To develop the model, a qualitative study is utilized to identify the characteristics of individuals who have developed IS user competency. Then, a partial model is validated with a quantitative study using the survey approach to test the resulting IS-specific factors of the IS user competency model derived from the qualitative study.

To address the research question, this research adopts a variance strategy approach, versus a process strategy approach which focuses on a sequence of events, to study IS user competency as a *final* state or outcome, or one in which a highly competent user has achieved IS competency (Sabherwal & Robey, 1995). Considering the ontological assumptions surrounding the variance strategy, a variance strategy entails "describing the states" of constructs (Sabherwal & Robey, 1995, p. 307). For example, previous research on avoidance behaviors of malicious information technology viewed the phenomenon from both a process and variance perspective (Liang & Xue, 2009). More specifically, their research examined the dynamic occurrence of the behaviors which entailed cognitive appraisals and the engagement of coping behaviors (i.e., process-oriented perspective) as well as identified key factors and the relationships among them that influenced the process (i.e., variance-oriented perspective).

The variance approach essentially captured the process perspective at a specific point in time (Liang & Xue, 2009). For this dissertation, the variance strategy approach is implemented to develop an understanding of IS user competency at the point in time where users have achieved IS user competency, rather than the process that occurred to develop the competency. Both the qualitative and quantitative research methods can be applied to either the variance or process strategy (Sabherwal & Robey, 1995). Using the

variance approach, the Repertory Grid technique is used in this dissertation to identify the unique characteristics of individuals who have attained IS user competency. Then, a survey is utilized to validate the resulting IS-specific factors.

Both inductive and deductive processes of inquiry are applied to this research study. Inductive logic aligns with the beliefs that multiple realities exist and inductive analyses are more likely to expose a fuller accounting of a phenomenon (Lincoln & Guba, 1985). The analysis typically entails studying the field data that is accumulated and coding it into common units or categories. The process starts with the data and then proceeds to theoretical categorizations and propositions. Hence, *a priori* theory or existing variables are typically not considered in the analysis or sense-making of the data.

On the other hand, the deductive process typically entails hypothesis testing derived from the use of laws or theory to explain a phenomenon. The relationships among variables are specified *a priori* through deductions of existing theory (Lincoln & Guba, 1985). The deductive analysis then entails acquisition of empirical data to confirm or disconfirm the hypotheses. For this research study, applying both processes lends to developing a richer understanding of IS user competency and the factors associated with IS user competency, as well as providing a means of developing support for the relationships between IS user competency and these factors. Additionally, both inductive and deductive processes are applied in this dissertation to triangulate and validate the findings. The Repertory Grid technique and content analysis approaches are utilized for inductive data analysis, and the survey method with covariance-based structural equation modeling is utilized for deductive data analysis.

In summary, this research develops a model of IS user competency and then validates a partial model comprising IS-specific factors. To accomplish this, the following steps were taken:

(i) Model development: A qualitative study was used to explore and identify both broad IS user competency factors as well as IS-specific factors. Specifically, the Repertory Grid approach was used to identify characteristics of highly competent IS users, or those who have achieved IS user competency. This inductive approach is used to develop a comprehensive list of potential characteristics of highly competent IS users (i.e., factors of IS user competency) which helps to fill an important gap in the literature to understand competency in the IS context.

(ii) Validation of partial model: A quantitative study was conducted to validate a partial IS user competency model that focuses on IS-specific factors. A survey was administered to test the IS-specific factors in the IS User Competency model developed using the inductive approach. This deductive approach is used to validate these IS-specific factors. The findings provide insights into factors that are relevant to IS training and development.

### 1.4 Theoretical and Practical Contributions

The findings from this research will broaden our understanding of factors associated with IS user competency. The qualitative study is intended to identify the relevant factors of IS user competency, both general and IS-specific. From the findings, a model of IS user competency is developed. The quantitative study validates the partial model involving IS-specific factors. This research extends Social Cognitive Theory to

explain IS user competency. In particular, the study identifies factors specific to the IS user competency context, and tests relationships of these factors with IS user competency. Practical contributions include identifying factors that can be fostered in users through training or interventions, as well as those to be used as hiring criteria for IS users in organizations.

### 1.5 Organization of Dissertation

The dissertation consists of seven chapters: 1) Introduction, 2) Literature review, 3) Theoretical foundation, 4) Qualitative study – development of a model, 5) Quantitative study – validation of a partial model, 6) Contributions and implications, and 7) Conclusion.

Chapter one provides the research motivation, the research question and approaches, as well as a summary of theoretical and practical contributions. Chapter two presents the literature review. Chapter three provides a review of Social Cognitive Theory and self-efficacy. Chapter four presents the qualitative study based on the Repertory Grid technique to develop a model of IS user competency. Chapter five presents the quantitative study, using a survey approach, to validate a partial model of IS user competency comprising IS-specific factors identified in the qualitative study. Chapter six provides the theoretical and practical contributions and implications. Chapter seven summarizes the research findings and addresses the limitations and future research.

# CHAPTER 2

# LITERATURE REVIEW

Chapter two provides a review of the literature associated with IS user competency. First, the literature review provides a background of issues associated with IS usage. Next, the review addresses current research on IS usage. Definitions of the key constructs utilized in this research are then provided. Finally, a review of the literature associated with competency and potential IS competency factors are presented.

## 2.1 Background

The reasons behind variations in IS usage are multi-dimensional (Auer, 1998). One aspect is the differences among individual users themselves. For example, Boudreau (2003) studied a state institution's successful implementation of an enterprise system and found different degrees of usage. Some individuals were identified as becoming functional, experienced users of the system, and utilized it beyond the rudimentary ways to develop processes that better suited their needs. Others struggled with using the system, remained less functional, and relied on their more proficient colleagues for assistance. This example of variations in usage can lead to lower efficiencies in completing a task or lower quality of task performance. Poor quality of IS usage can hinder an IS user's ability to utilize IS effectively or discover new utilizations of IS. In this research, the focus is to understand factors that are associated with IS user competency.

Providing perspectives on directions for IS research, Agarwal (citing Lee 2001) 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." (Lee, 2001, p. xiv).

IT human capital is defined as "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). The context of this research focuses on the latter group of organizational members who use IS on a regular basis in their jobs. These individuals who are able to effectively apply IS to the fullest possible extent to maximize their job performance are referred to as highly competent IS users and these abilities are labeled IS user competency.

Jain and Kanungo (2005) studied the nature of IS use, or the differences in the ways IS are used, and its impact on IS-enabled productivity. They suggest that the differences in IS usage may arise from many individual factors, such as personality, and that further research is needed to identify these antecedents and relationships with nature of IS use. More specifically, the question that exists among many in research and practice is: How are some individuals able to experience proficient IS usage?

## 2.2 IS Usage

To date, the MIS literature has mainly focused on perspectives of and factors influencing IS usage (e.g., multilevel factors), and studying intentions to use or adopt IS, as well as actual or frequency of IS usage (Burton-Jones & Gallivan, 2007; Burton-Jones & Hubona, 2006; Burton-Jones & Straub, 2006; Cenfetelli, 2004a, 2004b; Compeau, Meister, & Higgins, 2007; Karahanna, Straub, & Chervany, 1999; Lending & Straub, 1997; Straub & Limayen, 1995; Thompson, Compeau, & Higgins, 2006; Thompson & Higgins, 1991), all of which do not necessarily translate into effective IS use or IS user competency. In the context of complex technology, it is more appropriate and critical to study quality of use (Boudreau & Seligman, 2005). Furthermore, successful implementation or frequent usage of a complex IS does not necessarily mean that high quality usage is taking place, which is important if benefits from the system are to be realized. Enriching our understanding of use is important because it allows us to better understand organizational outcomes of technology use (Karahanna et al., 1999).

In reviews of system usage in terms of actual systems use (versus information use), a wide range of usage measurement exists (Burton-Jones & Straub, 2006). Examples of usage measurement include appropriateness versus inappropriateness of use, decision to use or not to use, proportion or percentage of use, and extent of use (e.g., counts of systems or functions). Therefore, Burton-Jones and Straub (2006) argue for the need to reconceptualize the usage construct not as one concept or measure but as one that is relevant to a particular context. They also suggest that diversity in conceptualization can provide support for progress. Reconceptualizing IS usage should be performed with

a disciplined approach to diversity. Considering the paucity of research that exists regarding IS user competency, studying IS usage in the competency context is justified because it can advance and support progress in research by providing important insights into this aspect of IS usage in the context of IS user competency.

Various conceptualizations of individual system usage have emerged. For instance, innovation infusion at the individual level is defined as "the extent to which the full potential of the innovation has been embedded within an individual's work system" (Meister & Compeau, 2002, p.24). The authors further define full potential as "the usage in all possible and appropriate applications" (Meister & Compeau, 2002, p.24). The construct encompasses both scope (i.e., variety of purposes) and intensity (i.e., time) of use, as well as satisfaction with use. However, IS user competency encompasses obtaining the greatest performance as well as realizing the full potential from IS use. This concept encompasses obtaining the maximum benefits that IS can provide and developing novel uses of IS, which is more extensive than just the variety of purposes it is used for, and does not directly account for the amount of time or satisfaction with IS use. Although an IS user may increase or extend the number of system features used, this may not improve performance outcomes considering they may be using the system features in an unproductive manner (Jasperson et al., 2005).

Also, concepts such as loyal use have been developed and defined as "a type of future use in which use of the technology has become part of the user's routine" (Clay, Dennis, & Ko, 2005, p.1). Incorporating this concept in the context of knowledge management systems, the loyal use conceptualization encompasses "the prolonged appropriation of the system that fundamentally changes behavior to incorporate KMS use

into the user's ongoing routine" and "a commitment to repeatedly consume knowledge content from the system consistently in the future" (Clay et al., 2005, p. 2). Other examples of IS usage conceptualizations include trying to innovate with IT, which is defined as "an individual's goal of finding novel uses of information technologies" (Ahuja & Thatcher, 2005, p. 435) and intention to explore, which is defined as "A user's willingness and purpose to explore a new technology and find potential use…a user's purpose and motivation to innovate based on the perceived business related benefits she will derive from IT deployment" (Nambisan et al., 1999, p. 373). However, none of the above encompasses the focus of this research which is to understand IS user competency or the ability to realize the full potential of IS and obtain the greatest performance from IS use.

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). The authors 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" (Jasperson et al., 2005, p.531). The IS user competency construct represents the ability of an IS user to exploit and extend IS applications to maximize task performance. To do so, Carte, Schwarzkopf, Shaft, and Zmud (2005) found project teams' performances as being enhanced by individuals who maintained both relevant business and technology capabilities. Considering the benefits that can be gained from such abilities but the dearth of research

that exists in this domain, studying IS user competency can contribute to both research and practice.

### 2.3 Definitions and Conceptualization of IS User Competency

Several constructs have been used to describe effective IS usage and highly performing IS users in the literature. Marcolin et al. (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). 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) and Boudreau (2003), *IS user competency*, which is the key construct in this research, refers to the *ability to realize the fullest potential and the greatest performance from IS use*. Adapting from Marcolin et al. (2000), Boudreau (2003), and Levy (2006), the *highly competent IS user* construct in this research is defined as one who has the skills, behaviors, and capabilities to utilize IS to the fullest potential and obtain the greatest performance from IS use.

IS, for this research, is defined as a technology-driven system that collects, processes, stores, and distributes information to support the operations, analysis, and decision-making of an organization (Laudon & Laudon, 2006). In this research, a human agency perspective is taken, or one that recognizes that humans have freedom to utilize and deploy technologies in various ways, including in novel and beneficial manners (Bandura, 1989; Boudreau & Robey, 2005). More specifically, the research focus is in understanding what factors are important for IS user competency.

## 2.4 Review of Competency

In reviewing previous research in IS user competency, studies have focused on other related aspects such as IT competence in business managers and its outcomes (Bassellier, Reich, & Benbasat, 2001). Bassellier et al. (2001) recognize "competence as a skill" (p. 162), "competence as a personality trait" (p. 163), and "competence as knowledge" (p. 164). All three dimensions are examined inclusively in this research, but from the perspective of user competency in IS rather than management and championship of IT, which is the focus in Bassellier et al.'s (2001) study. They conceptualize IT competence as the set of IT-related knowledge and experience that a business manager possesses and examine the effect on IT championship. Unlike their research which focuses on the outcomes of IT competency, the focus of this research is on the factors contributing to IS user competency.

The development of competency frameworks or models has taken place in other domains. For instance, 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.

These competency models assist in identifying the necessary skills, knowledge, and behaviors that an employee needs to successfully perform a particular role or job function (Naquin & Holton, 2006). Evaluation criteria are built upon these required skill

sets and the desired level of competency that should be demonstrated to successfully perform the function or required tasks. Assessments, which are based on the evaluation criteria, are performed such that gaps can be identified and specific training or interventions are conducted to reduce the gaps. These competency models can then be used to continuously monitor progress until the level of competency desired is reached. These models have also been utilized as guidance for performance evaluations and interviews.

Competency models have been utilized for various positions, such as healthcare leadership (Calhoun et al. 2008), human resource development (Chen, Mind-Dau, & Yi-Ming, 2005), technical managers in research and development (Rifkin & Fineman, 1999), and finance professionals (Scott, 1998). 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 for human resource development professionals include interpersonal/relationship building (Chen et al., 2005). Neither of these would be relevant to an IS user competency context. Considering that effective IS usage continues to be problematic in real-life, the development of such a framework or model could help improve or develop IS user competencies. Because other domain competency models are not entirely applicable to IS user competency, pursuing such an endeavor is warranted and has potential for contribution to both practice and research.

## 2.5 IS Competency Factors

The literature review also entailed identifying various factors or constructs identified or studied by IS researchers that may or may not be associated with IS user competency. Table 1.1 presents a summary of these constructs from a review of the MIS literature. Most of these constructs have been utilized to explain intentions to use IS and actual usage in terms of frequency, but not in the context of achieving IS user competency. In short, there has been no cohesive or integrative effort to identify the key factors contributing to IS user competency.

**Table 1.1: Previous Research Constructs**

| Source | Construct | Description | Findings |
|---|---|---|---|
| Agarwal & Prasad, 1998 | Personal Innovativeness in the Domain of IT (PIIT) | "The willingness of an individual to try out any new IT" (p. 206) | Validated scale for measuring PIIT. Found significant moderation for perception of compatibility and usage intentions. |
| Ahuja & Thatcher, 2005 | Trying to Innovate with IT | "An individual's goal of finding novel uses of information technologies" (p. 435) | Developed a measure for examining post-adoption IT use; Found that work environment factors (overload and autonomy) are antecedents to trying to innovate with IT, overload and autonomy interact, and the interactions vary by gender. |
| Amabile, 1983, 1996 | Components of Creativity | A novel and appropriate, useful, correct or valuable response to the task at hand | Identifies Components of Creativity: domain-relevant skills (or expertise), creativity-relevant skills (or creative thinking), and task motivation. |
| Bandura, 1997; Compeau & Higgins, 1995b; Thatcher & Perrewé, 2002 | Self-efficacy; Computer Self-efficacy | Beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments or a judgment of one's capability to use a computer | Development and validation of measurement. Compeau & Higgins (1995b) found computer self-efficacy to influence affect (or liking), computer anxiety, outcome expectations, and actual usage. Self-efficacy positively influenced by work group associates and their usage. Thatcher & Perrewé (2002) found computer self-efficacy to be influenced by computer anxiety and personal innovativeness in IT. |

| Source | Construct | Description | Findings |
|---|---|---|---|
| Burger & Blignaut, 2004; Loyd & Gressard, 1984 | Computer Attitude | Computer attitude is a mental state of mind which influences the way a person reacts towards computers… Computer attitude is composed of Computer Liking, Computer Anxiety, and Computer Confidence | Found negative relationship between computer attitude and computer experience; Examine reliability and validity of Computer Attitude Scale. |
| Butler & Gray, 2006 | Mindfulness | Individual mindfulness includes reasoning about new phenomena (openness to novelty), viewing situations from multiple perspectives (awareness of multiple perspectives), evaluating similarities and differences (alertness to distinction), recognizing the features of the present issue (sensitivity to different contexts), and orienting in the current situation (orientation in the present) | Suggest including individual and collective mindfulness in studies of design, use, and management of IS in realizing reliable work performance. |
| Chung & Tan, 2004 | Focused attention/control (antecedents of perceived playfulness) | Focused attention is a user's attention being completely absorbed in the interaction, and control is perception of being in charge of a given activity | Studied the antecedents of perceived playfulness and found focused attention and control to be important cognitive dimensions. |

| Source | Construct | Description | Findings |
|---|---|---|---|
| Clay et al., 2005 | Loyal Use in the context of Knowledge Management Systems | "The prolonged appropriation of the system that fundamentally changes behavior to incorporate KMS use into the user's ongoing routine" and "a commitment to repeatedly consume knowledge content from the system consistently in the future" (p. 2). | Found perceived usefulness, perceived ease of use, and extrinsic motivation to positively influence loyal use, and voluntariness to negatively influence. |
| Fagan, Neill, & Wooldridge, 2003-2004; Torkzadeh & Angulo, 1992; Thatcher & Perrewé, 2002 | Computer Anxiety | Anxiety or fear experienced when confronted with possibilities of computer usage or the tendency of individuals to be uneasy, apprehensive, or fearful about current or future use of computers | Studied relationships among computer self-efficacy, anxiety, experience, support and usage. Found computer anxiety negatively related to self-efficacy and experience; Presents the concept, correlates, and suggestions for future research. Computer anxiety is influenced by personal innovativeness in IT and trait anxiety, and influences computer self-efficacy. |
| Ghani & Deshpande, 1994 | Theory of Optimal Flow | The state in which people are so intensely involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost | Sense of control and task challenge factors resulted in optimal flow. Flow related to exploratory behavior which was related to extent of computer use. |

| Source | Construct | Description | Findings |
|---|---|---|---|
| Nambisan et al., 1999 | Technology Cognizance | A technology user's knowledge of a technology's capabilities, its potential uses and features, as well as its cost and benefits. | Organizational mechanisms (attending IT conferences, subscription to IT journals, joint ventures, and vendor demonstrations) associated with acquisition of industry specific IT knowledge and context-free IT knowledge were found to be significant determinants of technology cognizance. |
| | Ability to Explore | A technology user's perceived competence in appropriately applying the necessary cognitive and physical resources to conduct technology exploration. | Organizational mechanisms (user groups, customer support unit, user lab, and relationship manager) associated with conversion of industry specific IT knowledge and context-free IT knowledge into firm specific IT knowledge was found to be significant determinants of ability to explore. |
| | Intention to Explore | "A user's willingness and purpose to explore a new technology and find potential use…a user's purpose and motivation to innovate based on the perceived business related benefits she will derive from IT deployment" (p. 373). | Organizational mechanisms (IT steering committee, strategic IT planning committee, and IT task group) associated with acquisition of firm specific IT knowledge was found to be a significant determinant of intention to explore. |

| Source | Construct | Description | Findings |
|---|---|---|---|
| Rank, Pace, & Frese, 2004 | Creativity and Innovativeness | Creativity refers to idea generation, whereas innovation refers to idea implementation… Creativity is truly novel, whereas innovation can be based on ideas that are adopted | Identified research gaps in process differentiation, integration of concepts, and cross-cultural analysis. |
| Webster & Martocchio, 1992 | Microcomputer Playfulness | Degree of cognitive spontaneity in microcomputer interactions | Developed measure and found microcomputer playfulness to have positive relationships with computer attitude, computer competence, computer efficacy, and an inverse relationship with computer anxiety. |

In summary, the literature seems to suggest that certain factors that may be important for IS user competency include not only creativity, innovativeness, playfulness, willingness to accept and use technology, being unafraid of technology, and willingness to explore technology, but also a prominent sense of self-efficacy and a positive computer attitude. However, the various constructs identified from the literature review have been utilized mainly to describe intentions to use IS and its actual usage, but not to describe achieving levels of IS user competency, or the ability to realize the fullest potential and the greatest performance from IS use. Some of these factors may be relevant to IS user competency. However, there may also be *new* constructs that have not been previously identified. The literature review suggests that there has been a lack of empirical studies or integrative research to understand IS user competency. Hence, the research question posed for this study is: What are the relevant factors of IS user competency? Generating

an understanding of the factors that are important to IS user competency presents opportunities to identify any link between current research constructs (i.e., those presented in Table 1.1) to a highly competent level of using IS (i.e., the ability to realize the full potential of IS and obtain the greatest performance from IS use) as well as to determine if other constructs might be relevant to IS user competency.

# CHAPTER 3

# THEORETICAL FOUNDATION

Chapter three presents the theoretical foundation related to IS user competency. First, Social Cognitive Theory is reviewed because of its relevance to competency development. Next, self-efficacy, which is an important construct in Social Cognitive Theory, is discussed. Self-efficacy refers to one's belief of one's abilities to perform a certain task. Finally, a summary of the theory and its relation to this research is provided.

## 3.1 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). According to Bandura's Social Cognitive Theory (SCT) (1977, 1986), human behavior is not driven primarily by external stimuli or by inner forces. Instead, the theory proposes an interactive model in which *behavioral*, *environmental*, and *cognitive*/other *personal* factors are "triadic reciprocal determinants" of each other. As an example, an individual selecting a television show to watch is affected by his or her personal preferences of shows (personal factor), the available shows to watch (environmental factor), and the individual's own viewing or browsing behavior of selecting a show (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 symmetrical in strength or simultaneous, but

may vary by activity and circumstances. In addition, reciprocal interactions can occur within each of the factors.

Also, the SCT perspective advocates that individuals have a certain set of capabilities and cognitive regulators (i.e., symbolizing, forethought, vicarious capability, self-regulation, and self-reflection) which are discussed below (Bandura, 1986).

One of the capabilities proposed by SCT is symbolizing or the ability to create mental models (Bandura, 1986). The ability to symbolize allows individuals to provide meaning to immediate experiences. Also, the internal models that individuals create can be utilized to guide future behaviors. Hence, people can mentally develop and test solutions to problems before enacting them.

Another individual capability proposed by SCT is forethought (Bandura, 1986). Individuals do not consistently engage in a reactive nature to events, but also anticipate consequences and reactions to future events. Much of the purposive behavior of individuals is guided by forethought. Hence, individuals can cognize consequences of future behaviors, and then set goals or develop courses of action. This ability is founded on the individual's symbolic capabilities.

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. Therefore, individuals can create their own rule sets based on these observations and don't have to learn only through their own experiences. This capability is especially advantageous when learning novel behaviors is most effectively done through social modeling and cues. This

capability can also enhance the efficiency with which individuals can learn or develop competencies.

Self-regulatory mechanisms are another set of distinctive abilities advocated by SCT (Bandura, 1986). Through evaluations of personal standards, individuals can regulate and motivate their own behaviors rather than base their actions on the preferences of others. Individuals assess their performance against these standards, and then self-react to these evaluations. These self-reactions then provide guidance to future behaviors.

Self-reflection or reflective self-consciousness is the final capability proposed by SCT (Bandura, 1986). Individuals are not only able to analyze their experiences, thought processes, and existing knowledge, 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.

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 factors 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, their own experiences, or by observing others. What remains uncertain, is the relevant set of personal/behavioral factors that are necessary for IS user competency.

### 3.2 Self-Efficacy

Social Cognitive Theory (SCT) also incorporates the influence of self-efficacy on behaviors and the development of competencies. Bandura has noted the following in describing self-efficacy (Bandura, 2007, p. 646):

> 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. The operative nature of perceived self-efficacy is an integral feature of the procedure used to access people's efficacy beliefs. 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 he or she can perform a particular task (Bandura, 2007). Self-efficacy can help manage various stressors or pressures that one may experience (Bandura, 2007). Hence, self-efficacy pertains to the *beliefs* that one can overcome various anxieties that may prohibit them from accomplishing a task. For example, although self-regulation is considered a skill, self-regulatory efficacy is one's confidence that one can prompt oneself to perform an activity persistently despite whatever impediments that one may encounter, such as other commitments or work pressures. In developing scales of self-efficacy, items are termed relative to the degree of assurance that an individual can overcome levels of impediments associated with an activity.

Various mechanisms have been demonstrated to influence self-efficacy, including self-motivation mechanisms such as proximal goal-setting and self-evaluations (Bandura & Schunk, 1981). Self-efficacy has been found to be positively related to academic performance, intrinsic interest, perseverance, and positive attitude (Bandura & Schunk, 1981; Bandura, 1986). Self-efficacy can affect an individual's choice of activities to pursue, the amount of effort they will expend, the duration of their persistence, 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). Therefore, self-efficacy may relate to various factors of highly competent IS users which, in turn, may determine their IS user competency.

Self-efficacy is advantageous when it contributes to engaging in activities that foster competency growth (Bandura, 1986). One's self-efficacy can enhance new sub-skill development when it draws on existing sub-skills to develop new patterns of behavior. In assessing the relationship of self-efficacy to performance, judgments vary on several dimensions: level (simple to complex tasks), generality (domain-specific to general), and strength (weak to strong). This relationship can be problematic if the sub-skills required by the task are unknown or obscure, such that discrepancies between performance and self-efficacy judgments can arise. Also, problems can be present if individuals cannot monitor their performance, do not have specific goals to achieve, are constrained by external factors, or misjudge their self-efficacy. Therefore, holding high levels of self-efficacy can assist in developing competencies, but does not provide

certainty that competencies will be achieved. Hence, other variables, such as personal/behavioral factors, may be relevant as well.

Four sources of one's self-knowledge regarding their efficacy include enactive attainment, vicarious experiences, social and verbal persuasions, and assessing their physiological states (e.g., experiencing stress or tension may be read as cues of inability) (Bandura, 1986). The extent to which one's self-efficacy is influenced by information through performance experiences is influenced by task difficulty, effort exerted, temporal associations and patterns of failures and successes, circumstances surrounding the performance, interpretation of successes and failures (i.e., attributions to internal ability versus external factors), biases in performance self-monitoring, and the presence of external aids. Therefore, a variety of external and internal mechanisms have been identified that foster the self-efficacy that one holds. What is not clear is the set of personal/behavioral factors that self-efficacy is related to in the development of competencies.

Self-efficacy has been proposed to influence various perceptions, behaviors, emotional responses, and cognitive processes (Bandura, 1986). For instance, self-efficacy has been proposed to influence expected outcomes. If one believes that one does not have the capability to perform a task competently, then one may expect a dismal outcome which can thereby influence one's behavior and ultimately the final outcome experienced. Also, self-efficacy is proposed to influence choices in behaviors and activities that people engage in. If an individual believes that he or she has the ability to perform a task, then he or she may pursue active engagement in a task which can foster the development of competencies.

Also, self-efficacy is proposed to influence the effort that is expended and the persistence individuals will exert (Bandura, 1986). The more efficacious one is about their abilities, the more vigorous and persistent one may be willing to invest efforts, especially when encountering failures or mistakes, which can thereby lead to greater attainment of competencies. Self-efficacy is proposed to influence thought patterns and emotive responses. Individuals who have low levels of self-efficacy may focus on their deficiencies causing stress and a diversion of attention from proceeding with engagement in a task to potential failures or their misgivings. Alternatively, those with high levels of self-efficacy may apply themselves to situational demands and deploy increased effort to overcome challenges.

Computer self-efficacy has been an important variable of interest in various MIS research studies, and the findings have supported relationships with other variables including various perceptions, dispositions, and performance (e.g., usage factors such as frequency, intentions, knowledge and task performance) (Thompson et al., 2006; Compeau, Higgins, & Huff, 1999; Compeau & Higgins, 1995a, 1995b). For example, general computer self-efficacy has been found to directly influence perceived ease of use, affect, and perceived behavioral control, and indirectly influence perceived usefulness (through perceived ease of use) as well as intentions to use technology (Thompson et al., 2006). In a longitudinal study, self-efficacy has been found to directly influence affect, anxiety (negative influence), perceptions of job-related performance improvements, perceptions of job-related personal improvements (e.g., status, rewards), and computer usage (duration and frequency for both work and personal use) (Compeau et al., 1999). Perceptions of job-related performance improvements and affect also positively

influenced computer usage. Also, research has demonstrated that some personal factors can influence self-efficacy. Personal innovativeness was found to influence computer self-efficacy and intentions to use technology directly, with the latter being influenced indirectly through computer self-efficacy as well (Thompson et al., 2006).

Therefore, self-efficacy has been proposed to be related to various personal/behavioral factors, and MIS research has supported these relationships between computer self-efficacy and various perceptions and dispositions. What is not clear is the set of personal/behavioral factors that self-efficacy may correlate with in the context of IS user competency. Hence, the primary focus of this research is to identify these personal/behavioral factors, in particular the IS-specific factors, with a secondary focus on assessing the association of self-efficacy with these factors.

### 3.3 Summary

Therefore, SCT acknowledges that personal/behavioral factors are important and can influence one's actions and, ultimately, competencies achieved. What is unclear is the set of factors that can influence IS user competency. Therefore, a gap exists regarding the set of factors, specific to the context of IS competency, that may be related to or influencing IS user competency.

SCT also highlights that self-efficacy, or *beliefs* that one has in their abilities to perform a task or activity, can be related to other personal/behavioral factors (Bandura, 1986, 1997). Previous SCT 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 the IS-specific factors associated with IS user competency.

In summary, the overall research question is: What are the personal/behavioral factors or user characteristics that are important to achieving IS user competency? Hence, the primary focus of this research is to identify personal/behavioral factors influencing competency, specifically in an IS context. As a secondary consideration, the relationship between self-efficacy, specifically IS self-efficacy, and the IS-specific factors in the model will also be assessed.

# CHAPTER 4

# QUALITATIVE STUDY – DEVELOPMENT OF A MODEL

Chapter 4 presents the qualitative study, as well as the inductive data analysis procedures and results. First, the Repertory Grid research method is presented, followed by a discussion of the procedures. Then, the data collection and analysis is provided, along with the research results. Finally, a discussion of the findings is presented.

## 4.1 Research Approach

In order to develop a model of IS user competency, the Repertory Grid (RepGrid) Technique was used to identify characteristics that distinguish highly competent IS users (i.e., those who have achieved a high level of IS user competency) from least competent users from the perspective of business professionals who are also IS users themselves. The RepGrid technique has been utilized successfully in previous IS research to identify characteristics of individuals, including characteristics of software development team members (Siau, Tan, & Sheng, 2007) and qualities of excellent systems analysts (Hunter, 1993). The strength of the RepGrid technique is in capturing individuals' personal constructs that bring meaning and understanding to various phenomena (Stewart, 1981). Hence, it is an appropriate technique to uncover the personal construct systems associated with characteristics of highly competent users.

RepGrid is based on Kelly's personal construct theory (Hunter, 1997 citing Kelly, 1955, 1963). The premise of personal construct psychology is that each individual is his or her own scientist and that, according to Kelly, each individual creates a theoretical framework or a personal construct system to give meaning to various phenomena

(Fransella et al., 2004; Stewart, 1981). In other words, these constructs are used by an individual to interpret the world (Pervin, 1984), and are used as guidance when engaging in sense making (Davis & Hufnagel, 2007). A critical point noted by Walker and Winter (2007) is that discriminations (or constructs) are developed by individuals in which some things are identified as similar and others as different. The discriminations are bipolar and dependent upon the bipolar poles to provide understanding. Tan and Hunter (2002) also noted Kelly's contention that personal constructs are bipolar in nature. In Hunter's (1997) research of excellent systems analysts, an example of bipolar construct pairs that were identified included "delegator—keeps to himself" and "knows details—confused" (p. 73). In order to explore and extract these personal construct systems, Kelly (1955, 1963) developed the RepGrid technique, which is utilized in more than 90 percent of personal construct research (Walker & Winter, 2007).

The strengths of the RepGrid technique have been cited by various researchers. Pervin (1984) quoted Bonarius (1965) in recognizing that the standardized use of the RepGrid provides a stable and representative set of constructs. Siau et al. (2007) and Stewart (1981) have also argued that the technique allows for more precision and minimizes bias more so than other approaches. They suggest that the technique can effectively obtain a significant amount of detailed information while limiting the input of the researcher. Hunter (1997) suggests that when the participants are allowed to select their own elements and constructs (described below), the RepGrid provides a structured data-gathering process while still providing participants the greatest amount of freedom to share their perspectives about a particular subject. Therefore, this technique is deemed

an appropriate and reliable method for capturing an extensive set of detailed and unbiased constructs from the personal construct systems of IS users (Stewart, 1981).

This technique is deemed the most appropriate for this research considering the objective is to inductively identify characteristics of highly competent IS users and the RepGrid is not only appropriate to accomplish this, but is a psychological technique that has been well-established (Siau et al., 2007). It not only provides a structured method to minimize potential research biases but also provides flexibility and freedom to participants in their responses. This technique is superior to others for the purpose of this study considering other approaches such as means-end chain analysis focuses on identifying the activities (or means) that individuals engage in to achieve certain valued states (or ends) (Gutman, 1982) or value-focused thinking which focuses on identifying activities (or means objectives) that are important to obtain the end-benefits (or fundamental objectives) (Keeney, 1999). However, the objective of this study is to identify the characteristics of highly competent IS users *after* they have achieved IS user competency. Hence, the RepGrid technique is deemed the most appropriate to identify these characteristics or constructs that describe users who have achieved IS user competency.

RepGrid was used in this research to identify constructs that distinguish highly competent users (i.e., those who have achieved a high level of IS user competency) from others who are less capable of utilizing IS from the perspective of business IS users. The procedures for the RepGrid technique are presented below. Details of the RepGrid technique can be found in Stewart (1981) and Fransella et al. (2004).

## 4.2 Research Procedures

The research procedures include both the RepGrid technique as well as content analysis using the Grounded Theory approach. These procedures consist of seven steps which are explained below:

### *Step 1: Solicit Participants*

IS users were selected from a variety of industries, versus just one organization, to increase the breadth of highly competent user characteristics and increase the generalizability of the research findings. If just one organization was selected, a smaller number of highly competent users may have been identified (i.e., several participants may have identified the same highly competent users) and, hence, only characteristics from this smaller selection would potentially be obtained. The definition of IS, which refer to technology-driven systems that collect, process, store, and distribute information to support the operations, analysis, and decision-making of an organization, was provided to participants. This definition was utilized to determine their eligibility for participating in this research as well as selecting IS users that they know, as described in step 2.

The sample size for the study was determined by the point of saturation where no new constructs emerged from interviews with additional subjects. Tan and Hunter (2002) indicated that a sample size of 15 to 25 is generally adequate to reach the saturation point.

### *Step 2: Select Elements*

The next step was to have research participants identify *elements,* which are the focal point of the study (Tan & Hunter, 2002). In this research, the potential elements are IS users that the participant is familiar with and either currently work with or have

previously worked with IS. Familiarity was based on their ability to provide characteristics of these individuals. At the beginning of each interview, the participant was asked questions to help identify categories of highly and least competent IS users that they know. Then, the participant was asked to identify the top three IS users from the highly competent category, and the bottom three IS users from the least competent IS user category. These six identified users were included in the pool of elements for the RepGrid study. Each element (IS user's name or pseudonym) was listed on a separate card and utilized in step 3.

As Fransella et al. (2004) noted, "elements should be within the range of convenience of the constructs used…they should be representative of the area being investigated" (p. 18). An example provided by Stewart (2006) was to identify the four best and four least effective managers that the participants knew. By selecting the best and least 'objects' (i.e., managers in Stewart's example or users in this study) as elements, the characteristics that are clearly distinguishable between the two groups (i.e., highly competent versus least competent users in this study) can be extracted from the participant's personal constructs.

If, however, other managers or users were selected as elements who were just average, certain characteristics may be harder to generate considering that some of the essential characteristics may overlap (i.e., an average user may have a few characteristics that a highly competent user has as well as some characteristics of least competent users. As such, the characteristics associated with highly competent users may not emerge as part of the triadic approach in identifying similarities and differences in step 3).

Therefore, the strategy used by Stewart (2006) was utilized to elicit as rich and inclusive set of constructs as possible to understand highly competent IS users.

As mentioned, each of these elements (i.e., highly and least competent IS users) was listed on a separate card and this complete set of six elements was then utilized in step 3 to identify constructs that distinguish these two groups of IS users.

***Step 3: Identify Constructs***

*Constructs* identify the interpretation of the elements (Tan & Hunter, 2002). According to Fransella et al. (2004), individuals interpret events with the use of bipolar dimensions, or personal constructs, with which they can identify what some person/place/thing is and what it is not. For example, one set of the bipolar constructs developed by Hunter (1997) in researching the qualities of excellent system analysts was "user involvement—lack of user involvement."

The research participant was asked to provide constructs using the triadic approach. More specifically, three elements were selected by the researcher (i.e., randomly drawn but ensuring that both highly competent and least competent categories were represented) and the participant was asked to identify how two of them were similar but different from the third in the context of their ability or inability to effectively utilize IS. Confirmation was solicited to identify the positive and negative bipolar ends of the construct. Also, the laddering approach was utilized in which questions such as "how" and "why" were asked to gain further insight into the meanings of the participant's constructs (Tan & Hunter, 2002).

***Step 4: Develop Links***

*Links* illustrate the relationship between elements and constructs from the research participant's perspective, as well as interpretations of similarities and differences (Tan & Hunter, 2002). For this step, the participant was asked to physically arrange the elements' cards according to their relative positions on each of the bipolar constructs identified. If elements were construed as being the same, they were placed together so the participant was not forced to rank one over the other. Then, the participant was asked to rate the elements on a 1 to 9 scale, with 1 being the negative end and 9 the positive end.

Steps 3 and 4 were repeated until no new constructs emerged or the point of redundancy was reached. Reger (1990) indicated that previous research identifies seven to ten triads to be sufficient.

***Step 5: Add Two Extreme Bipolar Elements***

Two additional elements representing highly competent and highly incompetent users, or the extreme ends of the bipolar constructs, were included in the pool of elements to support the construct elicitation process. Definitions for these individuals (utilizing the definition of highly competent user noted in the Literature Review) were provided to the participant. These cards were included *after* the above procedures with the original set of six elements to introduce additional opportunities to elicit any other constructs that the participant felt would be associated with his/her conception of a highly competent user that may not have been identified with the previous six elements. Steps 3 and 4 were repeated ensuring that each triad had at least one of the two extreme elements included. The steps were repeated until the point of redundancy was reached.

***Step 6: Conduct Visual Focusing and Review***

After the grids' completion, visual focusing was utilized in which the participant was asked to review the grid and evaluate the ratings given to each element for the respective construct to ensure they agreed with what had been accomplished. Also, the participant was asked if the ratings given to the respective elements represented the participant's conception of a highly competent user and an incompetent user. To further verify the reliability of the constructs elicited, during the final stage of the interview, the participant was asked to focus on the highly competent users of IS that they identified earlier and asked probing questions such as: "If you can envision, for a moment, those individuals that you most closely associate with an ideal user, how would you describe these people in terms of what makes them ideal users of information systems?" If any new constructs emerged, they were included in the existing list and step 4 was repeated.

***Step 7: Analyze RepGrids***

To conduct the qualitative analysis of the RepGrids generated from the data, the constructs that were generated were categorized following Stewart's (1981) approach of content analysis and Strauss and Corbin's (1998) methodology for open, axial, and selective coding (which is further elaborated below). The Q-sort method was also utilized by each of two coders to group these constructs into categories following the method described by Moore and Benbasat (1991). Based on these prescribed procedures of sorting where each construct was noted on a card, each coder sorted the set of cards into piles of similar constructs and provided a label to each pile. The inter-coder consistencies were then evaluated, followed by allowing independent corrections to be

made by each coder. The final discrepancies were then resolved between the two coders through consensus.

As mentioned earlier, the grounded theory approach by Strauss and Corbin (1998) was used to analyze the qualitative data collected and to develop a conceptualization of IS user competency. The strength of this approach is providing a means with which theory can be grounded in categories of data that have been developed through identification of distinctive relationships. Hence, the grounded theory approach is appropriate for developing a grounded theoretical conceptualization of IS user competency. More specifically, the constructs that were generated by participants were coded according to the open coding methodology outlined by Strauss and Corbin (1998) and the sorting procedure described by Moore and Benbasat (1991) where bipolar pairs describing similar constructs were grouped or piled together and kept separate from those bipolar pairs describing different constructs.

*Open coding* entails identifying and categorizing like phenomena and then labeling these categorizations. Strauss and Corbin indicated that "during open coding, data are broken down into discrete parts, closely examined, and compared for similarities and differences. Events, happenings, objects and actions/interactions that are found to be conceptually similar in nature or related in meaning are grouped under more abstract concepts termed 'categories'" (Strauss & Corbin, 1998, p.102).

The next step is *axial coding* which entails relating categories to their respective subcategories. Strauss and Corbin (1998) stated that "The purpose of axial coding is to begin the process of reassembling data that were fractured during open coding. In axial coding, categories are related to their subcategories to form more precise and complete

explanations about phenomena…along the lines of their properties and dimensions" (p. 124). Strauss and Corbin (1998) also noted that about "…how categories relate, the actual linking takes place not descriptively but rather at a conceptual level (p. 125)…In axial coding, the analyst is relating categories at a dimensional level…when we analyze data, there really are two levels of explanations. These are (a) the actual words used by our respondents and (b) our conceptualization of these" (p.126). Hence, axial coding provides a more in-depth and precise conceptualization of the categories and subcategories that emerged from the data collected. Themes, or overarching categories from the data, were also identified.

The final step, *selective coding*, is the process in which a core category is identified and "the process of integrating and refining the theory takes place" (Strauss & Corbin, 1998, p. 143). This step also entails integrating the concepts that emerged from the data analysis as Strauss and Corbin (1998) indicated, "if theory building is indeed the goal of a research project, then findings *should* be presented as a set of interrelated concepts, not just a listing of themes." (p. 145). Strauss and Corbin also acknowledged that the use of existing literature can be supplemental to the theory development stage.

### 4.3 Data Collection and Analysis

A total of 20 RepGrid sessions were conducted with 10 males and 10 females, and the saturation point was adequately reached. Table 4.1 shows the demographic information of the participants. As presented in Table 4.1, research participants have an average work experience of 15 years and an average of 11 years of experience using IS.

Half of the participants are in management/supervisory positions and examples of IS used by participants include SAP, Siebel, and Lawson.

**Table 4.1: Demographic Information**

| **Age** | **# of Participants** | | |
|---|---|---|---|
| 21-30 | 6 | | |
| 31-40 | 7 | | |
| 41-50 | 5 | | |
| 51-60 | 2 | | |
| | | | |
| **Job Position** | | | |
| Management | 10 | | |
| Non-Management | 10 | | |
| | | | |
| | **Minimum** | **Maximum** | **Mean** |
| Work Experience | 4 | 30 | 15 |
| IS Experience | 2 | 30 | 11 |
| No. of people supervised | 0 | 14 | 2 |
| | | | |
| Industry Examples | *Retail*<br>*Publishing*<br>*Financial Services* | *Healthcare*<br>*HR Consulting*<br>*Publishing* | *Manufacturing*<br>*Insurance*<br>*Engineering* |
| IS Examples | *Lawson*<br>*Quadra Med* | *SAP*<br>*Rumba* | *Siebel*<br>*COGNOS* |

All participants were able to identify three highly competent IS users and three incompetent IS users for the RepGrid session, except for one participant who could only identify two of each. A minimum of seven triads among the set of highly competent and incompetent user elements were conducted for all participants and most sessions lasted approximately 1 to 1 ½ hours. The saturation point for the study was reached after the sixth participant. The first six participants included individuals with extensive work experience, one up to 30 years, and fairly extensive managerial experience, and one supervising up to 14 individuals. Considering managerial duties and responsibilities typically include evaluations of others, providing feedback, and assessing training

improvements that are needed, it was not surprising that the saturation point was reached after interviewing the first six participants.

However, additional interviews were conducted to enhance the richness and validity of the findings, and to confirm that the point of redundancy or saturation had been reached. In addition, to assess whether the order of the participants influenced the point of saturation being reached after six participants (due to individuals with extensive IS and managerial experience being interviewed first), the saturation point was re-assessed as if participants were interviewed in reverse order. If the reverse order of conducting interviews had taken place, the saturation point would have happened after 12 participants. Therefore, interviewing those with significant experience first appears to have caused the point of saturation to be reached after six participants.

### 4.4 Reliability and Validity

To address potential issues of reliability and validity, Yin's (1994) three Principles of Data Collection – using multiple sources of evidence, creating a database, and maintaining a chain of evidence – are addressed. The first principle is addressed using multiple coders to ensure triangulation of data. Two coders independently sorted the 416 bipolar pairs elicited from the participants. In the first round of independent coding, Cohen's Kappa of .76 was achieved between the two coders. In the second round, each coder independently reviewed their own and the other coder's sorting results, and indicated if they agreed with their original classification or the other coder's classification for constructs where they coded differently.

After reviewing each other's coding and making any corrections each of them deemed appropriate, Cohen's Kappa of .93 was obtained. These results are acceptable as indicated by Sun and Zhang (2006), who cite Moore, Harris, and Chen (1995) and Jarvenpaa (1989), that Kappa scores no lower than .65 are considered acceptable. The remaining discrepancies were discussed and resolved through consensus between the coders. In addition, coding results were verified with the participants by presenting the results to them and giving them the opportunity to rename categories or subcategories, reclassify characteristics, redefine any category or subcategory, or pose any other changes or questions. All subsequent responses were reviewed and clarifications/changes incorporated in the data analysis. A validation check was also performed to ensure that research participants identified individuals who met the definition of a highly competent IS user instead of those who are technology savvy with no business application capacity. The results indicated that participants selected individuals matching the given definition.

The second and third principles recommend creating a database and maintaining a chain of evidence such that an independent party could follow the data collected to the final conclusions. In the case study context, two separate data collections are typically considered: the data and the investigator's report. In this research, a database of all characteristics identified by each of the participants (the data) was created and stored. For confidentiality, all research participants' identifying information was not included in the database. The results of initial coding (considered the investigator's report) and all subsequent coding and categorizations of the data were also kept in separate databases, with each iteration of coding and categorization of the results maintained separately.

## 4.5 Research Results

### 4.5.1 Results of Open and Axial Coding

Open coding was carried out by having two coders examine the 416 bipolar characteristic pairs that participants generated and identifying the similarities and differences using the sorting procedure described by Moore and Benbasat (1991) and dissecting categories into richer subcategories as appropriate. Axial coding, on the other hand, entailed relating different levels of subcategories to higher-level categories, and identifying overarching categories as *themes*. By relating back to the bipolar ends and the anecdotal evidence in the transcripts, the names and definitions for categories and subcategories were refined and themes were identified. Table 4.2 shows the 22 categories that emerged from the analysis along with the number of times each category and subcategory was mentioned by the participants. Table 4.2 also provides the definitions of the categories and subcategories as well as examples of their bipolar ends.

Several overarching themes emerged during axial coding. These themes emerged by the common axes found among categories sharing similar or related properties and dimensions. These themes and the categories that fall under them are presented in Table 4.3. The key themes describing highly competent IS users are *General Learning & Cognitive Factors*, *Personal Dispositions and Traits,* and *Communication and Collaboration Skills and Tendencies*.

**Table 4.2: Construct Categorization**

| **Category/*Subcategory*<br>(No. of Counts)** | **Examples of Positive-Negative Bipolar Ends** | **Definition** |
|---|---|---|
| Domain Knowledge of and Skills in IS (40) | | Understanding how IS operate and ability to operate IS |
| *Domain knowledge of IS (21)* | "Understand how IS operates - Being a strict user/not a supporter" | Technical understanding and basic knowledge of IS |
| *Skills in using IS (19)* | "Able to pick up basic usage - Don't have necessary skills" | Ability to perform normal IS operations |
| Perception of IS Value (27) | "Recognize potential benefits of IS - Not being able to recognize value/connection to job" | Ability to see the benefits and opportunities that IS can provide |
| Sense of Curiosity with IS (5) | "Curiosity w/ technology - Phobia of technology" | Possess a curious, exploratory nature with IS |
| Dedication (9) | "Takes ownership of information/reports - Just doing job" | Commitment to one's job with high ownership and pride in tasks performed |
| Conscientious (13) | "Likes to verify accuracy - Produce reports only/not verify" | Attention to accuracy and detail |
| Ability and Desire to Learn (48) | | Ability and interest to self-initiate learning, find solutions to problems and discover new knowledge |
| *Willingness to Ask Questions (2)* | "Willing to ask questions - Don't ask questions" | Willingness to probe deeper to find answers |
| *Capacity for learning (9)* | "Ability to learn - Not able to learn" | Ability to assimilate new knowledge |
| *Ability to learn quickly (9)* | "Quick learner - Slow learner" | Ability to quickly understand and apply knowledge gained |
| *Ability to learn independently (9)* | "Facilitate own learning of IS - Have to be taught how" | Ability to self-initiate learning |
| *Willingness to learn (19)* | "Willing to understand new IS - Unwilling to try to understand" | Desire to obtain new knowledge and understanding |
| Ability to Solve Problems (10*)* | "Find ways to make things work - Make bigger problems/affects other things" | Capacity to resolve issues and find solutions |
| Willingness to Try and Explore IS (37) | "Not afraid of IS - Fearful" | Willingness and comfort with trying technology and using IS |
| Adaptability (17) | "Willing to change - Unwilling to change" | Willingness to embrace change and flexibility to adapt to changes |

| **Category/*Subcategory*<br>(No. of Counts)** | **Examples of Positive-Negative Bipolar Ends** | **Definition** |
|---|---|---|
| Motivation/Perseverance (39) | "Doing whatever it takes to get job done - Clock-watchers/not focused on job" | Highly driven and determined to accomplish a task, hold a strong work ethic and is reluctant to give up one's pursuits |
| Generation Factors (8) | "Younger - Older" | Generation one belongs to |
| Formal Education (8) | "Higher education - Less education" | Holds higher education degree |
| Open-mindedness (27) | "Sees big picture - Narrow-minded" | Being able to reason about new ideas/approaches and being aware of multiple perspectives |
| Positive Attitude (4) | "Focus on positive - Focus on negative" | Having a positive attitude |
| Confidence (13) | "Self-confident/assured - Lacking confidence" | Sense of self-assurance in one's abilities |
| Job Experience (30) | | Specific experiences in job-related tasks |
| *Variety of Job Experience (11)* | "Exposure to multiple situations - Not exposed to multiple situations" | Exposure to multiplicity and variation |
| *Task Experience (19)* | "Users of IS reports - Not IS report user" | Specific experience in job-related tasks |
| Communication and Collaboration Skills & Tendencies (26) | | Interactions with others |
| *Communication Skills (7)* | "Communicator (oral & written) - Inability to communicate" | Capacity to communicate (oral and written) |
| *Willingness to Collaborate (19)* | "Collaborator-Loner" | Willingness to share knowledge and work with others |
| Intellectual Abilities (18) | "Logical thinking - Illogical" | Being quick, logical, and analytical in thinking processes with a high-degree of intelligence |
| Risk-Taking Propensity with IS (3) | "Not fearful/takes risks - Afraid of breaking/doing something wrong" | Willingness to take risks with IS |
| Efficiency at Task (3) | "Efficiency at using IS - Inefficient at using" | Ability to manage time well and carry out tasks efficiently |
| Exposure to Technology (31) | | Prior experiences with technology |
| *Prior Experience (26)* | "Grew up w/ technology - Minimal exposure to technology" | Previous opportunities to learn/use IS |

| Category/*Subcategory* (No. of Counts) | Examples of Positive-Negative Bipolar Ends | Definition |
|---|---|---|
| *On-going Use (5)* | "Technology part of life - Have to learn how to incorporate" | Continuous routinized use of technology |

**Table 4.3: Themes from Axial Coding**

| Theme | Related Categories |
|---|---|
| General Learning & Cognitive Factors | Intellectual Abilities, Ability and Desire to Learn, & Ability to Solve Problems |
| Personal Dispositions and Traits | Motivation/Perseverance, Confidence, Dedication, Positive Attitude, Conscientious, Efficiency at Task, Adaptability, Sense of Curiosity with IS, Open-Mindedness, & Risk-Taking Propensity with IS |
| Communication and Collaboration Skills & Tendencies | Willingness to Collaborate & Communication Skills |

Research participants indicated that highly competent IS users possess high cognitive abilities in general. The common dimensions of factors associated with one's cognition brought together the categories of Intellectual Abilities, Ability and Desire to Learn, and Ability to Solve Problems and was identified as the theme of *General Learning & Cognitive Factors*.

Participants identified various personal characteristics and certain dispositions among highly competent users. Dimensions that highlight personal traits and dispositions emerged from the categories of Motivation/Perseverance, Confidence, Dedication, Positive Attitude, Conscientious, Efficiency at Task, Adaptability, Sense of Curiosity with IS, Open-Mindedness, and Risk-Taking Propensity with IS. The theme for the commonality among these categories is labeled *Personal Dispositions and Traits*.

Research participants indicated that interactions with others were also characteristics of highly competent IS users. Dimensions that consider factors associated

with interactions with others combined Willingness to Collaborate with Communication Skills. This theme is labeled *Communication and Collaboration Skills and Tendencies*. Categories that do not revolve around a common axis or theme with other categories are Formal Education, Job Experience, Exposure to Technology, and Generation Factors. Participants mentioned that highly competent users had a higher education degree, had certain job experiences that contributed to their competency of IS, have previously been exposed to technology, and were typically from a younger generation. These particular categories, though not identified as sharing common or similar dimensions with other categories, were obviously present in the conceptualization of highly competent user characteristics. Therefore, to present the complete set of personal constructs from research participants, all categories are included.

### 4.5.2 Results of Selective Coding

The final step, selective coding, is the process in which a core category is identified and "the process of integrating and refining the theory takes place" (Strauss & Corbin, 1998, p. 143). This step also entails integrating the concepts that emerged in the data analysis as noted by Strauss and Corbin:

> "…if theory building is indeed the goal of a research project, then findings *should* be presented as a set of interrelated concepts, not just a listing of themes. Relational statements, like concepts, are abstracted from the data. However, because they are interpreted abstractions and not the descriptive details of each case (raw data), they (like concepts) are 'constructed' out of data by the analyst. **By 'constructed,' we mean that an analyst**

> **reduces data from many cases into concepts and sets of relational statements that can be used to explain, in a general sense, what is going on (p. 145)…**The essential element is that categories are interrelated into a larger theoretical scheme (p. 146)."

Willingness to try and to explore IS, domain knowledge of and skills in IS, and perception of IS value emerged as the core IS-specific factors influencing IS user competency during the selective coding process. These IS-specific factors are discussed as follows.

Willingness to try and to explore IS emerged from characteristics that explained highly competent IS users as being unafraid to try new technologies and research how things work. Highly competent users were described as being comfortable with trying technology and using IS. These individuals were noted as being willing to invest the time to explore IS. Their enthusiasm and playfulness with IS were also cited as characteristics, as well as their acceptance of making mistakes. As one research participant explained:

> [Referring to highly competent user] *"This person likes to explore around the IS and find out what's behind the drop downs…* [Referring to incompetent users] *these people don't poke, don't probe deeper"*

> [Referring to highly competent user] *"he loves to research how things work on the computer, whether its web pages or the mainframe system, how all the information is connected and how to retrieve the*

*data…*[Referring to incompetent users] *these two do not…just using the system"*

Also, the domain knowledge of and skills in IS category emerged from characteristics that described highly competent IS users as being able to not only comprehend the operations behind IS, but also knowing ways to utilize the system. This understanding was described as having knowledge of how IS operate and knowing ways to utilize IS. Highly competent IS users were noted as having the knowledge and skills to use IS. As explained by research participants:

[Referring to incompetent users]*"they don't understand basic functionality for individuals who have been using it for the amount of time they should have been using it…*[Referring to highly competent user] *understanding basic underpinnings"*

[Referring to highly competent users] *"this set of individuals would have the ability to create new reports to access the data that they want to get out of the system…*[Referring to incompetent user] *this person would not be able to create reports…*[Referring to highly competent user] *best know how to utilize the system to facilitate business processes,* [Referring to incompetent user] *and this group would not understand the relationship between the system and the business process"*

Highly competent IS users were not only cited as being willing to explore IS and having knowledge of and skills with IS, but were also cited as having high perception of IS value. Highly competent IS users were identified as appreciating the value that technology presents and the benefits that IS can provide. Some participants indicated that highly competent users view IS as a strategic tool and as an extension of them. Therefore, highly competent IS users are recognized as seeing the potential that IS presents, being able to identify the value of IS, and being able to recognize efficiencies and improvements brought about by IS. For instance,

> [Referring to incompetent users]*"it's not even that they don't want to be technology proficient, but they just don't see the reason to do it…*[Referring to highly competent users] *because they want to be… made a very visible effort to take that technology on because they knew it was important…they wanted to do it…*[Referring to incompetent users] *these two individuals don't want to do it…you need to have a payoff, a benefit…these particular individuals don't see the payoff"*

> [Referring to incompetent users' reference to use IS for data entry only]*"it's a task, it's not a strategic tool that you would use in your job..will use to get some information…*[Referring to highly competent user] *using as a strategic tool"*

Therefore, IS users were noted as being open to trying technology and having IS skills and knowledge. They continue to use technology and incorporate it as part of their

work routines, and in some instances, many aspects of their lives. They can also see the benefits and opportunities that IS can potentially provide.

### 4.5.3 Summary of Findings

The results from this study have provided insights into the characteristics of highly competent IS users (i.e., important factors of IS user competency) that are both IS-specific and general characteristics. Based on their personal construct systems, research participants indicated that IS-specific factors of highly competent users include their understanding and capability to operate IS, their willingness and comfort levels with trying technologies and using IS, and their ability to see the value that IS can provide. Based on the anecdotal evidence provided by participants, characteristics such as perceptions of IS value, domain knowledge of and skills in IS, and willingness to try and to explore IS are factors of IS user competency. For instance, one participant commented about one incompetent IS user *"it's not even that they don't want to be technology proficient, but they just don't see the reason to do it"*.

Therefore, if an IS user doesn't see the value in IS or perception of IS value, they won't achieve proficiency or IS user competency. Also, one participant described a particular incompetent IS user as "*they don't understand basic functionality for individuals who have been using it for the amount of time they should have been using it."* This comment suggests that just using IS is not enough, but that understanding IS functionality or domain knowledge of and skills in IS are needed in order to achieve IS user competency. Finally, another participant commented about a highly competent IS user that "*he loves to research how things work on the computer, whether its web pages*

*or the mainframe system, how all the information is connected and how to retrieve the data."* Therefore, having a willingness to try and to explore IS is necessary for IS users to reach IS user competency.

For general characteristics that were identified, participants indicated that the highly competent users they know tend to belong to a younger generation, hold a higher education degree, have job-related experiences, and have prior use and continued use of technologies. Communication skills as well as willingness to use these skills to work with others were also identified. Highly competent users were described as having the capacity to learn and to initiate their own learning, utilizing logical and analytical approaches, and being capable of rapid processing and learning speeds. They were labeled as being driven, committed, and positive in their outlook. Also, they were noted as attuned to accuracy and efficiency in managing their time. With an exploratory nature and openness to change, they are able to reason through new ideas and visualize in multiple dimensions and perspectives. Holding a higher level of self-assurance, they are more willing to expose themselves to risks with IS. A summary of the above findings is presented in Figure 4.1.

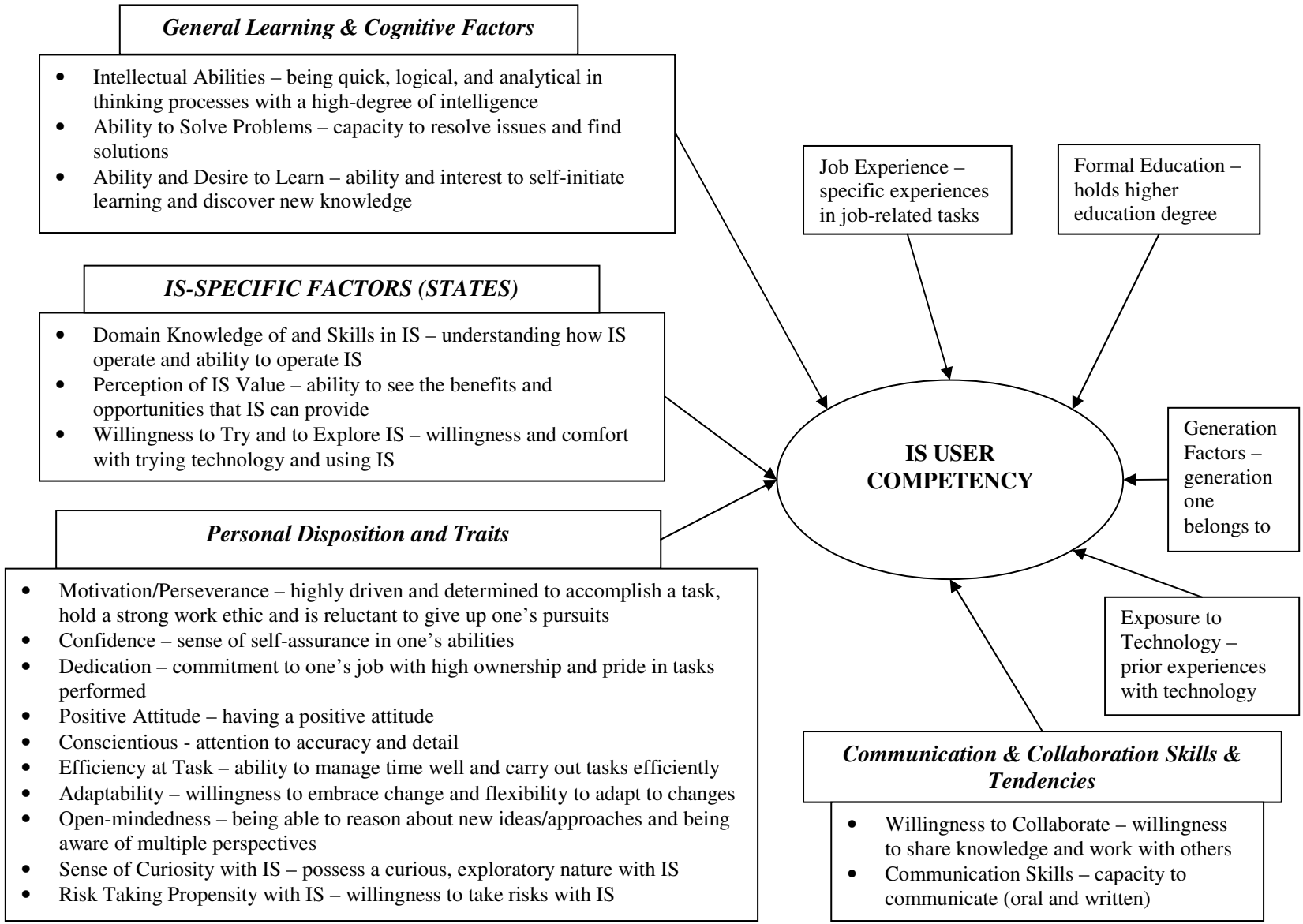



**Figure 4.1: IS User Competency Model**

## 4.6 Discussion of Results

### 4.6.1 IS-Specific Factors

The IS user competency model represents a theoretical conceptualization of factors of IS user competency that is grounded in the data from the Repertory Grid study. This model of IS User Competency identifies the core IS category or IS-specific factors (i.e., domain knowledge of and skills in IS, perception of IS value, and willingness to try and to explore IS) and the associated categories and subcategories that are all associated with IS user competency.

Unlike personal disposition and traits, the core IS category or IS-specific factors – domain knowledge of and skills in IS, perception of IS value, and willingness to try and to explore IS – are IS-specific states. A main focus of this research is on IS-specific states because they are not only specific to the IS context, but have a greater potential of being fostered in other IS users, thereby enhancing both the practical and theoretical contributions of this research.

These IS-specific states, or dynamic situation-specific individual differences, are "factors that reflect relatively enduring dispositions to respond to stimuli within a specific situation that may be changed through training or other experience" (Thatcher & Perrewe, 2002, p. 383). In contrast to traits, states have greater potential for being modified such that improved IS performance can be achieved. Chen, Whiteman, Gully, and Kilcullen (2000) cite that "Trait-like individual differences such as cognitive ability and personality characteristics are not specific to a certain task or situation and are stable over time…In contrast, state-like individual differences…are specific to certain situations or tasks and tend to be more malleable over time." (p. 835). Therefore, personal dispositions and

traits that were identified in this research may not be readily fostered in IS users. Although traits such as sense of curiosity with IS and risk-taking propensity with IS are specific to the IS context, they present less opportunity for improvement in IS users.

Also, Hudlicka (2002) cites that "traits tend to exert their influence via more stable structures (e.g., types of schemas stored in long-term memory, preferential processing pathways among cognitive architecture components), whereas states tend to produce transient changes that influence the dynamic characteristics of a particular cognitive or perceptual process" (p. 616). For example, in studying the relationship of optimism and job-related outcomes, Kluemper, Little, and DeGroot (2009) indicate that optimism as a trait is a stable individual difference and is more of a general nature versus optimism as a state which has the potential to change and is more context-specific in nature. They argue that trait optimism has a stronger relationship with general outcomes, whereas state optimism has a stronger relationship with job specific outcomes because states are amendable by situational or contextual factors. Their findings indicate that states have a closer relationship to context-specific outcomes. Therefore, the IS context-specific factors that are identified as states (i.e., perception of IS value, willingness to try and to explore IS, domain knowledge of and skills in IS) are more likely to be amendable and influence the specific outcome of IS user competency.

Although both broad and situation-specific traits are among the many factors that may influence dynamic situation-specific individual differences or states, broad traits present less of an influence than situation-specific traits (Thatcher & Perrewe, 2002). For the purpose of this research, the focus is on modeling IS-specific states or dynamic

situation-specific individual differences that influence IS user competency because they have greater potential to be fostered in IS users through training or experience.

These IS-specific states – perception of IS value, willingness to try and to explore IS, and domain knowledge of and skills in IS – are discussed and compared with related constructs in the literature in the next section. Examples from participants' transcripts of the traits and non-IS-specific states identified in this research are included in the Appendix.

### 4.6.2 Comparisons of IS-Specific States to Previous Research

In pursuit of discovering IS-specific states associated with IS user competency, this research entailed identifying IS-specific states and comparing them with existing MIS research and constructs that may be related or relevant (see Table 4.4). This section presents a summary of the comparison.

**Table 4.4: Comparisons of Current Findings vs Previous MIS Research**

| **Current Finding Constructs (Category/*Subcategory*)** | **Definition** | **Previous Research Constructs** | **Definition** |
|---|---|---|---|
| Domain Knowledge of and Skills in IS Usage | Understanding how IS operate and ability to operate IS | *(see following subcategory)* | *(see following subcategory)* |
| *Domain knowledge of IS* | Technical understanding and basic knowledge of IS | Technology Cognizance (Nambisan et al., 1999) | A technology user's knowledge of a technology's capabilities, its potential uses and features, as well as its cost and benefits. |
| | | IT Knowledge (Bassellier, Benbasat, & Reich, 2003) | Specialized knowledge that includes the degree to which an individual understands fundamental IT concepts and their understanding of IT in their organization. |
| *Skills in using IS* | Ability to perform normal IS operations | Ability to Explore (Nambisan et al., 1999) | A technology user's perceived competence in appropriately applying the necessary cognitive and physical resources to conduct technology exploration. |

| **Current Finding Constructs (Category/*Subcategory*)** | **Definition** | **Previous Research Constructs** | **Definition** |
|---|---|---|---|
| Willingness to Try and to Explore IS | Willingness and comfort with trying technology and using IS | Personal Innovativeness in the Domain of IT (PIIT) (Agarwal & Prasad, 1998) | "The willingness of an individual to try out any new IT." (p. 206) |
| | | Trying to Innovate with IT (Ahuja & Thatcher, 2005) | "An individual's goal of finding novel uses of information technologies." (p. 435) |
| | | Intention to Explore (Nambisan et al., 1999) | "A user's willingness and purpose to explore a new technology and find potential use…a user's purpose and motivation to innovate based on the perceived business related benefits he/she will derive from IT deployment." (p. 373). |

| **Current Finding Constructs (Category/*Subcategory*)** | **Definition** | **Previous Research Constructs** | **Definition** |
|---|---|---|---|
| Perception of IS Value | The ability to see the benefits and opportunities that IS can provide | Perceived Usefulness (Davis, 1989) | Degree that an individual believes a system will enhance job performance. |
| | | Perceived Value (Kim & Kankanhalli, 2009) | Evaluation of change of an IS implementation founded on comparisons of benefits and costs. |
| | | Technology Cognizance (Nambisan et al., 1999) | A technology user's knowledge of a technology's capabilities, its potential uses and features, as well as its cost and benefits. |

The findings of this study highlight some commonalities in constructs with those existing in the literature as well as new perspectives and/or dimensions of the constructs that have not been explored or studied in the MIS literature. Following is a discussion of the commonalities and differences of these IS-specific states with existing MIS constructs.

#### *4.6.2.1 Domain Knowledge of and Skills in IS*

Based on a comparison between the constructs previously studied in MIS research and the findings from this study, the constructs from previous research that share similarities with domain knowledge of and skills in IS include technology cognizance, IT knowledge, and ability to explore.

Technology cognizance was described as having an understanding of the technical features, the capabilities of an information system, cost and benefits, and potential uses (Nambisan et al., 1999). When operationalized, the five scale items assess the users' understanding of the features ("I know the features of the technologies." Nambisan et al., 1999, p.392), costs, benefits ("I know the extent of benefits that can be derived by deploying the technologies." Nambisan et al., 1999, p.392), and the business activities associated with deployment. Therefore, this construct appears multi-dimensional (also see comparisons with Perception of IS Value below) because it not only taps onto one's IS knowledge, but also one's understanding of the benefits.

However, it does not tap on whether one is able to operate IS. An IS user not only needs to know or understand the features, capabilities, and uses of IS, but he or she also needs the basic skills to operate IS in order to realize or take advantage of the benefits of IS. In regards to the knowledge of IS, the findings from this research study suggest that highly competent IS users have the basic knowledge of the underpinnings of information systems. However, differences with technology cognizance arise in that domain knowledge of and skills in IS includes other aspects such as *how* to operate IS (e.g., extracting information) versus just having knowledge of *what* business activities are supported.

As mentioned in the Literature Review, previous research has looked at IT competence in business managers (Bassellier et al., 2003). One aspect of IT competence is IT knowledge, which is considered "specialized knowledge possessed by individuals: how well they understand fundamental IT concepts, how well informed they are about IT in their organization" (Bassellier et al., 2003, p. 320). IT knowledge includes general

knowledge of technology (e.g., personal computer, multimedia), applications (e.g., e-mail, WWW, enterprise resource planning), systems development (e.g., traditional system development life cycle, prototyping), management of IT (e.g., IT budget, IT policies, current IS application assets of one's business unit), and access to IT knowledge (e.g., IT people to contact). Although this is similar to domain knowledge of and skills in IS as identified in this research study, it is also different in that the focus from a business user's perspectives is on knowledge of IS rather than on IT/IS management, planning, and development. More specifically, the construct, domain knowledge of and skills in IS, that emerged in this research study is more focused in that it specifically identifies the functionality of IS, how to operate IS (e.g., extract information), and the skills one possesses to utilize the available features and functions of IS.

The construct, ability to explore, is defined as the perception of one's ability in utilizing the required cognitive and physical skills to explore technology (Nambisan et al., 1999). This construct is similar to skills in using IS since it includes elements of ability to utilize and apply necessary technical skills. It is different from skills in using IS, however, in that it specifically refers to the context of being able to explore technology and having the skills to conduct exploration activities, whereas skills in using IS are associated with operating IS or performing basic IS functions.

In summary, domain knowledge of and skills in IS has certain dimensions that are similar to other MIS constructs. These similarities include referring to basic, high-level knowledge of IS. The main difference arises in that domain knowledge of and skills in IS also includes basic skills to operate IS which is beyond having an understanding of the features and capabilities of IS. Therefore, the domain knowledge of and skills in IS

construct comprises dimensions that include some aspects of previous MIS constructs, but also identifies new dimensions.

#### *4.6.2.2 Willingness to Try and to Explore IS*

In comparing the construct of willingness to try and to explore IS with existing MIS constructs in the literature, similarities emerge with personal innovativeness in the domain of IT, trying to innovate with IT, and intention to explore a technology.

Personal innovativeness in the domain of IT (PIIT), considered a domain-specific trait, has been defined as one's propensity to try any new IT (Agarwal & Prasad, 1998, p. 206). Therefore, as a trait, it is projected to be stable across various types of IT. PIIT "epitomizes risk-taking behavior" (Agarwal & Prasad, 1998, p. 207) and those with higher levels of PIIT are more apt to take risks. The construct has been measured with items that include "I like to experiment with new information technologies" and "Among my peers, I am usually the first to try out new information technologies." (Agarwal & Prasad, 1998, p. 210). Willingness to try and to explore IS is conceptualized, however, as a state or dynamic situation-specific individual difference such that it is a relatively enduring disposition that can be changed or modified through experience or training. Both constructs capture the essence of willing to try IS, for this context, but willingness to try and to explore IS also incorporates an individual's willingness to engage in exploratory behavior. Two of the measurements items for PIIT tap on this element, but the construct generated from this research appears to tap into a deeper aspect of exploration. For instance, participants indicated that highly competent IS users *like to explore IS/poke around*, and *loves to research how things work*. Therefore, there are

commonalities between these two constructs, but distinctive differences in that PIIT is a trait and willingness to try and to explore IS is conceptualized as a state with deeper elements of exploratory behavior.

Trying to innovate with IT is considered a goal and is defined as a "user's goal of finding new uses of existing workplace information technologies" (Ahuja & Thatcher, 2005, p. 431). The construct has been measured with two items "I try to find new uses of IT" and "I try to use IT in novel ways" (Ahuja & Thatcher, 2005, p. 459). This construct is similar to willingness to try and to explore IS considering participants indicated that highly competent IS users were individuals who have *eagerness to explore alternative uses.* However, willingness to try and to explore IS encompasses other facets such as being comfortable with trying technology and making mistakes.

Intention to explore refers to one's willingness, intention, and motivation to explore new technologies and innovate based on perceptions of the benefits that may be realized (Nambisan et al., 1999). Hence, this construct is judgment dependent whereas willingness to try and to explore IS is a general construct that is potentially contingent upon various other environmental factors such as facilitating conditions and subjective norms. The intention to explore construct has been measured using three items such as "I intend to explore new IT for potential application in my work context," and "I intend to explore new IT for enhancing the effectiveness of my work" (Nambisan et al., 1999, p. 392). Similar to willingness to try and to explore IS, both constructs incorporate an individual's willingness to explore technology. However, intention to explore is a goal-oriented construct whereas willingness to try and to explore IS is more situational dependent.

Therefore, willingness to try and to explore IS has some similarities and differences in comparison to previous MIS constructs. Similarities include that it taps into conceptualizations included in three previous constructs (i.e., personal innovativeness in the domain of IT, trying to innovate with IT, and intention to explore a technology) such as being willing to try (such as with PIIT), trying to discover novel uses with existing technologies, and being willing to explore new IT. However, differences arise in that willingness to try and to explore IS seems to have greater depth in that it also encompasses individuals' willingness to research how things work, being comfortable with trying technology and making mistakes with it, and is conceptualized as a state or dynamic situation-specific individual difference versus a domain-specific trait. Therefore, willingness to try and to explore IS overlaps with existing MIS research constructs, but additional dimensions exist with this construct and it is also considered a state or dynamic situation-specific individual difference.

#### *4.6.2.3 Perception of IS Value*

When evaluating the IS user competency factors that emerged in this research, some interesting findings emerged with the perception of IS value construct. Most noteworthy, perception of IS value highlights that identifying the importance of IS is an important characteristic of highly competent IS users. Hence, IS users need to be able to appreciate and understand the benefits that IS can derive in order to achieve IS user competency. However, this construct is considered a *state* or dynamic situation-specific individual difference, whereas the perceived usefulness construct associated with the Technology Acceptance Model (TAM) is a *belief* (Davis, 1989).

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320) and is considered "people's subjective appraisal of performance" (p. 335). Although there is some similarity between perception of IS value and perceived usefulness considering that they both tap onto perceptions of benefits that can be obtained (i.e., job performance enhancement), they diverge in many aspects. Perception of IS value is not only a *state* or dynamic situation-specific individual difference, versus a *belief*, but also encompasses a more extensive aspect. In this study, highly competent IS users who have obtained IS user competency are able to go beyond just being able to see the usefulness of a system, they are also able to recognize the potential opportunities and value that IS can provide.

For example, participants indicated that highly competent users apply IS as a strategic tool and view IS as an extension of themselves. Therefore, highly competent users may not only be enhancing their job, but may also be transforming their job responsibilities or other job activities. Hence, perceived usefulness is a construct developed to assess one's belief of the usefulness of a system associated with job-related tasks, whereas perception of IS value assesses one's overall perception of the value that IS can provide.

Enhancing job performance usually entails accomplishing specific job routines. However, transforming job responsibilities may include identifying new uses of a system that were not previously envisioned. Additionally, transforming job responsibilities may include identifying value-added opportunities to leverage the system in strategic or competitively advantageous ways, which is more extensive than improving the

performance of existing job routines and stretches the dimensions of perceived usefulness. Therefore, predictors of intentions to adopt technology to improve job performance may run along a continuum, however the ends are distinctive with perceptions of *usefulness* (considered a state for this discussion) on one end and perception of IS *value* on the other.

Previous research has cited the importance of IS users being able to develop innovative applications and identify opportunities to exploit new technologies as a matter of organizational survival (Nambisan et al., 1999). Therefore, consideration needs to be given to the growing need of IS users to not only adopt and use technology, but to identify advantages that can be gained with technology. The perception of IS value construct is not only different from perceived usefulness because it is conceptualized as a state versus a belief, but it also seems to fall on the extreme end of perceptions of IS, something that may be very important to achieving IS user competency versus just intending to adopt IS.

Perceived value is defined as "the overall evaluation of change related to a new IS implementation based on the comparison between benefits and costs" (Kim & Kankanhalli, 2009, p. 571). This construct, as operationalized, assesses perceptions that result when an individual weighs the costs of time and effort with changing to a new IS versus the benefits or value that can be derived. Therefore, both constructs tap onto IS users' perceptions of benefits and value. However, they are different in that the perceived value construct used by Kim and Kankanhalli (2009) focuses on switching to a new IS, whereas the perception of IS value construct, as conceptualized according to the researching findings from this study, focuses on opportunities, benefits, and advantages of any IS, both existing and new.

As noted previously, technology cognizance appears to be a multi-dimensional construct that encompasses understanding technical features of IS, as well as benefits and potential uses (Nambisan et al., 1999). Scale items include knowing the benefits that can be derived from technologies and the business activities that the technology can be applied to. This dimension of technology cognizance is similar to perception of IS value in that individuals understand the benefits of IS. It's also different in that research participants from this study also indicated that being able to identify new opportunities was important.

Therefore, perception of IS value has conceptual similarities and differences with perceived value and technology cognizance in the MIS literature. It is similar to Kim and Kankanhalli's conceptualization of perceived value and Nambisan et al.'s dimension of technology cognizance (referring to benefits) in that both of them tap on aspects of IS benefits and value. However, it is different in that perception of IS value in this research is tapping on the extreme end of a continuum (encompassing strategic value and opportunities) and does not focus on just perceptions of the change. Also, the perception of IS value construct that emerged from this research study incorporates identifying opportunities and possibilities associated with IS.

#### *4.6.2.4 Summary of Comparisons*

In summary, this study finds conceptual similarities between previous MIS research constructs and the IS-specific factors or dynamic situation-specific individual differences associated with IS user competency. All three IS-specific factors (i.e., domain knowledge of and skills in IS, willingness to try and to explore IS, and perception

of IS value) have dimensions that incorporate conceptual elements of constructs previously used in MIS research, such as technology cognizance and personal innovativeness in the domain of information technology. However, the comparisons between constructs also finds dimensions of these constructs that have not been explored and, hence, has identified other aspects associated with IS user competency. For instance, highly competent IS users understand limitations associated with IS as well as how business processes are facilitated. They are comfortable with trying technology and making mistakes. Also, they are not only able to recognize benefits associated with job enhancement, but can envision much greater opportunities and value. Considering the growing need for IS user competency, more MIS research in this area is warranted.

In addition, a paucity of research exists that studies these existing MIS constructs in an IS user competency context. For instance, personal innovativeness in the domain of IT has been studied in the context of perceptions of IT, intentions to use IT, beliefs about technology usage (e.g., ease of use), innovation characteristics (e.g., compatibility), and environmental influences (e.g., work overload) (Agarwal & Prasad, 1998; Lewis, Agarwal, & Sambamurthy, 2003; Thatcher, Srite, Stepina, & Liu, 2003; Yi, Fiedler, & Park, 2006). Previous research has studied mechanisms associated with technology cognizance, ability to explore a technology, and intention to explore a technology which included attending IT conferences, setting up user labs, and establishing an IT task group (Nambisan et al., 1999). Research involving perceived value has focused on user acceptance and resistance to new IS (Kim & Kankanhalli, 2009). Therefore, studying IS-specific factors in an IS user competency context has the potential to not only fill this gap

in the literature but also create a more complete nomological network that associates these new and existing constructs with IS user competency.

# CHAPTER 5

# QUANTITATIVE STUDY – VALIDATION OF A PARTIAL MODEL

Chapter 5 presents the quantitative study, as well as the deductive data analysis procedures and results. This chapter builds on the previous chapter by testing the relationships between IS-specific state factors and IS user competency. Considering the motivation of this research is to extend Social Cognitive Theory in the domain of IS user competency, the IS-specific factors are the focus of this quantitative study. Specifically, IS-specific *state* factors are of interest because they can be fostered in IS users through training or interventions. Hence, the relationships of IS-specific state factors with IS user competency are validated. First, hypotheses development is presented along with the associated theoretical support. Next, the survey research method and procedures are provided. The data analysis is then presented, which includes results from the pilot test. A secondary analysis is also included to assess the relationship of IS self-efficacy with the IS-specific state factors. Finally, the results are discussed.

## 5.1 Hypotheses Development

### 5.1.1 Future Time Perspective Theory

Future Time Perspective Theory proposes that the utility value of a present factor or task for achieving a future goal or accomplishing a future task is important for persistence, motivation, and performance outcomes (Simons, Dewitte, & Lens, 2000, 2003, 2004). Future time perspective has been defined as "the degree to which and the way in which the chronological future is integrated into the present life-space of an individual through motivational goal-setting processes…the present anticipation of future

goals" (Husman & Lens, 1999, p. 114-115). Utility value is the perceived value that a particular factor acquires because one relates this factor as being instrumental in achieving certain outcomes, which can be either long-term or short-term goals (Simons et al., 2004). From a cognitive perspective, individuals can anticipate the short-term as well as long-term implications from current activities or perspectives. In other words, individuals can understand the usefulness of a present activity to achieving future goals. For IS users, being able to perceive the value of IS may influence achieving future goals such as attaining IS user competency. Therefore, if an individual can identify the value that a present factor or artifact can have in achieving a desired outcome, this can influence one's persistence at a task and final performance outcomes. In the context of this study, if an IS user can identify the value, or benefits and opportunities, of utilizing IS, this may influence the final performance outcome, or the IS user competency.

Applied in learning or educational settings, Future Time Perspective Theory has been used to emphasize the importance of relating present tasks or perspectives to achieving future goals, and the influence that this can have on motivation, learning, and performance. For instance, research findings suggest that individuals who focus on future benefits gained by engaging in an immediate task (e.g., becoming a good tennis player by taking lessons to acquire the necessary skills and knowledge) were more task-oriented (i.e., focused on acquiring new skills and understanding subject matter) and less performance-oriented (i.e., demonstrating competency to others) (Simons et al., 2000). Previous research has demonstrated that being more task-oriented, versus performance-oriented, can contribute to cognitive engagement, deep processing, self-regulation, as well as to performance outcomes such as course achievement outcomes (Miller et al.,

1996). In a learning context, previous research has found that individuals would achieve higher grades when they had high perceptions of instrumentality of obtaining a good grade in a course to achieving future career accomplishments (or a relationship between them) (Raynor, 1970). If individuals can perceive the value of utilizing IS, they may be more likely to achieve IS user competency.

The propositions of Future Time Perspective Theory are also consistent with the expectancy-value model and perspectives. In the expectancy-value model, expectations and values are proposed to influence performance outcomes, as well as perseverance and choice of tasks (Eccles & Wigfield, 2002). Of the task values that individuals can perceive when engaging in a task, utility value is deemed important because individuals can understand the relevancy beyond the current situation (Hulleman, Durik, & Schweigert, 2008). Task values can be thought of as "situation-specific predictors of subsequent interest and performance" (Hulleman et al., 2008, p.400). In an IS context, these theories suggest that perceptions that individuals have of the utility value of IS should influence their IS-related task performance outcomes.

Individuals can perceive the instrumentality of a present task to achieve immediate or future goals (Vansteenkiste et al., 2004; Eccles & Wigfield, 2002). Previous research studies have found support for the influence that perceived utility of a task can have on subsequent performance outcomes (Hulleman et al., 2008; Vansteenkiste et al., 2004; Eccles & Wigfield, 2002). For example, the expectancy-value model has been applied to predict future employment status through expectations of obtaining a job as well as the importance, or value, of obtaining a job (Lynd-Stevenson, 1999). Also, research has found that individuals who highly value health information

websites are more likely to perceive the importance of the Internet in decision-making, and found that individual health information seeking behaviors are a function of their value expectations (Leung, 2008). Hence, one would expect that individuals who can envision the opportunities or the benefits that can be derived from IS usage could develop higher IS user competency.

Therefore, based on the propositions of Future Time Perspective Theory and the perspectives of the expectancy-value model, perception of IS value is expected to influence IS user competency. If an IS user can perceive the value of IS, which in this context refers to the benefits and opportunities of utilizing IS, the IS-related task performances, or IS user competency, should increase. Therefore, being able to perceive the value of IS, or the benefits and opportunities that IS can potentially provide, is hypothesized to be important to achieving IS user competency.

H1: Perceptions of IS value will positively influence IS user competency.

According to Simons et al. (2004), "future time perspective theorists also value…the utility of what is learned for the future." (p. 345). In regard to the cognitive aspects of future time perspectives, individuals can comprehend the long-term implications of behaviors (De Volder & Lens, 1982). Research findings have shown that individuals with high GPAs and persistence in their studies attached greater value to future goals and to studying hard to reach these future goals than those with lower GPAs and less study persistence. Therefore, those with greater knowledge or skills (i.e., higher GPAs) identified greater value in studying to achieve future goals. In an IS context, this

may imply that having knowledge and skills in IS can influence the value one assigns to IS or the understanding of the benefits and opportunities that might be obtained with IS.

From the expectancy-value model perspective, "Individuals can discover and appreciate the value of activities through interaction and experience." (Hulleman et al., 2008, p. 398). Therefore, having an understanding or skill sets in a particular domain, acquired through interactions or experiences, may enhance one's perceptions of the value, or benefits and opportunities that may be achieved. Suggestions have also been made that as individuals accomplish intermediate tasks (acquiring knowledge and/or skills) towards a future goal, they acquire feedback regarding their progress towards their future goals (Miller et al., 1996). Therefore, individuals who are acquiring or have acquired knowledge of or skills in a certain domain can better understand and assess future implications. Therefore, in an IS context, the domain knowledge of and skills in IS may influence future opportunities or perceptions of benefits that can be achieved with IS.

Therefore, domain knowledge of and skills in IS is expected to influence perception of IS value. Considering research participants' comments regarding highly competent IS users, or those who are considered as competent in using IS, included "*best know how to utilize the system to facilitate business processes"*, IS users may need a basic knowledge of IS capabilities in order to understand the opportunities that IS can provide, or perception of IS value, such as facilitating business processes. Thus, domain knowledge of and skills in IS is hypothesized to influence perception of IS value.

H2: Domain knowledge of and skills in IS will positively influence perception of IS value.

### 5.1.2 Theory of Trying

The theory of trying, an extension of both the theory of planned behavior (Ajzen, 1985) and the theory of goal pursuit (Bagozzi & Edwards, 1998), proposes that trying is a reflection of action and some aspects of actual behavior (Ahuja & Thatcher, 2005). Trying is different from intention, which is considered a state of mind that is a driving force prompting one to take action. According to the theory of trying, expectations and attitudes, which can be impacted by obstacles, influence trying or the intent to try. Trying "reflects some action, and even some parts of the actual behavior…can be conceptually defined as doing all the necessary pre-behaviors and otherwise satisfying all necessary conditions that are within voluntary control for the performance of the subject behavior" (Mathur, 1998, p. 244-245) and has been referred to as "mental and physical activities leading up to and regulating the instrumental acts directly producing goal attainment" (Bagozzi & Edwards, 1998, p. 598). Although previous IS research has looked at factors such as work environment influencing trying to innovate with IT, suggestions have also been made to look at other potential factors.

Another potential factor is domain knowledge and skills. The theory of trying proposes that factors such as frequency of past trying can influence intentions to try and actual trying (Bagozzi & Warshaw, 1990). Previous research indicates that past trying or behaviors can influence future trying or behavioral intentions. When individuals reflect on their experiences associated with previous trying, they can use this knowledge to develop expectations of the possible consequences of future trying. This, in turn, can influence attitudes, intentions, and the ultimate action of trying. In the context of IS user

competency, domain knowledge of and skills in IS could be obtained from past or recent trying and, hence influence one's willingness to try and to explore IS.

Arguments have been made that if individuals are constrained by a lack of resources, they may not be interested in engaging in exploration (Thatcher et al., 2003). Although an individual may have intentions to perform a certain behavior, he/she may not have the required knowledge, skills, information or resources (Mathur, 1998). Researchers have proposed that "in order to effectively utilize a new technology in an innovative manner…Organizational actors need to understand *both* what the technology is capable of providing, as well as how it might best be utilized within the constraints imposed by the existing organizational environment and work processes (Nambisan et al., 1999, p.371). Hence, not having domain knowledge of and skills in IS may influence one's willingness to explore or attempt to try IS. Research participants, from this study, suggested that (referring to highly competent IS users) "*this set of individuals would have the ability to create new reports to access the data that they want to get out of the system.*" Therefore, specific IS skills or knowledge may be necessary in order to explore IS or try new activities in IS, such as creating new reports.

Hence, domain knowledge of and skills in IS is also proposed to influence willingness to try and to explore IS.

H3: Domain knowledge of and skills in IS will positively influence willingness to try and to explore IS.

As referred to in the Theory of Trying, trying is a reflection of action and satisfying all of the necessary conditions for performance of a particular behavior (Mathur, 1998). Also, trying is associated with the activities that provide the structure for actions to occur and achieve certain outcomes (Bagozzi & Edwards, 1998). Therefore, if one is in a state of willingness to try and to explore, this could provide the condition for certain behaviors to occur and outcomes to be realized. In the context of IS, a willingness to try and to explore IS can result in certain actions and outcomes.

Previous MIS research has cited that innovating with technologies can result in realizing the full potential of IT (Ahuja & Thatcher, 2005). Therefore, in the context of IS user competency, willingness to try and to explore IS may result in IS user competency or the ability to realize the fullest potential and the greatest performance from IS use. Suggestions have also been made that users may acquire an initial introduction and awareness to a particular technology, but the knowledge gained needs additional refinement through interaction with the technology (Nambisan et al., 1999). Hence, although domain knowledge may be acquired (which can thereby influence one's willingness to try and to explore IS as proposed by (H3), one's willingness to try and to explore IS is needed to develop IS user competency, which is hypothesized as follows.

H4: Willingness to try and to explore IS will positively influence IS user competency.

### 5.1.3 Theory of Expert Competence

According to the Theory of Expert Competence, competency is dependent upon domain knowledge, associated psychological traits, cognitive skills, effective decision

strategies, and appropriate task characteristics such that competency can be applied (Shanteau, 1992). The knowledge, just like the expertise, is domain specific. Therefore, developing expert competence in a particular domain requires prerequisite knowledge or content knowledge, but the expertise will only be developed for that particular domain (Shanteau, 1989, 1992). Various research studies have been cited that indicate the importance of domain knowledge (or referred to as a common core of knowledge) for expert performance to be realized (Libby & Luft, 1993; Bonner & Lewis, 1990; Einhorn, 1974).

Therefore, domain knowledge of and skills in IS is predicted to influence IS user competency. Previous research has identified that employees who were expected to become proficient IT/IS users needed significant amounts of knowledge and assistance to achieve this (Lee, 1986) and "in general, participants with better IS domain knowledge have been found to perform better than those with less domain knowledge" in contexts such as program comprehension (Khatri et al., 2006, p. 83). Also, previous research studies have demonstrated the importance of IS and application domain knowledge in tasks such as comprehending conceptual schemas and problem-solving in various contexts (Khatri et al., 2006). Hence, domain knowledge of and skills in IS is expected to influence IS user competency.

H5: Domain knowledge of and skills in IS will positively influence IS user competency.

Figure 5.1 shows the research model.

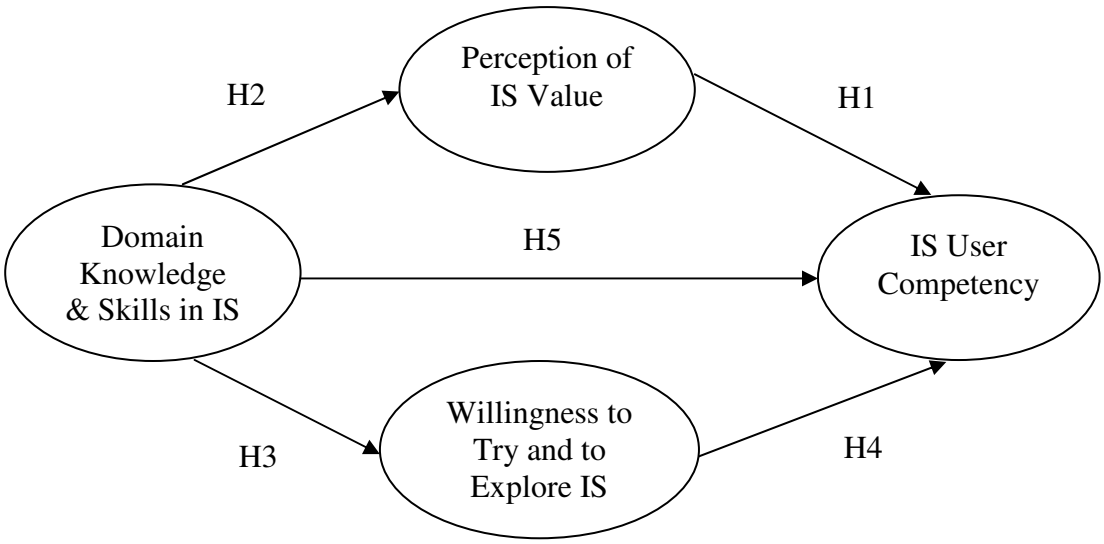



**Figure 5.1: Proposed Research Model**

Based on the findings from the qualitative study, the IS-specific state factors that are proposed to influence IS user competency include perception of IS value, domain knowledge of and skills in IS, and willingness to try and to explore IS. More specifically, IS-specific factors that are important to IS user competency include a good understanding of IS and skills to utilize IS, as well as a need to be willing to try and explore IS. Also, the ability to see the value, benefits, and opportunities that IS can provide is important for IS user competency. Therefore, the proposed model was developed based on these findings and is supported by existing literature and theories. This research study proposes to test the relationships between these factors and IS user competency.

## 5.2 Research Method and Procedures

The proposed research model was tested utilizing a survey research method. The target population for this survey is individuals who are IS users and who utilize IS for business-related tasks. A nation-wide insurance company in the Midwest was utilized for the research. Considering that organizations in the insurance industry are significant users of information systems, this industry is considered appropriate for this research. This company is heavily dependent on information systems that support its operations for its business functions; hence its employees meet the criteria of the target population for this study.

Only one organization is selected for this study to increase the internal validity of the results by minimizing potential confounding effects due to extraneous variables. Also, this organization has routinely used information systems but has also implemented new IS within the last several years. Wang, Butler, Hsieh, and Hsu (2008) cite "higher level usage behaviors like 'Innovate with IT' are more likely to occur after users have accepted and routinely used an IT" (p. 30). Also, the authors argue that although many companies mandate the use of IS, they do not mandate that employees find novel uses for and applications of IS. Therefore, considering this institution has used IS and implemented new IS several years ago, routine use should be established making innovation with IS more probable. Examples of tasks that IS are utilized for include report writing and data analysis. Innovation in these particular tasks is important to provide new insights into business operations and performance. Control variables were added to the survey to assess the perceptions that participants have on their control over the ability to innovate with IS, versus being restricted to routine usage.

A company representative emailed employees who utilize information systems in business-related capacities with a request to voluntarily participate in the survey. The email contained the URL for the survey and it also indicated that the survey is in conjunction with a Ph.D. research project. The representative also emailed reminders to employees to complete the survey, and requested they do so within 10 days. The survey request was emailed to all IS users who utilize IS for business related tasks regardless of job title or function considering that the manner and flexibility in which specific job responsibilities and tasks are to be completed may vary. Also, individuals may have different levels of autonomy in their jobs. Therefore, the impact of these control variables is evaluated as well.

The first part of the survey asked introductory questions to ensure that research participants meet the criteria of the population targeted for this survey. In order to complete the survey, participants needed to affirm that they: 1) utilize IS with the given definition of technology-driven systems that collect, process, store, and distribute information to support the operations, analysis and decision-making of an organization, and 2) utilize IS for business-related tasks. Examples of IS specific to the organization were provided as well as specific business-related tasks that could be performed with IS. If individuals answered "No" to either question, they were not allowed to proceed to the survey questions.

The second part of the survey assessed their domain knowledge and skills in IS, willingness to try and explore IS, perception of IS value, and level of IS user competency. Also, measures of control variables were taken as well as measures of IS self-efficacy for

secondary analysis. Items for IS self-efficacy were adapted from Compeau and Higgins (1995b).

The measurement items for the IS-specific state factors (i.e., perception of IS value, willingness to try and to explore IS, and domain knowledge of and skills in IS) and IS user competency were first adapted from existing literature. For constructs in which existing scales do not capture the conceptualization provided by the research participants in the qualitative study, additional items were developed based on these conceptualizations (see Table 5.1). All items were assessed on a 7-point Likert scale, with 1 being strongly disagree and 7 being strongly agree. Although perceived usefulness is being considered a theoretically distinct construct from perceptions of IS value, it was measured and included in the data analysis for both the pilot study and final survey to provide support for this distinction.

**Table 5.1: Factor Measurement Items**

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| Perception of IS Value - the ability to see the benefits and opportunities that IS can provide | Perceived Usefulness - "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320) | 1. Using information systems in my job enables me to accomplish tasks more quickly.<br>2. Using information systems improves my job performance.<br>3. Using information systems in my job increases my productivity.<br>4. Using information systems enhances my effectiveness on the job.<br>5. Using information systems makes it easier to do my job.<br>6. I find information systems useful in my job.<br>Note: Measures adapted to general information systems context. |
| | Perceived Value - "the overall evaluation of change related to a new IS implementation based on the comparison between benefits and costs" (Kim & Kankanhalli, 2009, p. 571) | 7. Considering the time and effort that I would spend completing a task without the use of information systems, utilizing information systems is worthwhile.<br>8. Considering the loss in efficiency and effectiveness that I would incur if I complete a task without the use of information systems, utilizing information systems is of good value.<br>9. Considering the hassle that I would experience to complete a task without the use of information systems, utilizing information systems is beneficial to me.<br>Note: Measures adapted to general information systems context. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| | New items developed based on research participants' concepts from the RepGrid study | 10. I envision new opportunities to enhance job performance by using information systems.<br>11. I envision new opportunities to achieve competitive advantages for the organization by using information systems.<br>12. I envision new opportunities to achieve strategic advantages for the organization by using information systems.<br>13. Information systems are valuable in completing job tasks.<br>14. Information systems are viewed as a strategic tool.<br>15. There are many advantages that can be gained with using information systems.<br>16. I recognize the potential benefits of information systems.<br>17. I couldn't imagine completing job tasks without information systems.<br>18. I envision how information systems contribute to accomplishing job tasks.<br>19. I see no value in applying information systems in novel ways to accomplish a job task.<br>20. Information systems present little value to completing a job task. |
| Willingness to Try and to Explore IS - willingness and comfort with trying technology and using IS | Personal innovativeness in the domain of information technology -"the willingness of an individual to try out any new IT" (Agarwal & Prasad, 1998, p. 206) | 1. When I hear about new information systems, I look for ways to experiment with them.<br>2. Among my peers, I am the first to try out new information systems.<br>3. I am hesitant to try out new information systems.<br>4. I experiment with new information systems.<br>Note: Measures adapted to general information systems context. |
| | Trying to Innovate with IT - "a user's goal of finding new uses of existing workplace information technologies" (Ahuja & Thatcher, 2005, p.431) | 5. I try to find new uses of information systems.<br>6. I try to use information systems in novel ways.<br>7. I try to be creative in using information systems. [Added item]<br>Note: Measures adapted to information systems context; an additional item was added that represents an adaptation of the original items to capture the research participants' perceptions of the construct. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| | Intention to Explore a Technology – "a user's willingness and purpose to explore a new technology and find potential use…a user's purpose and motivation to innovate based on the perceived business related benefits she will derive from IT deployment" (Nambisan et al., 1999, p. 373) | 8. I explore new information systems for potential application in my work context.<br>9. I explore new information systems for enhancing the effectiveness of my work.<br>10. I spend considerable time and effort in exploring new information systems for potential applications.<br>Note: Measures adapted to general information systems context. |
| | New items developed based on research participants' concepts from the RepGrid study | 11. I figure out how to use information systems that I am not familiar with.<br>12. I do not mind making mistakes with information systems.<br>13. I am interested in exploring the features that are available in information systems.<br>14. I am comfortable with trying to use information systems that I am not familiar with.<br>15. I prefer to be told how to use information systems.<br>16. I am uncomfortable exploring information systems.<br>17. I am afraid of making mistakes when exploring information systems.<br>18. I am unwilling to try using information systems that I am not familiar with. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| Domain Knowledge of and Skills in IS - understanding how IS operate and ability to operate IS | Technology cognizance – "a user's knowledge about the capabilities of a technology, its features, potential use, and cost and benefits, i.e., it relates to *awareness-knowledge*" (Nambisan et al., 1999, p. 372)<br><br>IT Knowledge – "specialized knowledge possessed by individuals: how well they understand fundamental IT concepts, how well informed they are about IT in their organization" (Bassellier et al., 2003, p. 320) | 1. I have general knowledge of information systems.<br>2. I have general knowledge of the available features of information systems.<br>3. I have general knowledge of the functionality of information systems.<br>4. I have general knowledge of how to extract information from information systems.<br>5. I have general knowledge of the type of business activities in which information systems have been/can be deployed.<br>6. I have the skills to use information systems.<br>7. I have the skills to utilize the available features of information systems.<br>8. I have the skills to use the functions of information systems.<br>9. I have the skills to extract information from information systems.<br><br>Note: Items were adapted to general information systems context, converted from questions to statements for the Likert scale, and adapted to also capture skills. |
| | New items developed based on research participants' concepts from the RepGrid study | 10. I understand how information systems operate.<br>11. I understand the limitations of information systems.<br>12. I am knowledgeable of how information systems work.<br>13. I know how to use information systems to facilitate business processes.<br>14. I am able to use information systems.<br>15. I can operate information systems.<br>16. I am unable to figure out how to use information systems on my own.<br>17. I have no basic skills in information systems usage. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| IS User Competency - the ability to utilize IS to its fullest potential and obtain the greatest performance from IS use | IT Business Integration – "their ability to visualize the ways in which IT can contribute to organizational performance and to look for synergies between IT and business activities" (Bassellier & Benbasat, 2004, p. 680) | 1. I am capable of recognizing potential ways to exploit new business opportunities using information systems.<br>2. I am capable of utilizing information systems to its fullest potential. [Added item]<br>3. I am capable of developing novel uses of information systems to address business problems. [Added item]<br>4. I am capable of analyzing ways to use information systems to obtain the greatest performance from information systems use. [Added item]<br>5. I am capable of utilizing information systems to achieve the greatest organizational impact.<br>6. I am capable of utilizing information systems to achieve the greatest positive impact. [Added item]<br>7. I am able to utilize information systems to achieve business goals.<br>8. I am able to utilize information systems to develop competitive advantages for my organization. [Added item]<br>9. I am able to utilize information systems to develop strategic advantages for my organization. [Added item]<br>10. I am able to utilize information systems to obtain maximum performance. [Added item]<br>11. I am able to develop novel uses of information systems to obtain superior performance. [Added item]<br>12. I am able to utilize information systems to address novel business problems. [Added item]<br>13. I am able to develop novel uses of information systems to address unique circumstances. [Added item]<br><br>Note: Items were converted from questions and ratings to statements for the Likert scale, and adapted from experience and level of knowledge to capabilities and abilities, and to general information systems context. Additional items were also added that represent adaptations of the original items to the definition of IS user competency. |

## 5.3 Pilot Study

### 5.3.1 Procedures-Pilot

Before the full-scale survey was administered, a pilot study was carried out to refine the factor measurement scales. In other words, the pilot study was administered to assess the reliability and validity of the survey items, and to refine the scales used to measure the factors in the proposed research model. Pilot subjects were also asked to provide feedback regarding the online questionnaire, the process (e.g., layout), as well as the measures (e.g., clarity). Various individuals who are acquaintances with the researchers, and were known to utilize IS, were recruited from a variety of organizations to complete the online survey. Individuals who agreed to complete the online survey were emailed the URL to access the survey.

To ensure that individuals were IS users, they needed to answer "yes" to two questions asking if they utilized IS (which was defined as technology-driven systems that collect, process, store, and distribute information to support the operations, analysis, and decision-making of an organization) and if they utilized IS for business-related tasks. If they answered the questions affirmatively, they could proceed to the survey. If not, then they were unable to complete the survey and received a message of appreciation for their time. After completing the two introductory questions in the survey affirming that they were IS users and utilized IS in a business-context, they then proceeded to complete the survey. Participants were asked to email the author any comments or concerns during and after completion of the survey regarding issues with the survey including wording of the measurement items as well as the survey layout and functionality. All issues

presented by participants were addressed before the final full-scale survey was administered.

The sample size for the pilot was 100 participants. Demographics of participants are presented in Table 5.2. As noted in Table 5.2, participants averaged 9 years of experience utilizing IS, 18 years of experience utilizing computers, and 13 years of total work experience.

**Table 5.2: Pilot Study – Demographic Information**

| **Age** | **# of Participants** | | |
|---|---|---|---|
| 19-20 | 8 | | |
| 21-30 | 34 | | |
| 31-40 | 26 | | |
| 41-50 | 23 | | |
| 51-60 | 8 | | |
| 61-70 | 1 | | |
| | | | |
| **Job Position** | | | |
| Management | 47 | | |
| Non-Management | 53 | | |
| | | | |
| | **Minimum** | **Maximum** | **Mean** |
| Computer Experience | 3 | 35 | 18 |
| IS Experience | <1 | 27 | 9 |
| Total Work Experience | <1 | 44 | 13 |
| | | | |
| IS Examples | *SAP* *Oracle* *POS* *CRM* *Databases (e.g., MS Access)* | | |

### 5.3.2 Item Statistics-Pilot

Factor analysis and reliability analysis was conducted using SPSS 18.0 for each of the four model factors: perception of IS value (PIV), willingness to try and to explore IS (WTE), domain knowledge of and skills in IS (DKS), and IS competency (ISC). Descriptive statistics, as shown in Table 5.3, demonstrate most items cover the range of response categories (responses on a 1 to 7 Likert-type scale). Two items' (PIV16 and

DKS15) minimums were 4 and will be reviewed closely in the factor analysis that follows.

Factor analysis was conducted using principal components analysis with Varimax rotation and Kaiser normalization. Initial results generated 13 factors. Measurement items with problems in their loading were reviewed (e.g., cross-loadings, unexpected loadings on same factor, loadings less than .5 on any one factor). Those that were determined to be too abstractly worded or too broad were removed in subsequent iterations. Final results of the factor analysis are shown in Table 5.4.

As noted previously, perceived usefulness and perception of IS value are included in the data analysis to obtain support for the proposed theoretical distinction between them. Based on the pilot study, most of these items loaded separately onto two factors. Further testing will be conducted by collecting additional data in the full-scale survey. Willingness to try and to explore IS may have multiple dimensions. For instance, the first dimension may be tapping onto *behaviors* associated with a state of willingness to try and to explore IS (e.g., I experiment with new information systems) and the second dimension tapping onto *affect* (e.g., I am uncomfortable exploring information systems). Items for all dimensions were retained for the full-scale survey that was administered.

**Table 5.3: Descriptive Statistics – Pilot Study**

| Item | Minimum | Maximum | Mean | Std Dev |
|---|---|---|---|---|
| *Perception of IS value* | | | | |
| PIV1 | 2 | 7 | 6.06 | .97 |
| PIV2 | 2 | 7 | 5.97 | .97 |
| PIV3 | 1 | 7 | 5.96 | 1.09 |
| PIV4 | 2 | 7 | 5.94 | 1.01 |
| PIV5 | 2 | 7 | 6.11 | .94 |
| PIV6 | 3 | 7 | 6.15 | .91 |
| PIV7 | 2 | 7 | 6.10 | 1.13 |
| PIV8 | 2 | 7 | 5.99 | 1.24 |
| PIV9 | 2 | 7 | 6.08 | 1.09 |
| PIV10 | 3 | 7 | 5.85 | .95 |
| PIV11 | 3 | 7 | 5.88 | .96 |
| PIV12 | 1 | 7 | 5.89 | 1.03 |
| PIV13 | 3 | 7 | 6.17 | .84 |
| PIV14 | 2 | 7 | 5.83 | 1.12 |
| PIV15 | 3 | 7 | 6.21 | .84 |
| PIV16 | 4 | 7 | 6.15 | .77 |
| PIV17 | 2 | 7 | 5.71 | 1.37 |
| PIV18 | 3 | 7 | 5.92 | .98 |
| PIV19 | 1 | 7 | 5.5 | 1.53 |
| PIV20 | 1 | 7 | 5.68 | 1.53 |
| PIV (average) | | | 5.96 | .76 |
| *Willingness to Try and to Explore IS* | | | | |
| WTE1 | 2 | 7 | 4.83 | 1.36 |
| WTE2 | 2 | 7 | 4.34 | 1.46 |
| WTE3 | 1 | 7 | 4.84 | 1.45 |
| WTE4 | 1 | 7 | 4.73 | 1.43 |
| WTE5 | 1 | 7 | 5.01 | 1.37 |
| WTE6 | 2 | 7 | 4.96 | 1.36 |
| WTE7 | 2 | 7 | 5.13 | 1.20 |
| WTE8 | 2 | 7 | 4.88 | 1.35 |
| WTE9 | 1 | 7 | 4.96 | 1.37 |
| WTE10 | 1 | 7 | 4.01 | 1.57 |
| WTE11 | 2 | 7 | 4.92 | 1.29 |
| WTE12 | 1 | 7 | 4.93 | 1.33 |
| WTE13 | 2 | 7 | 5.28 | 1.09 |
| WTE14 | 2 | 7 | 5.05 | 1.21 |
| WTE15 | 1 | 7 | 3.39 | 1.51 |
| WTE16 | 2 | 7 | 4.90 | 1.38 |
| WTE17 | 1 | 7 | 4.84 | 1.50 |
| WTE18 | 2 | 7 | 5.32 | 1.38 |
| WTE (average) | | | 4.80 | .92 |

| Item | Minimum | Maximum | Mean | Std Dev |
|---|---|---|---|---|
| *Domain Knowledge of and Skills in IS* | | | | |
| DKS1 | 3 | 7 | 5.50 | 1.02 |
| DKS2 | 3 | 7 | 5.44 | .98 |
| DKS3 | 3 | 7 | 5.54 | .93 |
| DKS4 | 2 | 7 | 5.42 | 1.06 |
| DKS5 | 2 | 7 | 5.47 | 1.04 |
| DKS6 | 3 | 7 | 5.68 | .84 |
| DKS7 | 3 | 7 | 5.70 | .94 |
| DKS8 | 3 | 7 | 5.71 | .90 |
| DKS9 | 2 | 7 | 5.57 | 1.01 |
| DKS10 | 2 | 7 | 5.25 | 1.11 |
| DKS11 | 2 | 7 | 5.25 | 1.10 |
| DKS12 | 2 | 7 | 5.20 | 1.16 |
| DKS13 | 2 | 7 | 5.34 | 1.18 |
| DKS14 | 2 | 7 | 5.84 | .94 |
| DKS15 | 4 | 7 | 5.87 | .83 |
| DKS16 | 1 | 7 | 5.28 | 1.44 |
| DKS17 | 2 | 7 | 5.83 | 1.14 |
| DKS (average) | | | 5.52 | .83 |
| *IS Competency* | | | | |
| ISC1 | 2 | 7 | 5.08 | 1.24 |
| ISC2 | 1 | 7 | 4.82 | 1.30 |
| ISC3 | 2 | 7 | 4.84 | 1.27 |
| ISC4 | 2 | 7 | 4.84 | 1.28 |
| ISC5 | 2 | 7 | 4.81 | 1.27 |
| ISC6 | 2 | 7 | 4.92 | 1.23 |
| ISC7 | 2 | 7 | 5.42 | 1.08 |
| ISC8 | 2 | 7 | 4.98 | 1.21 |
| ISC9 | 2 | 7 | 4.85 | 1.33 |
| ISC10 | 2 | 7 | 4.97 | 1.24 |
| ISC11 | 2 | 7 | 4.79 | 1.34 |
| ISC12 | 2 | 7 | 4.89 | 1.33 |
| ISC13 | 2 | 7 | 4.84 | 1.35 |
| ISC (average) | | | 4.93 | 1.09 |

**Table 5.4: Factor Analysis – Pilot Study**

| | PIV1 | PIV2 | WTE1 | WTE2 | WTE3 | DKS | ISC |
|---|---|---|---|---|---|---|---|
| PIV1 | **.855** | .184 | .028 | .102 | .260 | .176 | .091 |
| PIV2 | **.827** | .214 | .115 | -.020 | -.014 | .118 | .181 |
| PIV3 | **.862** | .135 | .112 | .125 | .186 | .131 | .179 |
| PIV4 | **.845** | .123 | .139 | .111 | .003 | .174 | .278 |
| PIV5 | **.779** | .134 | .003 | .175 | .113 | .088 | .108 |
| PIV6 | **.789** | .279 | .099 | .101 | -.097 | .251 | .029 |
| PIV7 | **.854** | .001 | .118 | .032 | .002 | .072 | .117 |
| PIV9 | **.804** | .033 | .080 | -.025 | -.188 | .147 | .089 |
| PIV10 | .302 | **.688** | .097 | .020 | .006 | .153 | .174 |
| PIV11 | .288 | **.794** | .216 | .121 | .023 | .161 | .195 |
| PIV12 | .219 | **.773** | .186 | .091 | .149 | .201 | .164 |
| PIV14 | .241 | **.627** | .148 | -.153 | -.120 | .157 | .156 |
| PIV17 | **.707** | .123 | .345 | .011 | -.048 | .118 | -.002 |
| PIV18 | **.632** | .307 | .126 | -.033 | -.307 | .314 | .218 |
| WTE1 | .357 | -.049 | **.593** | .079 | -.070 | .157 | **.409** |
| WTE2 | .087 | .002 | **.701** | .190 | -.048 | .135 | .337 |
| WTE4 | .176 | .005 | **.718** | .117 | -.047 | .197 | .238 |
| WTE5 | .334 | .232 | **.673** | .221 | -.043 | .324 | .134 |
| WTE6 | .043 | .291 | **.668** | .223 | -.333 | .273 | .164 |
| WTE7 | .240 | .184 | **.674** | .297 | -.075 | .296 | .185 |
| WTE8 | .122 | .254 | **.672** | .108 | **.432** | .287 | .265 |
| WTE9 | .086 | .304 | **.642** | .072 | **.401** | .285 | .255 |
| WTE10 | .032 | .234 | **.700** | -.023 | .187 | -.019 | .310 |
| WTE12 | .150 | .080 | .146 | **.714** | .167 | .066 | .161 |
| WTE15 | -.074 | -.110 | .219 | **.612** | -.008 | .184 | .239 |
| WTE16 | .094 | -.105 | .252 | **.690** | -.148 | .337 | .223 |
| WTE17 | .019 | .059 | .037 | **.870** | -.098 | .139 | .141 |
| WTE18 | .269 | .132 | .104 | **.655** | .100 | .338 | .002 |
| DKS1 | .243 | .135 | .225 | .182 | .021 | **.769** | .269 |
| DKS2 | .190 | .171 | .307 | .177 | .145 | **.729** | .252 |
| DKS3 | .148 | .146 | .239 | .171 | .098 | **.750** | .325 |
| DKS4 | .230 | .027 | .195 | .184 | .123 | **.793** | .331 |
| DKS5 | .150 | .047 | .185 | .086 | .062 | **.798** | .348 |
| DKS6 | .129 | .166 | .095 | .152 | -.189 | **.808** | .219 |
| DKS7 | .209 | .175 | .114 | .081 | -.011 | **.821** | .283 |
| DKS8 | .128 | .165 | .070 | .143 | -.090 | **.820** | .251 |
| DKS9 | .193 | .113 | .164 | .204 | -.018 | **.752** | .256 |

| | PIV1 | PIV2 | WTE1 | WTE2 | WTE3 | DKS | ISC |
|---|---|---|---|---|---|---|---|
| ISC2 | .231 | -.103 | .288 | .163 | .134 | **.429** | **.643** |
| ISC3 | .020 | .083 | .259 | .151 | -.142 | .379 | **.644** |
| ISC4 | .244 | -.016 | .293 | .176 | .111 | .380 | **.658** |
| ISC5 | .200 | .075 | .237 | .070 | .224 | .359 | **.706** |
| ISC8 | .101 | .294 | .096 | .113 | .095 | .395 | **.711** |
| ISC9 | .101 | .257 | .175 | .111 | .110 | .273 | **.783** |
| ISC10 | .130 | .148 | .221 | .088 | .027 | .343 | **.760** |
| ISC11 | .213 | .155 | .261 | .125 | -.104 | .235 | **.793** |
| ISC12 | .225 | .182 | .287 | .211 | -.172 | .262 | **.748** |
| ISC13 | .175 | .236 | .274 | .227 | -.103 | .229 | **.746** |

PIV1 = Perception of IS Value (Dimension 1); PIV2 = Perception of IS Value (Dimension 2); WTE1 = Willingness to Try and to Explore IS (Dimension 1); WTE2 = Willingness to Try and to Explore IS (Dimension 2); WTE3 = Willingness to Try and to Explore IS (Dimension 3); DKS = Domain Knowledge of and Skills in IS; ISC = IS User Competency

A few items cross-loaded between factors (i.e., WTE1 and ISC2), but considering the loading on at least one of the factors for each of these items was close to .6 and it could not be theoretically justified to discard them, they were retained for the final full-scale survey. Reliability analysis was conducted utilizing Cronbach's alpha coefficients (results are shown in Table 5.5) and all constructs achieved acceptable levels above .90, which is above the threshold of .70 recommended by Nunnally (1978). Also, four additional survey items were created for the perception of IS value construct, shown in Table 5.6, and included in the final full-scale survey. These items were created based on refinements of the items that were previously discarded because they were too broad or abstract, and were added considering the novelty of this construct.

**Table 5.5: Cronbach's Alpha Coefficients – Pilot Study**

| Construct | Cronbach's Alpha Coefficient |
|---|---|
| Perception of IS Value | .94 |
| Willingness to Try and to Explore | .92 |
| Domain Knowledge of and Skills in IS | .97 |
| IS User Competency | .96 |

**Table 5.6: Additional Survey Items – Perception of IS Value**

| Items |
|---|
| I can see the opportunities that the organization can derive from information systems. |
| I see the value that the organization can derive from information systems. |
| I can perceive why the organization utilizes information systems to achieve its objectives. |
| I can envision the benefits that the organization can derive from information systems. |

## 5.4 Full-scale Survey

### 5.4.1 Measurement

The following survey items (see Table 5.7 and Table 5.8) were utilized for the final full-scale survey. The factor measurement items were refined based on the results of the pilot study.

**Table 5.7: Survey – Factor Measurement Items**

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| Perception of IS Value - the ability to see the benefits and opportunities that IS can provide | Perceived Usefulness - "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320) | 1. Using information systems in my job enables me to accomplish tasks more quickly.<br>2. Using information systems improves my job performance.<br>3. Using information systems in my job increases my productivity.<br>4. Using information systems enhances my effectiveness on the job.<br>5. Using information systems makes it easier to do my job.<br>6. I find information systems useful in my job. |
| | Perceived Value - "the overall evaluation of change related to a new IS implementation based on the comparison between benefits and costs" (Kim & Kankanhalli, 2009, p. 571) | 7. Considering the time and effort that I would spend completing a task without the use of information systems, utilizing information systems is worthwhile.<br>8. Considering the hassle that I would experience to complete a task without the use of information systems, utilizing information systems is beneficial to me. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| | New items developed based on research participants' concepts from the RepGrid study and based on results from Pilot Study | 9. I envision new opportunities to enhance job performance by using information systems.<br>10. I envision new opportunities to achieve competitive advantages for the organization by using information systems.<br>11. I envision new opportunities to achieve strategic advantages for the organization by using information systems.<br>12. Information systems are viewed as a strategic tool.<br>13. I can see the opportunities that the organization can derive from information systems.<br>14. I see the value that the organization can derive from information systems.<br>15. I can perceive why the organization utilizes information systems to achieve its objectives.<br>16. I can envision the benefits that the organization can derive from information systems.<br>17. I couldn't imagine completing job tasks without information systems.<br>18. I envision how information systems contribute to accomplishing job tasks. |
| Willingness to Try and to Explore IS - willingness and comfort with trying technology and using IS | Personal innovativeness in the domain of information technology -"the willingness of an individual to try out any new IT" (Agarwal & Prasad, 1998, p. 206) | 1. When I hear about new information systems, I look for ways to experiment with them.<br>2. Among my peers, I am the first to try out new information systems.<br>3. I experiment with new information systems. |
| | Trying to Innovate with IT - "a user's goal of finding new uses of existing workplace information technologies" (Ahuja & Thatcher, 2005, p.431) | 4. I try to find new uses of information systems.<br>5. I try to use information systems in novel ways.<br>6. I try to be creative in using information systems. [Added item] |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| | Intention to Explore a Technology – "a user's willingness and purpose to explore a new technology and find potential use…a user's purpose and motivation to innovate based on the perceived business related benefits she will derive from IT deployment" (Nambisan, Agarwal, & Tanniru, 1999, p. 373) | 7. I explore new information systems for potential application in my work context.<br>8. I explore new information systems for enhancing the effectiveness of my work.<br>9. I spend considerable time and effort in exploring new information systems for potential applications. |
| | New items developed based on research participants' concepts from the RepGrid study | 10. I do not mind making mistakes with information systems.<br>11. I prefer to be told how to use information systems.<br>12. I am uncomfortable exploring information systems.<br>13. I am afraid of making mistakes when exploring information systems.<br>14. I am unwilling to try using information systems that I am not familiar with. |
| Domain Knowledge of and Skills in IS - understanding how IS operate and ability to operate IS | Technology cognizance – "a user's knowledge about the capabilities of a technology, its features, potential use, and cost and benefits, i.e., it relates to *awareness-knowledge*" (Nambisan, Agarwal, & Tanniru, 1999, p. 372) | 1. I have general knowledge of information systems.<br>2. I have general knowledge of the available features of information systems.<br>3. I have general knowledge of the functionality of information systems.<br>4. I have general knowledge of how to extract information from information systems.<br>5. I have general knowledge of the type of business activities in which information systems have been/can be deployed.<br>6. I have the skills to use information systems.<br>7. I have the skills to utilize the available features of information systems.<br>8. I have the skills to use the functions of information systems.<br>9. I have the skills to extract information from information systems. |

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| | IT Knowledge – "specialized knowledge possessed by individuals: how well they understand fundamental IT concepts, how well informed they are about IT in their organization" (Bassellier, Benbasat, & Reich, 2003, p. 320) | |
| IS User Competency - the ability to utilize IS to its fullest potential and obtain the greatest performance from IS use | IT Business Integration – "their ability to visualize the ways in which IT can contribute to organizational performance and to look for synergies between IT and business activities" (Bassellier & Benbasat, 2004, p. 680) | 1. I am capable of utilizing information systems to its fullest potential. [Added item]<br>2. I am capable of developing novel uses of information systems to address business problems. [Added item]<br>3. I am capable of analyzing ways to use information systems to obtain the greatest performance from information systems use. [Added item]<br>4. I am capable of utilizing information systems to achieve the greatest organizational impact.<br>5. I am able to utilize information systems to develop competitive advantages for my organization. [Added item]<br>6. I am able to utilize information systems to develop strategic advantages for my organization. [Added item]<br>7. I am able to utilize information systems to obtain maximum performance. [Added item]<br>8. I am able to develop novel uses of information systems to obtain superior performance. [Added item]<br>9. I am able to utilize information systems to address novel business problems. [Added item]<br>10. I am able to develop novel uses of information systems to address unique circumstances. [Added item] |

**Table 5.8: Survey - Control Measurement Items**

| Existing Literature Construct and Definition | Measurement Items |
|---|---|
| Autonomy - "refers to' the degree to which the job provides substantial freedom, independence and discretion in scheduling the work and in determining the procedures to be used in carrying it out' (Hackman & Oldham, 1975, p. 162)" (Ahuja & Thatcher, 2005, p. 436) | 1. I have the freedom to decide how I perform assigned tasks.<br>2. I control the content of my job.<br>3. I have the authority to initiate projects at my job.<br>4. I set my own schedule for completing assigned tasks.<br><br>Note: Measures adapted based on research context. |
| New items developed based on context of IS user competency and modification of Autonomy items (Ahuja & Thatcher, 2005, p. 436) | 1. I have the freedom to decide how to apply information systems to a particular job task.<br>2. I have the opportunity to explore information systems.<br>3. I have the freedom to develop new uses for information systems.<br>4. I control how information systems will be used to complete a job task.<br>5. I control how I use information systems.<br>6. I have the authority to decide whether or not to utilize information systems to complete a job task. |
| Top management support for innovation and organizational learning – "the extent to which employees perceived that top management established a work climate that encouraged creativity, innovation, sharing of information, and responsiveness to change" (Latting et al., 2004, p.32) | 1. My organization publicly recognizes those who are innovative with information systems.<br>2. Our ability to function creatively with information systems is respected by the leadership at my organization.<br>3. Top management encourages us to learn more about information systems.<br>4. My organization can be described as continually adapting changes to information systems<br>5. Top management encourages us to share information with each other regarding information systems.<br>6. My organization is open to changes to information systems.<br>7. My organization is responsive to changes to information systems.<br>8. My organization's reward system encourages innovation with information systems.<br><br>Note: Items were adapted to information systems context, and converted from questions to statements for the Likert scale. |

| Existing Literature Construct and Definition | Measurement Items |
|---|---|
| Supervisor support for employee empowerment and development – " defined as the extent to which employees perceived that their supervisors afforded them flexibility and freedom, encouraged their suggestions and opinions, and provided opportunities for training" (Latting et al., 2004, p.33) | 1. My supervisor provides opportunities for employees to give comments and opinions about information systems.<br>2. My supervisor provides notification of training opportunities for information systems.<br>3. My supervisor provides encouragement to develop better ways of using information systems.<br>4. My supervisor provides meetings to discuss fundamental problems with information systems.<br><br>Note: Items were adapted to information systems context as well as individual interaction with supervisor (versus workgroup interaction), and converted from questions to statements for the Likert scale. |

### 5.4.2 Research Participants

The sample size for the full-scale survey is 596 participants. This sample size was deemed adequate considering guidelines for structural equation modeling suggest that sizes that exceed 200 are considered "large" (Kline, 2005, p.15), and the sample for this study is almost three times that criteria. Demographics of participants are presented in Table 5.9. Participants averaged 11 years of work experience with the current organization, and 23 years of total work experience. For IS experience, participants averaged 19 years of experience. Considering the two introductory questions in the survey affirming that they were IS users and utilized IS in a business-context, and the extensive experience with IS, this sample is deemed appropriate for the current study.

**Table 5.9: Demographic Information**

| Age | # of Participants | | |
|---|---|---|---|
| 21-30 | 72 | | |
| 31-40 | 143 | | |
| 41-50 | 205 | | |
| 51-60 | 141 | | |
| 61-70 | 35 | | |
| | | | |
| **Job Position** | | | |
| Management | 158 | | |
| Non-Management | 438 | | |
| | | | |
| | **Minimum** | **Maximum** | **Mean** |
| Computer Experience | 3 | 46 | 23 |
| IS Experience | 2 | 40 | 19 |
| Work Experience w/ Current Organization | <1 | 45 | 11 |
| Total Work Experience | <1 | 61 | 23 |

## 5.5 Data Analysis

### 5.5.1 Item Statistics

Factor analysis was conducted with SPSS 18.0 using principal components analysis with Varimax rotation and Kaiser normalization. The factor analysis includes not only the four variables in the research model but also perceived usefulness, which is included to demonstrate that perception of IS value is a distinct construct from perceived usefulness in the literature. All measurement items with problems in their loading were reviewed and evaluated for potential semantic and theoretical issues. Those deemed problematic (e.g., cross-loadings) were discarded. Final results of the factor analysis indicate that five factors emerged. Descriptive statistics are shown in Table 5.10 and factor analysis results are shown in Table 5.11, and 78.9% of the variance in the data is explained. All items achieved at least a .70 factor loading except for three which ranged

from .674 to .695, and the loadings for these three items were higher on one particular factor than any other and the loadings did not exceed .38 on the other factors.

To note, the items adapted from perceived usefulness (Davis, 1989) did not load with the items developed for perception of IS value, which was a construct derived based on participants' comments. Therefore, the factor analysis suggests that they are conceptually different (i.e., perceived usefulness is a distinct construct from perception of IS value based on the data from this study), which is consistent with the theoretical propositions proposed in Chapter four. An $R^2$ analysis indicates that perception of IS value explains five times more variation in IS user competency than perceived usefulness (.105 vs .021), suggesting that perception of IS value is a more important and relevant construct for explaining IS user competency.

An additional factor analysis reveals that the four factors (i.e., not including perceived usefulness items noted in Table 5.11) explain 77.1% of the variance in the data. Reliability analysis was conducted with SPSS 18.0 utilizing Cronbach's alpha coefficients and the results are shown in Table 5.12. All four factors achieved acceptable levels above .90 which exceeds Nunnally's recommendation of .70 (Nunnally, 1978). Also, items were reviewed for internal consistency – ensuring that no items have low corrected-item total correlations (i.e., below .5) and no improvements in Cronbach's alpha coefficients occur if any item was removed. Based on this review, no issues were noted and all items appear internally consistent.

**Table 5.10: Descriptive Statistics**

| Item | Minimum | Maximum | Mean | Std Dev |
|---|---|---|---|---|
| *Perception of IS value* | | | | |
| PIV1 | 1 | 7 | 6.42 | .88 |
| PIV2 | 1 | 7 | 6.32 | .92 |
| PIV3 | 1 | 7 | 6.34 | .95 |
| PIV4 | 1 | 7 | 6.35 | .87 |
| PIV5 | 1 | 7 | 6.32 | .96 |
| PIV6 | 1 | 7 | 6.42 | .83 |
| PIV9 | 1 | 7 | 6.10 | .95 |
| PIV10 | 1 | 7 | 6.18 | .94 |
| PIV11 | 1 | 7 | 6.11 | .97 |
| PIV12 | 1 | 7 | 6.29 | .91 |
| PIV13 | 1 | 7 | 6.28 | .82 |
| PIV14 | 1 | 7 | 6.37 | .75 |
| PIV16 | 1 | 7 | 6.29 | .80 |
| PIV (average) | | | 6.29 | .73 |
| *Domain Knowledge of and Skills in IS* | | | | |
| DKS1 | 1 | 7 | 6.13 | .81 |
| DKS2 | 1 | 7 | 6.02 | .89 |
| DKS3 | 1 | 7 | 6.00 | .94 |
| DKS4 | 1 | 7 | 5.89 | 1.01 |
| DKS5 | 1 | 7 | 5.90 | 1.00 |
| DKS6 | 2 | 7 | 6.12 | .82 |
| DKS7 | 2 | 7 | 6.02 | .89 |
| DKS (average) | | | 6.01 | .80 |
| *Willingness to Try and to Explore IS* | | | | |
| WTE1 | 1 | 7 | 5.29 | 1.35 |
| WTE2 | 1 | 7 | 4.76 | 1.46 |
| WTE3 | 1 | 7 | 4.95 | 1.49 |
| WTE4 | 1 | 7 | 5.02 | 1.42 |
| WTE7 | 1 | 7 | 4.95 | 1.43 |
| WTE8 | 1 | 7 | 5.07 | 1.40 |
| WTE9 | 1 | 7 | 4.09 | 1.49 |
| WTE (average) | | | 4.88 | 1.23 |

| Item | Minimum | Maximum | Mean | Std Dev |
|---|---|---|---|---|
| *IS Competency* | | | | |
| ISC1 | 1 | 7 | 4.97 | 1.34 |
| ISC3 | 1 | 7 | 4.88 | 1.41 |
| ISC4 | 1 | 7 | 4.93 | 1.31 |
| ISC5 | 1 | 7 | 4.80 | 1.37 |
| ISC6 | 1 | 7 | 4.76 | 1.37 |
| ISC7 | 1 | 7 | 5.11 | 1.23 |
| ISC8 | 1 | 7 | 4.68 | 1.37 |
| ISC9 | 1 | 7 | 4.85 | 1.32 |
| ISC10 | 1 | 7 | 4.76 | 1.40 |
| ISC (average) | | | 4.86 | 1.19 |

**Table 5.11: Factor Analysis**

| | PU | PIV | WTE | DKS | ISC |
|---|---|---|---|---|---|
| PIV1 | **.885** | .279 | .141 | .009 | .014 |
| PIV2 | **.866** | .355 | .111 | .056 | .048 |
| PIV3 | **.863** | .329 | .120 | .020 | .039 |
| PIV4 | **.868** | .343 | .141 | .041 | .010 |
| PIV5 | **.859** | .295 | .141 | .016 | .049 |
| PIV6 | **.827** | .361 | .124 | .033 | .016 |
| PIV9 | .385 | **.717** | .142 | .152 | .151 |
| PIV10 | .331 | **.811** | .122 | .114 | .129 |
| PIV11 | .286 | **.837** | .135 | .122 | .132 |
| PIV12 | .303 | **.789** | .169 | .064 | .107 |
| PIV13 | .224 | **.819** | .097 | .114 | .099 |
| PIV14 | .341 | **.782** | .132 | .093 | .088 |
| PIV16 | .305 | **.742** | .176 | .113 | .152 |
| DKS1 | .105 | .154 | **.871** | .140 | .132 |
| DKS2 | .145 | .154 | **.886** | .170 | .158 |
| DKS3 | .121 | .136 | **.889** | .174 | .178 |
| DKS4 | .127 | .175 | **.816** | .177 | .234 |
| DKS5 | .135 | .152 | **.803** | .146 | .232 |
| DKS6 | .119 | .068 | **.695** | .207 | .354 |
| DKS7 | .119 | .110 | **.674** | .191 | .378 |
| WTE1 | .098 | .147 | .216 | **.777** | .260 |
| WTE2 | .005 | .035 | .206 | **.794** | .278 |
| WTE3 | .025 | .071 | .217 | **.807** | .311 |
| WTE4 | .070 | .127 | .238 | **.735** | .389 |
| WTE7 | .035 | .143 | .128 | **.766** | .396 |
| WTE8 | .047 | .167 | .146 | **.761** | .376 |
| WTE9 | -.032 | .105 | .092 | **.691** | .366 |
| ISC1 | -.012 | .068 | .258 | .272 | **.709** |
| ISC3 | -.012 | .083 | .203 | .381 | **.761** |
| ISC4 | .026 | .103 | .163 | .281 | **.842** |
| ISC5 | -.017 | .159 | .143 | .225 | **.858** |
| ISC6 | -.011 | .167 | .129 | .250 | **.850** |
| ISC7 | .111 | .107 | .247 | .190 | **.790** |
| ISC8 | .047 | .069 | .193 | .310 | **.831** |
| ISC9 | .095 | .101 | .227 | .262 | **.806** |
| ISC10 | .075 | .085 | .230 | .338 | **.793** |

PIV-PU = Perception of IS Value (Items adapted from Perceived Usefulness); PIV = Perception of IS Value (New items); WTE = Willingness to Try and to Explore IS; DKS = Domain Knowledge of and Skills in IS; ISC = IS User Competency

**Table 5.12: Cronbach's Alpha Coefficients**

| Construct | Cronbach's Alpha Coefficient |
|---|---|
| Perception of IS Value | .95 |
| Willingness to Try and to Explore | .94 |
| Domain Knowledge of and Skills in IS | .95 |
| IS User Competency | .96 |

### 5.5.2 Skewness and Kurtosis

The data were reviewed for potential issues of skewness and kurtosis. Specifically, guidelines by Kline (2005) were followed which suggest that indexes above 3 indicate extreme skewness. For kurtosis, indexes above 3 suggest positive kurtosis and below 3 indicate negative kurtosis. Also, general guidelines provided by Kline suggest that kurtosis indices above 10 suggests a problem, and above 20 a serious problem. None of the measurements items had skewness indexes above 3, but 12 out of the 20 items had kurtosis indexes above 3 (see Table 5.13). The largest kurtosis index of 9.03 is below Kline's suggested index of 10 in which problems can occur. Considering the presence of non-normality, a logarithmic transformation of the data was performed. One method of addressing non-normality is conducting transformations of the data points such as a logarithmic transformation (Kline, 2005; Raykov & Marcoulides, 2006).

**Table 5.13: Skewness and Kurtosis**

| | **Skewness** | **Kurtosis** |
|---|---|---|
| PIV9 | -1.508 | 3.957 |
| PIV10 | -1.624 | 4.130 |
| PIV11 | -1.481 | 3.222 |
| PIV12 | -1.959 | 6.072 |
| PIV13 | -1.673 | 5.779 |
| PIV14 | -2.002 | 9.032 |
| PIV16 | -1.667 | 5.309 |
| DKS1 | -1.607 | 6.304 |
| DKS2 | -1.702 | 5.661 |
| DKS3 | -1.765 | 5.610 |
| DKS4 | -1.387 | 3.011 |
| DKS5 | -1.331 | 2.928 |
| DKS6 | -1.282 | 3.446 |
| DKS7 | -1.265 | 2.908 |
| WTE1 | -.808 | .550 |
| WTE2 | -.404 | -.358 |
| WTE3 | -.612 | -.150 |
| WTE4 | -.527 | -.314 |
| WTE7 | -.555 | -.273 |
| WTE8 | -.688 | .022 |
| WTE9 | -.070 | -.682 |
| ISC1 | -.746 | .152 |
| ISC3 | -.508 | -.400 |
| ISC4 | -.594 | .065 |
| ISC5 | -.474 | -.167 |
| ISC6 | -.448 | -.147 |
| ISC7 | -.786 | .672 |
| ISC8 | -.377 | -.366 |
| ISC9 | -.498 | -.216 |
| ISC10 | -.419 | -.356 |

### 5.5.3 Common Method Variance

The data were also analyzed for common method variance. Common method variance is variance due to the measurement method rather than the constructs (Podsakoff, MacKenzie, & Lee, 2003). One widely used test to measure for this bias is the Harman's one-factor test (Podsakoff et al., 2003; Podsakoff & Organ, 1986). All variables were loaded into an exploratory factor analysis and the unrotated factor solution was reviewed. The number of factors needed to account for the variance in the variables was four (i.e., four factors with eigenvalues greater than one). This provides support for the absence of common method variance because only a single factor is proposed to emerge if common method variance was present (Podsakoff et al., 2003; Podsakoff & Organ, 1986). Also, only one factor would have accounted for a majority of the variance, but the largest variance accounted for by any one factor was 47 percent.

Also, another test to assess common method variance is utilizing confirmatory factor analysis in which all items are modeled as indicators of a single factor and the model fit assessed (Malhotra, Kim, & Patil, 2006). If the model achieves acceptable fit, then common method bias is assumed to be present. For this study, confirmatory factor analyses were conducted for four different models. The first model was ran with one factor and all items being forced to load on one factor, and each subsequent model was ran with one additional factor added. If common method variance is present, then the model fit statistics for the first model with one factor should not only be acceptable, but be better than the subsequent models with additional factors because items from different constructs should be more highly correlated and load together on one factor. As can be

seen in Table 5.14, model fit statistics show that the 1 factor model did not achieve acceptable model fit, but also improvements in fit statistics resulted as each factor was added. Chi-square difference tests were conducted and demonstrated significant differences between each pair of models. Therefore, common method variance is not deemed to be significantly present in the variance accounted for.

**Table 5.14: Model Fit Statistics – Common Method Test**

| | $\chi 2$ | df | *p* | CFI | RMSEA | SRMR |
|---|---|---|---|---|---|---|
| 1 Factor Model | 13523.927 | 405 | <.001 | .397 | .233 | .180 |
| 2 Factor Model | 9692.307 | 376 | <.001 | .572 | .204 | .117 |
| 3 Factor Model | 6358.372 | 348 | <.001 | .724 | .170 | .066 |
| 4 Factor Model | 4599.544 | 321 | <.001 | .803 | .150 | .043 |

### 5.5.4 Psychometric Analysis

Covariance-based structural equation modeling using maximum likelihood (ML) estimation was utilized to assess the measurement model and test the structural model in Figure 5.1 with MPlus 5.1. Structural equation modeling (SEM) is a second generation data analysis technique that allows simultaneous modeling and assessment of relationships among multiple constructs (Gefen, Straub, & Boudreau, 2000). Part of the strength of SEM is that it can be utilized to test both structural models (i.e., the relationships among constructs) as well as measurement models, or the loadings of the measurement items on their respective latent construct. The argument has been made that SEM provides a more rigorous analysis of a research model and provides a richer set of information regarding the fit of the model to one's data set. Hence, SEM was considered an appropriate analysis tool to test the research model for this study.

A measurement model for all factors was analyzed first to provide support for the assumption of unidimensionality. The fit of the initial measurement model (Model 1) was not acceptable, $\chi 2$ (399) = 5203.172, $p$ <.001, CFI = .779, RMSEA = .142, SRMR = .086. (See Table 5.15 for summary of all models' fit statistics). Although the $\chi 2$ is significant and fairly sizeable, this fit index is affected by sample size (Kline, 2005). Considering the sample for this study was 596, this fit index may be inflated and not a good indicator of model fit. Recommendations for acceptable results of other fit indexes include results above .90 for CFI and less than .10 for SRMR (Kline, 2005). For RMSEA, results above .10 are considered indications of poor model fit, values between .05 and .08 to be reasonable, and below .05 to be close fit. Although the SRMR for Model 1 appears to indicate fit, the CFI and RMSEA do not. Based on a review of the results (e.g., model fit indices), improvement in fit (chi-square approximate improvement of 572.024) could be achieved by correlating WTE7 and WTE8 for willingness to try and to explore IS (correlation of .936). These items both refer to exploring new IS (one for potential application at work and the other enhancing the effectiveness of one's work). Therefore, it appears reasonable to correlate these items considering the similarities in wording (i.e., both referring to exploration of new IS).

The subsequent model (Model 2) was also not acceptable, $\chi 2$ (398) = 4554.084, $p$ <.001, CFI = .809, RMSEA = .132, SRMR = .090, but is significantly better than the initial model, $\chi 2$ difference (1) = 649.088, $p$ < .001. The modification indices suggest that items ISC5 and ISC6 of IS competency should be correlated (chi-square approximate improvement of 571.295), which is consistent with the high correlation (.957). Considering the wording for these items is fairly similar (refer to being able to utilize

information systems to develop competitive versus strategic advantages for one's organization.), adding a correlation for these items is deemed reasonable.

The subsequent model (Model 3) was not acceptable, $\chi 2$ (397) = 3831.579, $p$ <.001, CFI = .842, RMSEA = .120, SRMR = .090, but is significantly better than the previous model without the correlation, $\chi 2$ difference (1) = 722.505, $p < .001$. Based on the suggestions from the modification indices and a review of the correlations, items DKS6 and DKS7 of domain knowledge of and skills in IS should be correlated (chi-square approximate improvement of 449.594 and correlation previously noted .910). DKS6 refers to having the skills to use information systems while DKS7 refers to having the skills to utilize the available features of information systems. Therefore, considering the consistency in wording, adding a correlation is considered reasonable.

The subsequent model (Model 4) was not acceptable, $\chi 2$ (396) = 3047.378, $p$ <.001, CFI = .878, RMSEA = .106, SRMR = .089, but is significantly better than the previous model, $\chi 2$ difference (1) = 784.201, $p < .001$. Based on the suggestions from the modification indices and a review of the correlations, items PIV13 and PIV14 of perception of IS value should be correlated (chi-square approximate improvement of 363.485 and correlation previously noted .871). PIV13 refers to identifying opportunities that the organization can derive from IS and PIV14 refers to identifying the value that the organization can derive from IS. Therefore, considering the consistency in wording among these two, adding a correlation is considered reasonable.

The subsequent model (Model 5) achieved acceptable model fit, $\chi 2$ (395) = 2555.594, $p$ <.001, CFI = .901, RMSEA = .096, SRMR = .069 and is significantly better than the previous model, $\chi 2$ difference (1) = 491.784, $p < .001$.

Based on the item statistics, the factor loadings were reviewed for meaningfulness (above .3) and significance (p<.001) for all factors (Brown, 2006). Also, results were reviewed to ensure that they were within bounds (no standardized factor loadings are greater than 1). The results met these criteria and were deemed acceptable.

Finally, the structural model (see Figure 5.1) including all four factors was tested and achieved acceptable fit: $\chi 2$ (396) = 2568.373, $p$ <.001, CFI = .900, RMSEA = .096, SRMR = .098 (see Table 5.15). Although the model fit is significantly different from the previously acceptable measurement model (Model 5), $\chi 2$ difference (1) = 12.779, $p$ =.001, the overall model achieves acceptable fit. Hence, this model is deemed acceptable.

**Table 5.15: Model Fit Statistics**

| | **χ2** | **df** | ***p*** | **CFI** | **RMSEA** | **SRMR** |
|---|---|---|---|---|---|---|
| Model 1 – *Measurement* | 5203.172 | 399 | <.001 | .779 | .142 | .086 |
| Model 2 | 4554.084 | 398 | <.001 | .809 | .132 | .090 |
| Model 3 | 3831.579 | 397 | <.001 | .842 | .120 | .090 |
| Model 4 | 3047.378 | 396 | <.001 | .878 | .106 | .089 |
| Model 5 | 2555.594 | 395 | <.001 | .901 | .096 | .088 |
| Model 6 - *Structural* | 2568.373 | 396 | <.001 | .900 | .096 | .098 |

To assess convergent and discriminant validity, the average variance extracted (AVE) for each construct can be assessed (Gefen et al., 2000). The AVE represents "the percent of variance captured by a construct" (Gefen et al., 2000, p.66). In order for convergent validity to be supported, recommendations have been made that the AVE for each construct should be greater than .5 (Fornell & Larcker, 1981). The smallest AVE is .811 for willingness to try and to explore IS, which is shown as the square root of .901 in Table 5.16.

For discriminant validity, the square root of the AVE for each construct should be larger than its correlation with other constructs to demonstrate that the variance shared between the respective construct and its measurement items is greater than the variance shared between the respective construct and other constructs (Cenfetelli, Benbasat, & Al-Natour, 2008). The smallest square root of AVE is .901 which exceeds any of the inter-construct correlations as is shown in Table 5.16. Therefore, results of this analysis provide support for both convergent and discriminate validity.

**Table 5.16: Average Variance Extracted and Construct Correlations**

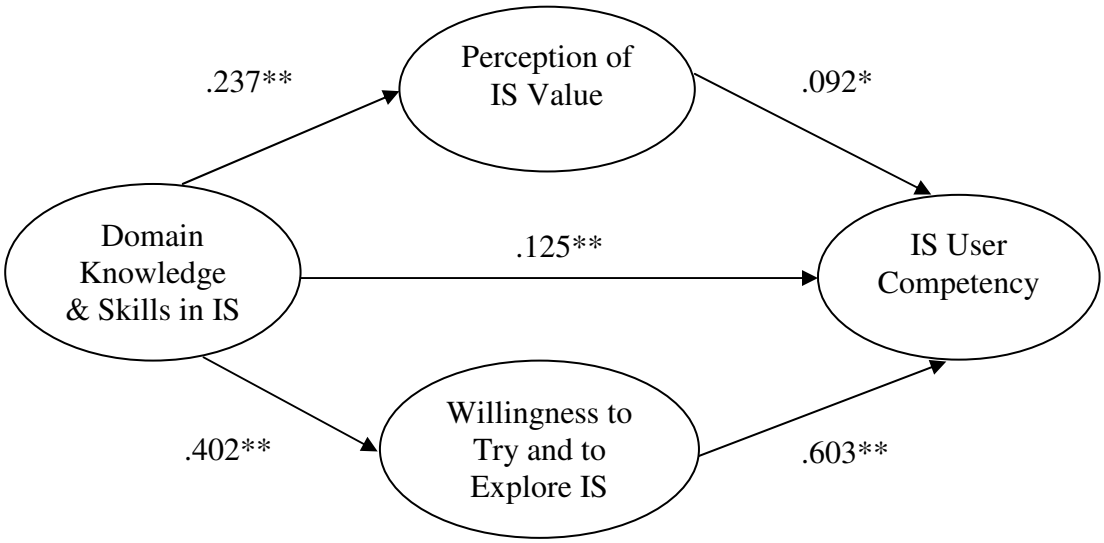
| Construct | PIV | WTE | DKS | ISC |
|---|---|---|---|---|
| Perception of IS Value | **.915*** | | | |
| Willingness to Try and to Explore | .095 | **.901*** | | |
| Domain Knowledge of and Skills in IS | .237 | .402 | **.901*** | |
| IS User Competency | .179 | .662 | . 389 | **.919*** |

*Square root of average variance extracted

PIV = Perception of IS Value; WTE = Willingness to Try and to Explore IS; DKS = Domain Knowledge of and Skills in IS; ISC = IS User Competency

The structural model (see Figure 5.2) shows that the significant paths to IS user competency are perception of IS value (B = 0.092; $p$ = .006), domain knowledge of and skills in IS (B = 0.125; $p$ = .001), as well as willingness to try and to explore IS (B = .603; $p < .001$). Also, other significant paths include the paths from domain knowledge of and skills in IS to perception of IS value (B = 0.237; $p < .001$) and willingness to try and to explore IS (B = 0.402; $p < .001$). Therefore, domain knowledge of and skills in IS significantly influences perception of IS value, willingness to try and to explore IS, and IS user competency. Also, perception of IS value and willingness to try and to explore IS

significantly influence IS user competency. The results provide support for all hypotheses. The model accounts for 46.4% of the variance in IS user competency.




*p <=.01 **p<=.001

**Figure 5.2: Research Model**[1]

Also, t-tests were performed to determine if the regression coefficients are statistically different from each other when comparing paths from the IS-specific factors to IS user competency. The results indicate that the path coefficient from willingness to try and to explore IS to IS user competency is statistically different from (i.e., higher than) the path coefficient from perception of IS value to IS user competency ($t = 11.106$, $p < .001$) and the path coefficient from domain knowledge of and skills in IS ($t = 10.061$, $p < .001$) to IS user competency. The path coefficient from domain knowledge of and

[1] Including the covariates (i.e., autonomy, IS autonomy, top management support, and supervisor support) did not change the results of the model. When Risk-taking propensity with IS was included, the significance of the paths did not change.

skills in IS to IS user competency is not statistically different from the path coefficient from perception of IS value to IS user competency ($t$ = .666, $p$ = .50).

### 5.6 Secondary Analysis

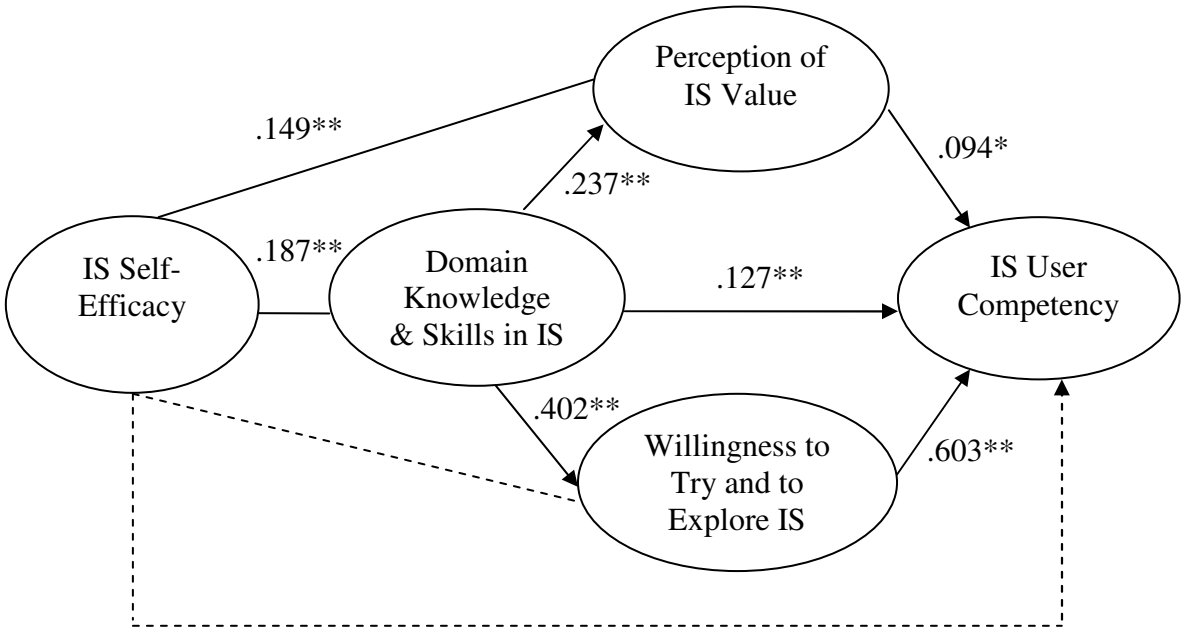
As a secondary analysis, the potential correlation that IS self-efficacy has with the IS-specific factors (i.e., perception of IS value, willingness to try and to explore IS, and domain knowledge of and skills in IS) was evaluated. A factor analysis was carried out to include items from the three IS-specific factors, IS user competency, and IS self-efficacy. IS self-efficacy items with cross-loading or wording issues were discarded. The final set of four items loaded on a separate factor, with all item loadings on IS self-efficacy above .83 (items shown in Table 5.17). Reliability analysis was assessed by reviewing the Cronbach's alpha coefficient, which was .90 and considered high based on threshold of .70 recommended by Nunnally (1978). All IS self-efficacy items were reviewed for internal consistency with no issues noted (i.e., no items have low corrected-item total correlations, below .5, and no drop in Cronbach's alpha coefficient would occur if an item was removed).

**Table 5.17: IS Self-efficacy Measurement Items**

| Research Construct and Definition | Existing Literature Construct and Definition | Measurement Items |
|---|---|---|
| IS Self-efficacy – a belief or judgment of one's capability to use an information system | Computer self-efficacy – "a judgment of one's capability to use a computer" (Compeau & Higgins, 1995b, p. 192) | Often in our jobs we are told about information systems that are available to make work easier. For the following questions, imagine that you were given a new information system for some aspects of your work. It doesn't matter specifically what this information system does, only that it is intended to make your job easier and that you have never used it before.<br><br>The following questions ask you to indicate whether you could use this unfamiliar information system under a variety of conditions. For each of the conditions, please indicate the extent to which you agree or disagree with each statement regarding your beliefs in your ability to complete the job using the information system.<br><br>I *BELIEVE* I WOULD BE ABLE TO COMPLETE THE JOB USING THE INFORMATION SYSTEM...<br>1. ...if someone else had helped me get started.<br>2. ...if I had a lot of time to complete the job for which the information system was provided.<br>3. ...if someone showed me how to do it first.<br>4. ...if I had used a similar information system before this one to do the same job.<br><br>Note: Items were converted from yes/no questions and ratings of confidence to statements for the Likert scale, adapted to information systems context, and adapted to specifically note "beliefs "in one's abilities. |

The structural model in Figure 5.2 was adapted to include correlations between IS self-efficacy and the three IS-specific factors and to assess if IS self-efficacy explains any additional variance. First, factor loadings were reviewed for meaningfulness (above .3), significance ($p<.001$), and to be within bounds (standardized factor loadings less than 1) (Brown, 2006). All achieved acceptable levels based on the review. Then, model fit was assessed. The model fit statistics achieved an acceptable fit based on the previous criteria noted ($\chi 2$ (514) = 2780.826, $p$ <.001, CFI = .904, RMSEA = .086, SRMR = .091). The

research model with IS self-efficacy is presented in Figure 5.3. The model explains 46.5% of the variance in IS User Competency, which shows an equivalent amount of variance explained over the original research model in Figure 5.2.




*p <.01, **p<.001, dashed line indicates p>.05

**Figure 5.3: Research Model with IS Self-efficacy**

Based on the results, IS self-efficacy is found to correlate with perception of IS value (p<.001) and with domain knowledge of and skills in IS (p<.001). However, the correlation between IS self-efficacy to willingness to try and to explore IS is not significant (p=.695). Overall, the variance explained in IS user competency shows no improvement with the addition of IS self-efficacy in the model.

## 5.7 Discussion of Results

Based on the results from this research study, all five hypotheses are supported. In other words, domain knowledge of and skills in IS influence IS user competency both directly and indirectly through perception of IS value and willingness to try and to explore IS. Hence, one's understanding of IS will enhance one's ability to identify the benefits and opportunities that IS can provide. Knowledge and skills in IS will also influence one's propensity to explore and willingness to try to use IS. Finally, IS user competency is also influenced by one's domain knowledge and skills in IS.

Perception of IS value and willingness to try and to explore IS directly influence IS user competency. The results suggest that if an IS user is able to recognize the potential of IS, this perception can influence their IS user competency. Also, if an IS user is willing to engage in utilizing IS and experimenting with it, this can also increase their level of IS user competency.

Interestingly, the results suggest that the factor that has the most significant, direct influence on IS user competency is willingness to try and to explore IS. Hence, the most important factor that can be emphasized in improving an IS user's ability to utilize IS to its fullest potential and obtain the greatest performance from IS use is one's willingness to be exploratory with IS and one's attempt to use IS.

In evaluating the relationships of IS self-efficacy and the IS-specific factors, IS self-efficacy is shown to be related to domain knowledge of and skills in IS as well as perception of IS value. However, it is not significantly related to or statistically correlated with willingness to try and to explore IS. Therefore, the beliefs that one holds regarding their ability to utilize IS is related to the benefits and opportunities that they

can envision with IS as well as their knowledge and understanding of IS. However and interestingly, these beliefs are not directly correlated with their propensity to explore and to try utilizing IS.

As proposed previously in relation to Social Cognitive Theory, self-efficacy can be related to expectations of future outcomes, the behaviors individuals choose to engage in, the persistence and vigor one invests, as well as their emotional responses and thought patterns (Bandura, 1986). However, in the context of IS user competency, IS-specific state factors, which include perception of IS value, domain knowledge of and skills in IS, and willingness to try and to explore IS, provide greater explanatory power than IS self-efficacy. In other words, the IS-specific state factors identified in this research study are important factors of IS user competency, or the ability to realize the fullest potential of IS and the greatest performance of IS use.

# CHAPTER 6

# CONTRIBUTIONS AND IMPLICATIONS

Chapter six summarizes the contributions and implications from this dissertation research study. First, theoretical contributions and implications are discussed. Next, the practical contributions and implications are presented.

## 6.1. Theoretical Contributions and Implications

This research study identifies the IS-specific factors associated with IS user competency that evolved through the identification of highly competent IS users' characteristics. An IS User Competency Model (see Figure 4.1) was developed which includes all of the factors generated by research participants, i.e., general factors and traits as well as IS-specific state factors such as domain knowledge of and skills in IS, willingness to try and to explore IS, and perception of IS value. A partial model was validated by testing the IS-specific state factors that can be fostered through training and experience.

This study generates some rich and interesting findings as well as expands existing theories in the IS competency context. Although some of the findings are consistent with various aspects of the existing literature on Social Cognitive Theory (SCT) (Bandura, 1977, 1986) in a general competency context, others enlighten a specific set of factors contributing to one's competencies specifically in the context of IS. These IS-specific state factors include perception of IS value, domain knowledge of and skills in IS, and willingness to try and to explore IS (see Figure 5.2). Interestingly, these IS-specific factors along with the rest of the factors that emerged from the grounded approach of the

RepGrid study can also be classified into the broad framework of the triadic reciprocal interaction in SCT (see Figure 6.1) and the triadic interactions of these IS-specific state factors will be discussed next.

In particular, perception of IS value (personal/cognitive factor) pertains to the ability to see benefits and opportunities that may arise with IS. As noted in a research participant's comment above regarding less competent users, or those who have not obtained IS user competency, and Perception of IS value:

*"…it's not even that they don't want to be technology proficient, but they just don't see the reason to do it…"*

Therefore, it is important for IS users to envision the value that IS can provide in the context of IS user competency. This factor may interact with other personal/cognitive, behavioral, and environmental factors and impact the resulting level of IS user competency achieved. For example, being able to communicate and collaborate (behavioral factor), being exposed to various technologies (environmental factor), and having the cognitive ability to learn (personal/cognitive factor) can facilitate one's ability to develop perceptions of the value that IS can provide. Individuals can develop their perceptions through others' understanding of benefits of IS, learn about the opportunities of IS through continuous exposure to IS, and have the capacity to develop their own mental models of the potential benefits and opportunities.

Domain knowledge of and skills in IS (personal/cognitive factor) encompasses one's knowledge of how IS operates as well as one's capability to utilize IS. Research participants indicated that it refers to:

*"knowledge of how IS works…figure out system after training"*

Hence, this basic foundation of knowledge and skills is a necessary component to achieve IS user competency, but may also interact with other factors. For instance, one may acquire various skills and knowledge of IS because of their training associated with their job experiences or formal education (environmental factor). Also, individuals may acquire their knowledge and skills because they have an ability and desire to learn (personal/cognitive factor). By communicating and collaborating with others (behavioral factor), individuals can acquire knowledge from others and learn new skills.

Also, willingness to try and to explore IS (behavioral factor) is a unique factor and refers to an individual's willingness to attempt to use IS and to explore it. Participants noted that highly competent IS users:

*"…try to use IS to its fullest potential…are not afraid to explore new things"*

Therefore, being willing to try and to explore IS is important in an IS user competency context by facilitating the achievement of using IS to its fullest potential and achieving the greatest performance from IS use. Willingness to try and to explore IS is also present in the triadic reciprocal interaction that determines IS user competency. For example, certain job experiences (environmental factor) that may have required greater usage, usage of multiple technologies or completing tasks using multiple functions of a technology, or using technology to accomplish unique tasks, may influence their willingness to try and to explore and, ultimately, the IS user competency that is achieved. Also, unique traits identified in this research were risk-taking propensity with IS and sense of curiosity with IS (personal/cognitive factors). If an individual does not have the propensity to take risks with IS or does not possess a curious nature, they may be less willing to attempt to try IS or apply their curious nature with IS and explore IS.

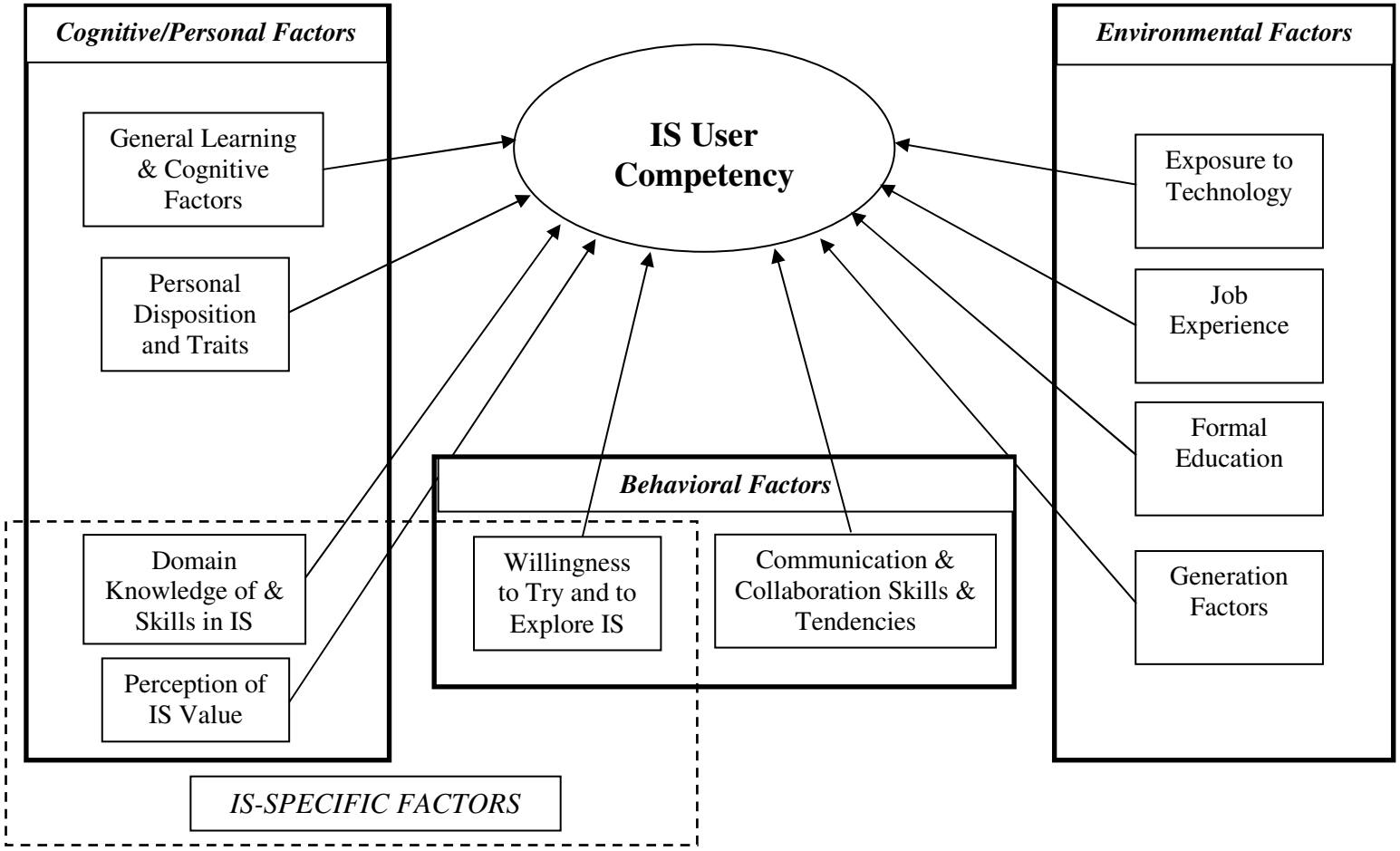



**Figure 6.1: IS User Competency Model relative to Social Cognitive Theory**

This research also identifies personal factors important to IS user competency that are not explicitly identified or discussed in the literature on SCT. These factors may be less likely to be fostered in others, but may be important hiring criteria to consider for positions in which IS user competency is desired. For instance, this research study identifies factors such as risk-taking propensity with IS and sense of curiosity with IS. If an individual, through self-initiated actions or experiential learning, does not have the propensity to take risks with IS, their knowledge acquisition may be limited. These limitations may arise due to the restricted amount of risks or new experiences they are willing to encounter.

For example, if one encounters certain environmental experiences that present opportunities to learn, they may capture the knowledge from their observations. However, for those individuals that are more willing to take risks with IS, they may take this knowledge (captured through observation) and develop their own insights through additional self-initiated experiences. For those individuals that are not as risk-taking with IS, their knowledge may be limited to just what they observed.

Having an exploratory nature or sense of curiosity with IS was also recognized as a factor of IS user competency. In this same consideration, one's propensity to want to explore their environment or to have a curious nature that propels them to experiment with new behaviors may contribute to their knowledge and competencies. These contributions to understanding competency and contributing personal factors warrant further elaboration and exploration to extend SCT.

Therefore, this research has enhanced the understanding of competencies proposed by SCT by identifying domain-specific personal/behavioral factors associated

with IS user competency. These factors may not have been included previously in SCT due to a focus on the broad development of competency in general, whereas this research study focused on the highest level of competencies in the IS context. Therefore, these additional factors may need to be incorporated when considering SCT in an IS user competency context in future research studies.

Further, the results of the survey validated the proposed partial model of IS user competency that included the IS-specific state factors. The findings provide support for the Future Time Perspective Theory and expectancy-value models in an IS user competency context. More specifically, being able to identify the value of IS can influence IS user competency. Therefore, being able to understand the benefits and opportunities of IS is important to being able to obtain the greatest performance from IS. Contributing to this perception of IS value are an individual's domain knowledge of and skills in IS. The results are consistent with valuing the "utility of what is learned for the future" (Simons et al., 2004, p. 345). Hence, having the knowledge of IS and the ability to operate IS can influence the value that one can perceive in IS.

In regards to the Theory of Trying and expectancy-value models, the findings also provide support for the antecedent of domain knowledge of and skills in IS influencing one's willingness to try and to explore IS. Therefore, it is important for individuals to gain knowledge and skill sets in a particular domain for them to engage in experimental or exploratory behavior. Consistent with the suggestions of research participants from the qualitative study, competent IS users have the capability to attempt new activities. Previous research has identified other antecedents to trying, such as work environment

factors (Ahuja & Thatcher, 2005). In the context of IS user competency, antecedents to trying should also include an individual's domain knowledge of and skills in IS.

Also in regards to the Theory of Trying, the research results provide support for the importance of willingness to try and to explore to realize IS user competency. In fact, this factor has more influence than domain knowledge of and skills in IS as well as perception of IS value. In other words, it's important for individuals to gain an understanding of IS, acquire abilities to operate IS, and be able to understand the benefits and opportunities IS can offer. However, it's most important for an individual to experiment with and try out the different features of IS. According to the Theory of Trying, the activities needed to produce the action of trying are necessary to achieve certain outcomes (Bagozzi & Edwards, 1998). In this context, individuals need to be willing to engage in the activity of trying and exploring in order to realize the outcome of IS user competency.

Consistent with the Theory of Expert Competency, competency is dependent on an individual's knowledge and skills in a particular domain. In particular, expertise in an IS competency domain is dependent on an individual's IS knowledge and IS capabilities, which is consistent with previous expert performance studies (e.g., Bonner & Lewis, 1990). Therefore, understanding how to operate IS and being able to operate IS are necessary for individuals to become competent IS users.

The results of the measurement of the Perception of IS Value construct also shed light onto the application of the Perceived Usefulness (PU) construct associated with TAM to the context of IS user competency. The items that measure perceptions of IS value, which refer to perceiving the benefits and opportunities of IS, did not load with the

PU items from the literature in the factor analysis that was performed (see Table 5.11 for full-scale survey factor analysis and Table 6.1 for factor analysis involving perceived usefulness and perception of IS value only).

**Table 6.1: Factor Analysis – Perceived Usefulness and Perception of IS Value**

| | Perceived Usefulness | Perception of IS Value |
|---|---|---|
| PIV1 | .895 | .284 |
| PIV2 | .870 | .367 |
| PIV3 | .870 | .335 |
| PIV4 | .878 | .350 |
| PIV5 | .866 | .308 |
| PIV6 | .838 | .363 |
| PIV9 | .388 | .759 |
| PIV10 | .337 | .836 |
| PIV11 | .294 | .865 |
| PIV12 | .321 | .805 |
| PIV13 | .228 | .836 |
| PIV14 | .346 | .802 |
| PIV16 | .314 | .782 |

The data suggests that a new and important construct of perception of IS value has emerged for studying IS use in the context of competent IS usage and is needed in future research on IS competency. Therefore, the findings also provide support for extending Social Cognitive Theory and including other IS factors, such perception of IS value, in an IS user competency context.

Consistent with Social Cognitive Theory, IS self-efficacy was found to be related to domain knowledge of and skills in IS as well as perception of IS value. Although IS self-efficacy may be related to certain personal/behavioral factors associated with IS user competency, as proposed by SCT, it provides no additional variance explained on IS user

competency as compared to the three IS-specific state factors (i.e., willingness to try and to explore IS, perceptions of IS value, and domain knowledge of and skills in IS).

### 6.2. Practical Contributions and Implications

The implications for practitioners are to consider possible training interventions as well as hiring criteria when considering individuals who they desire to achieve IS user competency as defined in this research study. Based on the factors that were discovered in this research, restructuring future training to involve interventions that focus on strengthening or developing the factors that were discovered may be considered. The following are examples of training interventions that can be pursued. Note that this list provides some suggestions for training interventions and is not exhaustive considering the rich set of findings generated by the research study. Furthermore, future research will assess these training interventions in the context of IS user competency.

*Intentional Practice and Exposure to Technology.* Practice is, of course, heavily emphasized in any learning or expertise subject-matter (Feltovich, Prietula, & Ericsson, 2006), and would hence be a vital area of consideration in acquiring IS competence and increasing the amount of IS training. Thompson, Higgins, and Howell (1994) found that experience with technology, in the context of personal computer usage, significantly influenced usage directly and indirectly. Burton-Jones and Hubona (2006) also found that system experience (e.g., email) could directly impact a user's frequency and volume of usage. Considering the context of this study is for users to achieve the full potential that IS can provide, practice and exposure to technology may be even more important.

Circumstances may need to be intentionally staged such that individuals have an opportunity to try and to explore IS, and are encouraged to make themselves vulnerable to making mistakes with IS. For instance, Lending and Straub (1997) found that awareness of new technology's availability was enough to prompt some innovative individuals to try it. For individuals who are less familiar with technology and need more time to learn to use IS, practice provides even greater promise. Ackerman (1988) indicates that practice can reduce performance differences between the fastest and slowest learners. Ericsson, Krampe, and Tesh-Romer (1993) found that experts optimize their opportunity to practice by designing their lives to do so.

*Identifying Benefits and Opportunities of IS.* Because perception of IS value was found to positively influence IS user competency, emphasis should also be placed on helping individuals identify the benefits that IS can provide. Bannister's (2002) longitudinal study found that of two departments within the same organization, the one with the most successful development of IS had experienced increasing understanding of IS value and benefits among management and staff. He noted that this widening conception of IS value grew from understanding cost savings to a wider conception of creating customer value. Whereas, the other department was not as successful with IS development and tended to view IS as a means of survival and even having negative value at times. Therefore, training can include encouraging and assisting individuals to view or widen their conception of IS value and benefits within their individual roles and responsibilities as well as those related to the overall organization.

Introductions to IS may entail emphasizing the benefits and opportunities that the IS can provide. This introduction may include more immediate considerations (e.g.,

increase in productivity for a particular job task), but should also focus on higher-level value in order to achieve IS user competency. For instance, emphasis may need to be placed on the competitive or strategic advantages that the organization is pursuing that a particular IS is instrumental in achieving. Also, individuals may be encouraged to help identify the benefits that the organization may be able to derive with IS. For instance, in a sporting context, individuals who were explicitly told the relevancy of immediate skill sets they were to learn and its relationship to future needs out-performed those who were not given this explanation (Simons et al., 2003).

Similarly, organizations can identify potential benefits or strategic opportunities associated with IS by monitoring other firms or IT innovators (Clemons & Row, 1991). They then can imitate the technology services or applications, and leverage these existing capabilities to develop new opportunities or competitive advantages – essentially enhancing the organization's IS competency. In many industries, identifying new benefits or opportunities is necessary for survival. From an individual usage perspective, similar activities can be encouraged in that IS users can be encouraged to identify benefits and opportunities that have been realized by others within or outside their own department or division, or outside their own firm. They can capitalize on the existing value and leverage this to enhance or develop additional value from IS.

*Independent Learning and Problem-Solving.* Future interventions may consider training users to be self-sufficient learners and problem-solvers. For example, Artis and Harris (2007) propose a framework of self-directed learning methodologies that includes four types of self-learning: *induced* (required by an authority), *synergistic* (self-motivated to seize an opportunity to learn provided by others), *voluntary* (self-initiated learning in

which content is discovered by the individual and the individual determines if learning has occurred), and *scanning* (exploratory, open-ended searches with no pre-defined goals). Interventions may also enhance problem-solving skills. For example, IS users may engage in problem representation tasks or be taught various problem-solving strategies such as means-ends analysis (Bruning, Schraw, Norby, & Ronning, 2004). Also, individuals may be taught creativity-enhancing processes for solving problems (Marakas & Elam, 1997). Learning and training are even more important in the context of complex technologies where demands of the user's time and effort may be greater (Boudreau & Seligman 2005).

*Enhancing Goal Setting, Open-mindedness, Adaptability, and Confidence.* Another training opportunity is to have trainees set goals before training commences. In accordance with self-regulation theories, setting specific goals and having higher motivation (or intentions) can lead to better performance and a greater likelihood of the desired behavior occurring (Shayo, Olfman, & Teitelroit, 1999 citing Locke & Latham, 1991). Other training enhancement opportunities include encouraging individuals to visualize the processes in the system to assist them in developing a conceptual understanding of the system and to promote open-mindedness, as well as focus on change-orientation to improve their adaptability in utilizing IS.

*Social and Co-discovery Learning.* Training can also take the form of working and learning in teams, which may assist in enhancing one's willingness to explore IS and willingness to share and collaborate. Gallivan, Spitler, and Koufaris (2005) created a model to explain individual adoption and usage of IT in an organizational context by drawing upon social information processing theory and previous research. In their study,

they found that coworkers' perceived training quality and coworkers' IT usage had a significant effect on the amount of individual IT usage, but the individual's own quantity of IT training and their own perceived quality of training (unless gender is removed as a control variable) did not have a significant effect. Hence, the authors suggest that giving employees opportunities to learn and explore an IT application together can be beneficial to future IT usage. Spitler (2005) also found that social interaction among other peer users was a notable factor for consultants learning IT necessary for their job tasks, and Boudreau and Robey (2005) found that social influences can assist in user learning. Lim, Ward, & Benbasat (1997) demonstrated that co-discovery learning can be superior to self-discovery learning by facilitating deeper levels of thinking about the task. Co-discovery learning participants developed mental models with higher inference, which resulted in greater task performance.

*Hiring Criteria.* Although training may be considered to improve certain characteristics, some of these may be more appropriately considered as hiring criteria, especially those identified as traits. Although every position and job responsibility will vary in terms of requirements for these factors (e.g., formal education, intellectual ability), some general factors were highlighted in this study and hence, are worth considering when developing employment screening mechanisms. For example, sense of curiosity with IS and risk-taking propensity with IS. Organizations may want to assess if an individual is willing to take risks when using IS or if they are curious about IS if IS user competency is important for a position. Also, attention to detail may be considered for those positions in which accuracy is paramount. Dedication was also identified as an

important factor. Hence, one may want to consider the fit of the particular job and the organization with the goals of the individual.

*Design of IS Interface.* The findings from this study also provide guidance to developers regarding important aspects to consider when designing interfaces for IS. For example, to help facilitate IS users' propensity to explore and try IS, the design should be flexible enough to allow for this activity and to encourage these activities. Unfortunately, some systems have been described as being rigid which has inhibited use (Shanteau, 1989). Flexibility may need to be built into a beta system that can be used for testing ideas and then implemented in the operational IS once approval of the changes are confirmed. In fact, recommendations have been made that system flexibility should be equivalent to their expert users that they are being designed for (Shanteau, 1989). Although this suggestion is made in the expert system context, it would also apply to the highly competent IS user context based on the findings of this study.

Also, designers are encouraged to consider the skill sets, characteristics, and strategies employed by IS users (Shanteau, 1992). For example, designers may want to provide dynamic feedback, which may assist users in developing or applying problem-solving abilities and enhance their ability to learn. The findings from this research also indicate that highly competent IS users are efficient at completing tasks and are willing to share knowledge and collaborate with others. Therefore, designers may want to consider the efficiency with which core tasks can be completed based on the design of the user interface as well as implement applications that allow for easy knowledge transfer and collaboration with others.

# CHAPTER 7

# CONCLUSIONS

Chapter seven concludes this dissertation. First, a summary of the results is reviewed and discussed. Then, the limitations and opportunities for future research are presented.

In this dissertation, the factors that contribute to competent IS usage were identified and used to extend Social Cognitive Theory in the context of IS user competency. Considering the need for business professionals to not just *utilize* IS, but to *proficiently utilize* IS, this research sought to make an important and unique contribution. It encompasses both inductive and deductive processes of inquiry to develop a rich understanding of the factors associated with IS user competency and provide support for the relationships between IS-specific state factors and IS user competency.

## 7.1. Summary of Results

This research study contributes to the theoretical development and understanding of IS user competency. More specifically, a IS User Competency Model was first developed based on the findings from a Repertory Grid study and a partial model comprising IS-specific state factors and their relationships with IS User Competency was then validated through a survey study. The strength of the Repertory Grid technique is in bringing meaning to phenomena by tapping into individuals' personal construct systems. In this research, the Repertory Grid technique was utilized to identify characteristics of highly competent IS users (i.e., important factors of IS user competency). The constructs provided by the participants not only offer a broader and richer understanding of the

factors of IS user competency, but they also extend Social Cognitive Theory to explain user competency in IS. The factors identified included both IS-specific and general characteristics.

The categories and sub-categories of these characteristics can be classified into three broad factors under Social Cognitive Theory, including: (i) cognitive/personal factors such as general learning and cognitive factors, personal dispositions and traits, domain knowledge and skills in IS, and perception of IS value; (ii) environmental factors which include exposure to technology, job experiences, and formal education; and (iii) behavioral factors that encompass willingness to try and to explore IS, and communication and collaboration skills and tendencies. The IS-specific state factors that emerged from the findings include willingness to try and to explore IS, domain knowledge of and skills in IS, and perception of IS value.

The findings from the quantitative study validate this partial model of IS user competency that represents the relationships between these IS-specific state factors and IS user competency. The results of the survey revealed that all three factors are important to IS user competency, with willingness to try and to explore IS having the greatest influence or explanatory power. Therefore, although it's very important for individuals to perceive the benefits and opportunities of IS and have the ability to use IS, it's even more important for IS users to be willing to attempt to use IS and experiment with it. Also, the data analysis supports the new construct, perception of IS value, being distinct from perceived usefulness associated with the Technology Acceptance Model (Davis, 1989). Therefore, individual perceptions of the benefits and opportunities of IS are

important to IS user competency, and are different from beliefs that IS can enhance one's job performance.

Identifying the factors of IS user competency may shed light onto promising areas of research and training. The factors that were identified can be further scrutinized and tested. If users are trained or encouraged to foster similar factors (such as engaging in exploratory behavior) that are identified as trainable, they may be able to reach higher levels of performance from IS use. In future research, specific interventions (e.g., training programs) that encourage or develop the identified factors will be explored.

For those that are more innate, the factors may present specific criteria that organizations can utilize in hiring individuals whose characteristics will more appropriately fit with the job expectations. Also, modifications in the design of IS interfaces can provide further insights into enhancing IS user competency. Future research may also benefit by understanding the development process, or sequence of actions, that result in the outcome of IS user competency. Limitations and future research possibilities are discussed in greater detail below.

### 7.2. Limitations and Future Research

There are some limitations in this research. A possible limitation of the Repertory Grid study is that it may not tap on cognitive processes associated with IS user competency because cognitive processes are largely 'hidden' or not directly 'visible' to others. Hence, further studies are needed to identify and study these processes. Also, some of the IS user competency factors that were identified are more innate to an individual and cannot be fostered in others. Considering the purpose of this study is to

capture a broad set of constructs associated with IS user competency, a comprehensive set of factors that are 'visible' to others are included to provide as complete a set of constructs associated with IS user competency as possible.

As noted earlier, dynamic relationships may exist among certain personal/cognitive, environmental, and behavioral factors as proposed by Social Cognitive Theory that are unique to the IS user competency context. Therefore, future research may entail studying these relationships and the dynamics between them. Future studies may entail exploring and validating the various categories and subcategories that were identified for theory building and for practical applications. Future research can then expand on the partial model developed and validated in this study to validate relationships between broad (e.g., ability to solve problems) and situation-specific traits (e.g., sense of curiosity with IS and risk-taking propensity with IS) and the dynamic situation-specific individual differences (i.e., perception of IS value, willingness to try and to explore IS, and domain knowledge of and skills in IS).

Research can also be employed to further explore the additional personal/behavioral factors found in this research that could extend Social Cognitive Theory and expand upon the existing model. For example, future research may explore the effects of curiosity or risk-taking factors with IS. According to risk-taking theory, an individual's risk perception (assessment of risk in a given situation) and risk propensity (one's tendency to take risks) influences their risk behaviors (Keil et al., 2000 citing Sitkin & Pablo, 1992). In the context of IS user competency, research could explore the specific factors of risk perception and risk propensity with IS.

Future studies may expand on previous research in self-regulated learning (Compeau & Higgins, 1995a; Gravill & Compeau, 2008; Santhanam, Sasidharan, & Webster, 2008; Yi & Davis, 2003). For instance, studies may incorporate goal-setting and self-regulated learning in IS training to determine the impact on performance outcomes in the context of IS competency. These future studies may provide additional guidance in using self-regulated learning strategies to apply their skills to novel problems or in unique contexts.

The survey data associated with validating the partial IS user competency model was collected within one organization which is heavily dependent on information systems. Hence, the generalizability of these findings needs to be tested in other organizations and industries. Another potential limitation includes the generalizability of the findings which may be limited to competency in the IS application or usage context. Additional research is needed to extend the generalizability to other contexts of competency and to other types of technology usage phenomena such as mobile application usage.

The current research uses the variance strategy approach to examine IS user competency after it has been achieved by highly competent IS users as recognized by other IS users. However, additional research can explore the process of achieving IS competency by applying the process strategy approach (Sabherwal & Robey, 1995). For example, one can further explore the major stages, or the sequence of actions, of skill acquisition (including the declarative stage in which instructions are interpreted as facts or the procedural stage in which additional tuning of knowledge and gradual speed increases) and by studying the major transition between these stages labeled knowledge compilation (Anderson, 1982).

Also, considering this research is a cross-sectional study of IS user competency, longitudinal studies may provide additional insights into the importance of the IS-specific factors and the relevancy to IS user competency. Additional insights may be gained regarding the relationship of IS self-efficacy and the IS-specific factors. Future research may introduce IS training or interventions and assess the relationships of the IS-specific factors, IS self-efficacy, and resulting IS user competency (which may be measured both objectively and subjectively) to provide further understanding of these relationships and the importance of these factors.

In addition, future research can test variations in IS designs that are built based on the factors associated with developing IS user competency. For instance, researchers can incorporate mechanisms that facilitate and encourage experimentation, as well as collaborative learning and working on IS and the resulting impact on IS user competency. They can also incorporate dynamic feedback mechanisms that support individuals trying IS or that facilitate problem-solving to assess the impact on IS user competency.

This research focuses on an individual level of analysis and hence, management- and organizational-level factors are outside the scope of this study. Additional research will be carried out in future research to examine these potential factors such as the influence of work environment, management support, and facilitating conditions (Thompson & Higgins, 1991) on IS competency, or the impact of organizational culture, leadership styles, and incentive structures on IS competency development.

Overall, developing an IS User Competency Model and identifying the factors that are most likely to foster IS user competency will provide greater opportunities for improved IS proficiency and greater IS benefits being realized by IS users. This

dissertation contributes towards the development of a Theory of IS User Competency by using a grounded approach to identify the antecedents of IS user competency and integrating theories from the existing literature to explain competency in IS.

# REFERENCES

Ackerman, P.L. "Determinants of Individual Differences During Skill Acquisition: Cognitive Abilities and Information Processing," *Journal of Experimental Psychology: General* (117:3), 1988, pp. 288-318.

Agarwal, R. and Prasad, J. "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Information Systems Research* (9:2), 1998, pp. 204-215.

Ahuja, M.K. and Thatcher, J.B. "Moving Beyond Intentions and Toward the Theory of Trying: Effects of Work Environment and Gender on Post-Adoption Information Technology Use," *MIS Quarterly* (29:3), 2005, pp. 427-459.

Ajzen, I. "From Intentions to Actions: A Theory of Planned Behavior," in *Action Control: From Cognition to Behavio*r, J. Kuhl and J. Beckmann (Eds.), Springer, New York, 1985, pp. 11-39.

Amabile, T.M. *The Social Psychology of Creativity*, Springer-Verlag, New York, 1983.

Amabile, T.M. *Creativity in Context*, Westview Press, Colorado, 1996.

Anderson, J.R. "Acquisition of Cognitive Skill," *Psychological Review* (89:4), 1982, pp. 369-406.

Artis, A.B. and Harris, E. G. "Self-Directed Learning and Sales Force Performance: An Integrated Framework," *Journal of Personal Selling and Sales Management* (27:1), 2007, pp. 9-24.

Auer, T. "Quality of IS Use," *European Journal of Information Systems* (7:3), 1998, pp. 192-201.

Bagozzi, R. and Edwards, E. "Goal Setting and Goal Pursuit in the Regulation of Body Weight," *Psychology and Health* (13), 1998, pp. 593-621.

Bagozzi, R. and Warshaw, P. "Trying to Consume," *Journal of Consumer Research* (17:2), 1990, pp. 127-140.

Bandura, A. *Social Learning Theory*, Prentice Hall, Englewood Cliffs, New Jersey, 1977.

Bandura, A. *Social Foundations of Thought and Action*, Prentice Hall, Englewood Cliffs, New Jersey, 1986.

Bandura, A. "Human Agency in Social Cognitive Theory," *American Psychologist* (44:9), 1989, pp. 1175-1184.

Bandura, A. Self-*Efficacy: The Exercise of Control*, W.H. Freeman and Company, New York, 1997.

Bandura, A. "Much Ado Over a Faulty Conception of Perceived Self-Efficacy Grounded in Faulty Experimentation," *Journal of Social & Clinical Psychology* (26:6), 2007, pp. 641-658.

Bandura, A. and Schunk, D. "Cultivating Competency, Self-Efficacy, and Intrinsic Interest Through Proximal Self-Motivation," *Journal of Personality and Social Psychology* (41:3), 1981, pp. 586-598.

Bannister, F. "Sustained Delivery of Value: The Role of Leadership in Long-term IS Effectiveness," *Evaluation and Program Planning* (25), 2002, pp. 151-158.

Bassellier, G. and Benbasat, I. "Business Competence of Information Technology Professionals: Conceptual Development and Influence on IT–Business Partnerships," *MIS Quarterly* (28:4), 2004, pp. 673-694.

Bassellier, G., Benbasat, I., and Reich, B. "The Influence of Business Managers' IT Competence on Championing IT," *Information Systems Research* (14:4), 2003, pp. 317-336.

Bassellier, G., Reich, B.H., and Benbasat, I. "Information Technology Competence of Business Managers: A Definition and Research Model," *Journal of Management Information Systems* (17:4), 2001, pp. 159-182.

Bonarius, H. "Research in the Personal Construct Theory of George A. Kelly: Role Construct Repertory Test and Basic Theory," in *Progress in Experimental Personality Research*, B.A. Maher (Ed.), Academic Press, New York, 1965.

Bonner, S. and Lewis B. "Determinants of Auditor Expertise," *Journal of Accounting Research (Supplement)* (28:3), 1990, pp. 1-20.

Boudreau, M.-C. "Learning to Use ERP technology: A Causal Model," in *Proceedings of 36th Annual Hawaii International Conference on System Sciences*, 2003, pp. 235-243.

Boudreau, M.-C. and Robey, D. "Enacting Integrated Information Technology: A Human Agency Perspective," *Organization Science* (16:1), 2005, pp. 3-18.

Boudreau, M.-C. and Seligman, L. "Quality of Use of a Complex Technology: A Learning-Based Model," *Journal of Organizational & End User Computing* (17:4), 2005, pp. 1-22.

Brown, T.A. *Confirmatory Factory Analysis for Applied Research*, The Guilford Press, New York, 2006.

Bruning, R.H., Schraw, G.J., Norby, M.M., and Ronning, R.R. *Cognitive Psychology and*

*Instruction*, Pearson Education Inc, New Jersey, 2004.

Burger, A. and Blignaut, P. "A Computer Literacy Course may Initially be Detrimental to Students' Attitudes towards Computers," in *Proceedings of the 2004 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries* (75), 2004, pp. 10-14.

Burton-Jones, A. and Gallivan, M.J. "Toward a Deeper Understanding of System Usage in Organizations: A Multilevel Perspective," *MIS Quarterly* (31:4), 2007, pp. 657-679.

Burton-Jones, A. and Hubona, G.S. "The Mediation of External Variables in the Technology Acceptance Model," *Information & Management* (43:6), 2006, pp. 706-717.

Burton-Jones, A. and Straub Jr., D.W. "Reconceptualizing System Usage: An Approach and Empirical Test," *Information Systems Research* (17:3), 2006, pp. 228-246.

Butler, B.S. and Gray, P.H. "Reliability, Mindfulness, and Information Systems," *MIS Quarterly* (30:2), 2006, pp. 211-224.

Calhoun, J., Dollett, L., Sinioris, M., Wainio, J., Butler, P., Griffith, J., and Warden, G.L. "Development of an Interprofessional Competency Model for Healthcare Leadership," *Journal of Healthcare Management* (53:6), 2008, pp. 375-390.

Carte, T.A., Schwarzkopf, A.B., Shaft, T.M., and Zmud, R.W. "Advanced Business Intelligence at Cardinal Health," *MIS Quarterly Executive* (4:4), 2005, pp. 413-424.

Cenfetelli, R. "Getting in Touch With Our Feelings Towards Technology," *Academy of Management Proceedings*, New Orleans, 2004a, pp. F1-F6.

Cenfetelli, R. "Inhibitors and Enablers as Dual Factor Concepts in Technology Usage," *Journal of the Association for Information Systems* (5:11/12), 2004b, pp. 472-492.

Cenfetelli, R.T., Benbasat, I., and Al-Natour, S. "Addressing the *What* and *How* of Online Services: Positioning Supporting-Services Functionality and Service Quality for Business-to-Consumer Success," *Information Systems Research* (19:2), 2008, pp. 161-181.

Chen, G., Whiteman, J. Gully, S., and Kilcullen, R. "Examination of Relationships Among Trait-Like Individual Differences, State-Like Individual Differences, and Learning Performance," *Journal of Applied Psychology* (85:6), 2000, pp. 835-847.

Chen, A., Mind-Dau, B., and Yi-Ming, H. "Taiwan HRD Practitioner Competencies: An Application of the ASTD WLP Competency Model," *International Journal of Training & Development* (9:1), 2005, pp. 21-32.

Chung, J. and Tan, F.B. "Antecedents of Perceived Playfulness: An Exploratory Study on User Acceptance of General Information-Searching Websites," *Information and Management* (41:7), 2004, pp. 869-881.

Clay, P.F., Dennis, A.R., and Ko, D.-G. "Factors Affecting the Loyal Use of Knowledge Management Systems," in *Proceedings of the 38th Hawaii International Conference on System Sciences*, 2005, pp. 1-10.

Clemons, E.K. and Row m.C. "Sustaining IT Advantage: The Role of Structural

Differences," *MIS Quarterly* (15:3), 1991, pp. 275-292.

Compeau, D.R. and Higgins, C.A. "Application of Social Cognitive Theory to Training for Computer Skills," *Information Systems Research* (6:2), 1995a, pp. 118-143.

Compeau, D.R. and Higgins, C.A. "Computer Self-efficacy: Development of a Measure and Initial Test," *MIS Quarterly* (19:2), 1995b, pp. 189-211.

Compeau, D., Higgins, C.A., and Huff, S. "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," *MIS Quarterly* (23:2), 1999, pp. 145-158.

Compeau, D. Meister, D., and Higgins, C. "From Prediction to Explanation: Reconceptualizing and Extending the Perceived Characteristics of Innovating," *Journal of the Association for Information Systems* (8:8), 2007, pp. 409-439.

Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* (13:3), 1989, pp. 319-340.

Davis, C.J. and Hufnagel, E.M. "Through the Eyes of Experts: A Socio-Cognitive Perspective on the Automation of Fingerprint Work," *MIS Quarterly* (31:4), 2007, pp. 681-703.

De Volder, M.L. and Lens, W. "Academic Achievement and Future Time Perspective as a Cognitive-Motivational Concept," *Journal of Personality and Social Psychology* (42:3), 1982, pp.566-571.

Eccles, J.S. and Wigfield, A. "Motivational Beliefs, Values, and Goals," *Annual Review of Psychology* (53), 2002, pp. 109-132.

Einhorn, H. "Expert Judgment: Some Necessary Conditions and an Example," *Journal of*

*Applied Psychology* (59:5), 1974, pp. 562-571.

Ericsson, K.A., Krampe, R.T., and Tesch-Romer, C. "The Role of Deliberate Practice in the Acquisition of Expert Performance," *Psychological Review* (100), 1993, pp. 363-406.

Fagan, M.H., Neill, S., and Wooldridge, B.R. "An Empirical Investigation into the Relationship between Computer Self-efficacy, Anxiety, Experience, Support and Usage," *Journal of Computer Information Systems* (44:2), 2003-2004, pp. 95-104.

Feltovich, P.J., Prietula, M.J., and Ericsson, K.A. "Studies of Expertise from Psychological Perspectives," In K.A. Ericsson, N. Charness, and P.J. Fletovich,(Eds), *The Cambridge Handbook of Expertise and Expert Performance* (pp. 41-67), Cambridge University Press, New York, 2006.

Fornell, C. and Larcker, D.F. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18), 1981, pp. 39-50.

Fransella, F., Bell, R., and Bannister, D. *A Manual for Repertory Grid Technique (2nd ed.)*, John Wiley & Sons Ltd., England, 2004.

Gallivan, M.J., Spitler, V.K., and Koufaris, M. "Does Information Technology Training Really Matter? A Social Information Processing Analysis of Coworkers' Influence on IT Usage in the Workplace," *Journal of Management Information Systems* (22:1), 2005, pp. 153-192.

Gefen, D., Straub, D.W., Boudreau, M.-C. "Structural Equation Modeling and Regression: Guidelines for Research Practice," *Communications of the*

*Association for Information Systems* (4:7), 2000, pp. 1-70.

Ghani, J. A. and Deshpande, S.P. "Task Characteristics and the Experience of Optimal Flow in Human-Computer Interaction," *The Journal of Psychology* (128:4), 1994, pp. 381-391.

Goleman, D., Boyatzis, R., and McKee A. *Primal Leadership: Learning to Lead with Emotional Intelligence,* Harvard Business School Press, Boston, 2002.

Gravill, J. and Compeau, D. "Self-regulated Learning Strategies and Software Training," *Information & Management* (45:5), 2008, pp. 288-296.

Gutman, J. "A Means-End Chain Model Based on Consumer Categorization Processes," *Journal of Marketing* (46:2), 1982, pp. 60-72.

Hackman, J. and Oldham, G. *Work Redesign*, Addison-Wesley, Reading MA, 1975.

Hudlicka, E. "This Time With Feeling: Integrated Model of Trait and State Effects on Cognition and Behavior," *Applied Artificial Intelligence* (16:7/8), 2002, p. 611-641.

Hulleman, C.S., Durik, A.M., Schweigert, S.A., and Harackiewicz, J.M. "Task Values, Achievement Goals, and Interest: An Integrative Analysis," *Journal of Educational Psychology* (100:20), 2008, pp. 398-416.

Hunter, M.G. "A Strategy for Identifying Excellent Systems Analysts," *Journal of Strategic Information Systems* (2:1), 1993, pp. 15-26.

Hunter, M.G. "The Use of RepGrids to Gather Interview Data about Information Systems Analysts," *Information Systems Journal* (7:1), 1997, pp. 67-81.

Husman, J. and Lens, W. "The Role of the Future in Student Motivation," *Educational*

*Psychologist* (34:2), 1999, pp. 113-125.

Jain, V. and Kanungo, S. "Beyond Perceptions and Usage: Impact of Nature of Information Systems Use on Information System-Enabled Productivity," *International Journal of Human-Computer Interaction* (19:1), 2005, pp. 113-136.

Jarvenpaa, S.L. "The Effect of Task Demands and Graphical Format on Information Processing Strategies," *Management Science* (35:3), 1989, pp. 285-303.

Jasperson, J., Carter, P.E., and Zmud, R.W. "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems," *MIS Quarterly* (29:3), 2005, pp. 525-557.

Karahanna, E., Straub, D., and Chervany, N. "Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-adoption and Post-adoption Beliefs," *MIS Quarterly* (23:2), 1999, pp. 183-213.

Keeney, R. "The Value of Internet Commerce to the Customer," *Management Science* (45:4), 1999, pp. 533-542.

Keil, M., Tan, B.C.Y., Wei, K.-K., Saarinen, T., Tuunainen, V., and Wassenaar, A. "A Cross-Cultural Study on Escalation of Commitment Behavior in Software Projects," *MIS Quarterly* (24:2), 2000, pp. 299-325.

Kelly, G.A. *The Psychology of Personal Constructs*, W.W. Norton, New York, 1955.

Kelly, G.A. *A Theory of Personality*, W.W. Norton, New York, 1963.

Khatri, V., Vessey, I., Ramesh, V., Clay, P., and Park, S. "Understanding Conceptual Schemas: Exploring the Role of Application and IS Domain Knowledge," *Information Systems Research* (17:1), 2006, pp. 81-99.

Kim, H., and Kankanhalli, A. "Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective," *MIS Quarterly* (33:3), 2009, pp. 567-582.

Kline, R.B. *Principles and Practice of Structural Equation Modeling (2nd ed)*, The Guilford Press, New York, 2005.

Kluemper, D., Little, L., and DeGroot, T. "State or Trait: Effects of State Optimism on Job-Related Outcomes," *Journal of Organizational Behavior* (30:2), 2009, pp. 209-231.

Latting, J.K., Beck, M.H., Slack, K.J., Tetrick, L.E., Jones, A.P., Etchegaray, J.M., and Silva, N.D. "Promoting Service Quality and Client Adherence to the Service Plan: The Role of Top Management's Support for Innovation and Learning," *Administration in Social Work* (28:2), 2004, pp. 29-48.

Laudon, K.C. and Laudon, J.P. *Management Information Systems: Managing the Digital Firm*, Prentice Hall, New Jersey, 2006.

Lee, A.S. "Research in Information Systems: What We Haven't Learned," *MIS Quarterly* (25:4), 2001, pp. v-xv.

Lee, D. "Usage Patterns and Sources of Assistance to Personal Computer Users," *MIS Quarterly* (10:4), 1986, pp. 313-325.

Lending, D. and Straub, D.W. "Impacts of an Integrated Information Center on Faculty End-users: A Qualitative Assessment," *Journal of the American Society for Information Science* (48:5), 1997, pp. 466-471.

Leung, L. "Internet Embeddedness: Links with Online Health Information Seeking, Expectancy Value/Quality of Health Information Websites, and Internet Usage

Patterns," *CyberPsychology & Behavior* (11:5), 2008, pp.565-569.

Levy, P.E. *Industrial/Organizational Psychology 2nd edition*, Houghton Mifflin Company, Boston, MA, 2006.

Lewis, W., Agarwal, R., and Sambamurthy, V. "Sources of Influence on Beliefs About Information Technology Use: An Empirical Study of Knowledge Workers," *MIS Quarterly* (27:4), 2003, pp. 657-678.

Liang, H. and Xue, Y. "Avoidance of Information Technology Threats: A Theoretical Perspective," *MIS Quarterly* (33:1), 2009, pp. 71-90.

Libby, R. and Luft, J. "Determinants of Judgment Performance in Accounting Settings: Ability, Knowledge, Motivation and Environment," *Accounting, Organizations, and Society* (18:5), 1993, pp. 425-450.

Lim, K., Ward, L., and Benbasat, I. "An Empirical Study of Computer System Learning: Comparison of Co-Discovery and Self-Discovery Methods," *Information Systems Research* (8:3), 1997, pp. 254-272

Lincoln, Y.S. and Guba, E.G. *Naturalistic Inquiry*, Sage Publications, Inc., Newbury Park, California, 1985.

Locke, E.A. and Latham, G.P. "Self-Regulation Through Goal Setting," *Organizational Behavior and Human Decision Processes* (50:2), 1991, pp. 212-247.

Loyd, B.H. and Gressard, C. "Reliability and Factorial Validity of Computer Attitude Scales," *Educational and Psychological Measurement* (44:2), 1984, pp. 501-505.

Lynd-Stevenson, R. "Expectancy-Value Theory and Predicting Future Employment Status in the Younr Unemployed," *Journal of Occupational & Organizational*

*Psychology* (72:1), 1999, pp. 101-106.

Mackay, J.M. and Elam, J.J. "A Comparative Study of How Experts and Novices Use a Decision Aid to Solve Problems in Complex Knowledge Domains," *Information Systems Research* (3:2), 1992, pp. 150-172.

Maholtra, N.K., Kim, S.S., and Patil, A. "Common Method Variance in IS Research: A Comparison of Alternative Approaches and a Reanalysis of Past Research," *Management Science* (52:12), 2006, pp. 1865-1883.

Marakas, G. M. and Elam, J.J. "Creativity Enhancement in Problem Solving: Through Process or Software," *Management Science* (43:8), 1997, pp. 1136-1146.

Marcolin, B.L., Compeau, D.R., Munro, M.C., and Huff, S.L. "Assessing User Competence: Conceptualization and Measurement," *Information Systems Research* (11:1), 2000, pp. 37-60.

Mathur, A. "Examining Trying as a Mediator and Control as a Moderator of Intention-Behavior Relationship," *Psychology & Marketing* (15:3), 1998, pp. 241-259.

Meister, D. and Compeau, D.C. "Infusion of Innovation Adoption: An Individual Perspective," in *Proceedings of ASAC conference*, 2002, pp. 23-33. Retrieved on June 29, 2010 from http://libra.acadiau.ca/library/ASAC/v23/230403.pdf.

Miller, R.B., Greene, B.A., Montalvo, G.P., Ravindran, B., and Nich, J.D. "Engagement in Academic Work: The Role of Learning Goals, Future Consequences, Pleasing Others, and Perceived Ability," *Contemporary Educational Psychology* (21:4), 1996, pp.388-422.

Moore, D.J., Harris, W.D., and Chen, H.C. "Affect Intensity: An Individual Difference

Response to Advertising Appeals," *Journal of Consumer Research* (22:2), 1995, pp. 154-164.

Moore, G.C. and Benbasat, I. "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," *Information Systems Research* (2:3), 1991, pp. 192-222.

Nambisan, S., Agarwal, R., and Tanniru, M. "Organizational Mechanisms for Enhancing User Innovation in Information Technology," *MIS Quarterly* (23:3), 1999, pp. 365-395.

Naquin, S.S and Holton III, E.F. "Leadership and Managerial Competency Models: A Simplified Process and Resulting Model," *Advances in Developing Human Resources* (8:2), 2006, pp. 144-165.

Nunnally, J.C. *Psychometric Theory, 2nd Edition*, McGraw-Hill Publishing Company, New York, 1978.

Pervin, L.A. *Personality: Theory and Research, 4th Edition*, John Wiley & Sons, Inc., New York, 1984.

Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and Podsakoff, N.P. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), 2003, pp. 879-903.

Podsakoff, P.M. and Organ, D.W. "Self-Reports in Organizational Research: Problems and Prospects," *Journal of Management* (12:4), 1986, pp.531-544.

Rank, J., Pace, V.L. and Frese, M. "Three Avenues for Future Research on Creativity,

Innovation and Initiative," *Applied Psychology* (53:4), 2004, pp. 518-528.

Raykov, T. and Marcoulides, *A First Course in Structural Equation Modeling (2nd Edition),* Lawrence Erlbaum Associations, Inc., New Jersey, 2006.

Raynor, J.O. "Relationships Between Achievement-Related Motives, Future Orientation, and Academic Performance," *Journal of Personality and Social Psychology* (15:1), 1970, pp. 28-33.

Reger, R.K. "The Repertory Grid Technique for Eliciting the Content and Structure of Cognitive Constructive Systems," in *Mapping Strategic Thought*, Huff, A.S. (Ed.), John Wiley & Sons, London, 1990, pp. 301-309.

Rifkin, K. and Fineman, M. "Developing Technical Managers – First You Need a Competency Model," *Research Technology Management* (42:2), 1999, pp. 53-57.

Sabherwal, R. and Robey, D. "Reconciling Variance and Process Strategies for Studying Information Systems Development," *Information Systems Research* (6:4), 1995, pp. 303-327.

Santhanam, R. Sasidharan, S., and Webster, J. "Using Self-Regulatory Learning to Enhance E-Learning-Based Information Technology Training," *Information Systems Research* (19:1), 2008, pp. 26-47.

Scott, M. "AICPA competency model for the new finance professionals," *CPA Journal* (68:10), 1998, pp. 40-45.

Shayo, C., Olfman, L., and Teitelroit, R. "An Exploratory Study of the Value of Pretraining End-User Participation," *Information Systems Journal* (9:1), 1999, pp. 55-79.

Shanteau, J. "Psychological Characteristics and Strategies of Expert Decision Makers," in *Advances in Decision Research*, B. Rohrmann, L.R. Beach, C.Vlek, and S.R. Watson (Eds.), North Holland, Amsterdam, 1989, pp. 203-215.

Shanteau, J. "Competence in Experts: The Role of Task Characteristics," *Organizational Behavior and Human Decision Processes* (53:2), 1992, pp. 252-266.

Siau, K., Tan, X., and Sheng, H. "Important Characteristics of Software Development Team Members: An Empirical Investigation Using Repertory Grid," *Information Systems Journal*, 2007, pp. 1-18. Retrieved November 21, 2008 from http://www3.interscience.wiley.com/cgi-bin/fulltext/120124606/PDFSTART.

Simons, J., Dewitte, S., and Lens, W. "Wanting to Have vs. Wanting to Be: The Effect of Perceived Instrumentality on Goal Orientation," *British Journal of Psychology* (91), 2000, pp. 335-351.

Simons, J., Dewitte, S., and Lens, W. "'Don't Do It for Me. Do It for Yourself.' Stressing the Personal Relevance Enhances Motivation in Physical Education," *Journal of Sport & Exercise Psychology* (25), 2003, pp. 145-160.

Simons, J., Dewitte, S., and Lens, W. "The Role of Different Types of Instrumentality in Motivation, Study Strategies, and Performance: Know Why You Learn, So You'll Know What You Learn!," *British Journal of Educational Psychology* (74:3), 2004, pp. 343-360.

Sitkin, S.B. and Pablo, A.L. "Reconceptualizing the Determinants of Risk Behavior," *Academy of Management Review* (17:1), 1992, pp. 9-38.

Spitler, V.K. "Learning to Use IT in the Workplace: Mechanisms and Masters," *Journal*

*of Organizational and End User Computing* (17:2), 2005, pp. 1-25.

Stewart, V. Business Applications of Repertory Grid. Retrieved December 7, 2005, from Enquire Within® website, https://www.enquirewithin.co.nz/BUS_APP/business.htm, 1981.

Stewart, V. Helpful Hints. Retrieved October 17, 2006, from Enquire Within® website, http://www.enquirewithin.co.nz/hintsfor.htm, 2006.

Straub, D., Boudreau, M.-C., and Gefen, D. "Validation Guidelines for IS Positivist Research," *Communications of the Association for Information Systems* (13), 2004, pp. 380-427.

Straub, D. and Limayen, M. "Measuring System Usage: Implications for IS Theory Testing," *Management Science* (41:8), 1995, pp. 1328-1343.

Strauss, A. and Corbin, J. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory, (2nd Edition),* Sage Publications, Thousand Oaks, California, 1998.

Sun, H. and Zhang, P. "Adaptive IT Use: Conceptualization and Measurement," in *Proceedings of the Fifth Annual Workshop on HCI Research in MIS*, Milwaukee, WI, 2006, pp. 65-69.

Tan, F.B. and Hunter, M.G. "The Repertory Grid Technique: A Method for the Study of Cognition in Information Systems," *MIS Quarterly* (26:1), 2002, pp. 39-57.

Thatcher, J.B. and Perrewé, P.L. "An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-Efficacy," *MIS Quarterly* (26:4), 2002, pp. 381-396.

Thatcher, J., Srite, M., Stepina, L., and Yongmei, L. "Culture, Overload and Personal Innovativeness with Information Technology: Extending the Nomological Net," *Journal of Computer Information Systems* (44:1), 2003, pp. 74-81.

Thompson, R., Compeau, D., and Higgins, C. "Intentions to Use Information Technologies: An Integrative Model," *Journal of Organizational and End User Computing* (18:3), 2006, pp. 25-46.

Thompson, R. and Higgins, C. "Personal Computing: Toward a Conceptual Model of Utilization," *MIS Quarterly* (15:1), 1991, pp. 125-143.

Thompson, R., Higgins, C., and Howell, J.M. "Influence of Experience on Personal Computer Utilization: Testing a Conceptual Model," *Journal of Management Information Systems* (11:1), 1994, pp. 167-187.

Torkzadeh, G. and Angulo, I.E. "The Concept and Correlates of Computer Anxiety," *Behaviour & Information Technology* (11:2), 1992, pp. 99-108.

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., Matos, L., and Lacante, M. "Less Is Sometimes More: Goal Content Matters," *Journal of Educational Psychology* (96:4), 2004, pp. 755-764.

Walker, B.M. and Winter, D.A. "The Elaboration of Personal Construct Psychology," *Annual Review of Psychology* (58:1), 2007, pp. 453-477.

Webster, J. and Martocchio, J.J. "Microcomputer Playfulness: Development of a Measure with Workplace Implications," *MIS Quarterly* (16:2), 1992, pp. 201-226.

Wang, W., Butler, J.E., Hsieh, J.J., and Hsu, S.-H. "Innovate with Complex Information Technologies: A Theoretical Model and Empirical Examination," *Journal of*

*Computer Information Systems* (49:1), 2008, pp. 27-36.

Yi, M. and Davis, F. "Developing and Validating an Observational Learning Model of Computer Software Training and Skill Acquisition," *Information Systems Research* (14:2), 2003, pp. 146-169.

Yi, M., Fiedler, K., and Park, J. "Understanding the Role of Individual Innovativeness in the Acceptance of IT-Based Innovations: Comparative Analyses of Models and Measures," *Decision Sciences* (37:3), 2006, pp. 393-426.

Yin, R.K. *Case Study Research: Designs and Methods (2nd Edition)*, Sage Publications Inc., Thousand Oaks, CA, 1994.

Yoon, C.Y. "An Evaluation System for End-User Computing Capability in a Computing Business Environment," *IEICE Transactions on Information and Systems* (11), 2008, pp. 2607-2615.

# APPENDIX

## Findings – Examples from Participants' Transcripts

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| *General Learning & Cognitive Factors* | |
| General Learning and Cognitive Factors include the categories of Intellectual Abilities, Ability and Desire to Learn, and Ability to Solve Problems. Each of these categories recognizes a unique cognitive aspect of highly competent users, and hence, is linked by the cognitive processes that were identified by research participants. As noted in Table 4.2, some of the categories of highly competent user characteristics that were identified were further partitioned into subcategories to provide a richer understanding of these multi-dimensional categorizations. For example, the category Ability and Desire to Learn was further sub-categorized into Capacity for Learning, Ability to Learn Quickly, Ability to Learn Independently, and Willingness to Learn. All but two participants provided constructs that fell within this main category.<br>Of the 416 constructs that were categorized, 48 were coded into Ability and Desire to Learn which is the category with the most constructs. Research participants indicated that highly competent users are individuals who are filled with intellectual pursuits and are invigorated by learning. They were described as individuals who search for meaning and enjoy seeing how | (referring to learning abilities)<br>[Referring to incompetent users] *"you would find yourself repeatedly helping them on the same thing…they are unable to transfer the skills from one application to the next.*<br>[Referring to highly competent user] *someone who retains what they've been shown something once or twice…ability to take skills learned in one setting and apply into new or different settings."*<br><br>(referring to learning independently)<br>[Referring to highly competent users] *"This group of people would be able to facilitate their own learning of the system, whereas this person* [referring to incompetent user] *would have to be taught how to do everything."*<br><br>[Referring to incompetent users] *"they don't understand the system or don't take the time to understand…someone who just gives up. It's kind of like the impatient part, they won't learn it or refuses to learn it because they can rely on someone else...*[Referring to highly competent user] *who goes the extra mile to learn it. Who would take a…class and who would go find opportunities to learn it."*<br><br>(referring to learning quickly)<br>[Referring to incompetent users] *"their recall and retention is slow..definitely slow…their process in how to use the system and process of stepping through the system for their uses and for their needs in how to access information...*[Referring to highly competent user] *faster to recall or ability to retain information given to them faster...they* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| things are connected. They are also willing to spend time to learn and to experience the learning curve, as well as being willing to make mistakes and to be wrong.<br>Interesting findings within the Ability and Desire to Learn category are Ability to Learn Independently and Ability to Learn Quickly. Some of the comments noted indicated that highly competent users took the initiative to learn IS and wanted the hands-on learning experience. These individuals were not only recognized for their ability and willingness to learn, but their ability to go beyond (or possibly forego) formal training and utilize self-initiated learning. These individuals were also cited as knowing when they needed to ask for help, but still initiating their own learning. Therefore, they may have been trained and may rely on support as they deem necessary, but are clearly not relying on training or training support alone for their ultimate knowledge acquisition in using IS. Additionally, these individuals were noted as quick learners, being able to apply their knowledge faster, and just "get it the first time" versus being slower to learn, recall, and acclimate to IS.<br>Also, within this theme of General Learning and Cognitive Factors, research participants indicated that highly competent users hold a certain level of intellectual capacity or Intellectual Abilities. They were described as being logical and analytical with | *ask less questions and get it the first time."*<br><br>(referring to intellectual abilities)<br>[Referring to competent user] *"he's a genius..he can figure anything out..I would say towards IS..even the rate or speed of thinking, how fast they process information..it makes it easier for them to work with information systems…*[Referring to incompetent users]*intelligence in areas other than IS…slow, methodical thinker."*<br><br>(referring to ability to solve problems)<br>*"I think it goes back to problem solving...*[Referring to highly competent users] *these individuals by nature are problem-solvers and* [Referring to incompetent user] *this individual, sort of by nature, is either a problem creator or…they just bring the issue's attention to others. They identify problems but they don't fix anything or they actually create the problems."* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| rapid thinking capacities versus being slow thinkers. Highly competent users were also described as problem-solvers in that they have the ability find solutions to their IS dilemmas. Problem-solving characteristics (or Ability to Solve Problems) of highly competent users that were generated indicated that highly competent users look for solutions when problems occur and assist with trouble-shooting. Within the Ability to Solve Problems category, these individuals are viewed as solution-finders and people who are determined to find ways to make things work. These individuals were described as users who seek answers, engage in trouble-shooting, and are able to correct problems. Therefore, their competence is viewed as not only having a certain level of intelligence and being able to learn, but also entails being able to solve problems as they arise.<br>Therefore, highly competent users were described as having a general set of learning and cognitive factors that encompasses their intellectual abilities, their desire and capacity to learn, and their propensity to be problem-solvers. They are considered logical and analytical thinkers who learn quickly and independently. They also tend to be trouble-shooters who actively seek answers. | |
| *Personal Dispositions and Trait* | |
| Personal Dispositions and Traits include the categories of Motivation/Perseverance, Dedication, Positive Attitude, | (referring to ability to motivation/perseverance)<br>[Referring to competent users] *"Just willing to help out when other people are having problems. It might not necessarily be their* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| Conscientious, Efficiency at Task, Adaptability, Sense of Curiosity with IS, Open-mindedness, Confidence, and Risk-Taking Propensity with IS. Research participants indicated various personal characteristics of highly competent users, hence the linkage that brings these categories together into this theme. These characteristics indicate that highly competent users are driven and persevere in their pursuits, are self-assured, are committed and take pride in what they do, and hold a positive attitude. They also give much attention to detail and in managing their time. They are flexible, are open to new approaches and have a multi-dimensional view which complements their exploratory nature and their propensity to take risks with IS.<br>Notably, Motivation/Perseverance encompasses 39 constructs alone and was mentioned by 15 of the 20 participants. This category captures the highly driven nature of highly competent users, as well as their determination to accomplish a task, strong work ethic and reluctance to give up their pursuits. Highly competent users were described as having patience with IS and not deterring by failures experienced when using IS. Also, they were labeled as being aggressive, high achievers, and go-getters. They were noted as being people who do whatever they need to in order to get the job done.<br>Also, Dedication emerged | *problem, but they are always willing to jump in to lend a hand…motivated…achievers…*[Referring to incompetent user] *disengaged in that they don't want to help…disengaged with people they work with…someone who just doesn't care, doesn't want to be number one…satisfied with average…they lack any type of competition to be number one"*<br><br>[Referring to competent users] "*These two people are constantly looking for more responsibility…*[Referring to incompetent user] *this person is shrugging off responsibility or always trying to get an assistant to help out…*[Referring to competent users] *the work ethic of these individuals is very strong, just a strong work ethic that they don't want to go home until the work is done…*[Referring to incompetent user] *somebody who has just a lower work ethic."*<br><br>(referring to dedication)<br>[Referring to highly competent users] *"They're happy where they are and they're not looking… to get out of the department or get out of their current job...*[Referring to incompetent user]*whereas this is not where his heart is at and not where he wants his career to be, this is temporary…so he's not committed to it, so what if he doesn't learn it, he's not going to use these skills somewhere else…*[Referring to highly competent user] *opposite is committed."*<br><br>(referring to conscientious)<br>[Referring to highly competent user] *"a detailed person…*[Referring to incompetent users] *disorganized…*[Referring to highly competent user] *quality of work is higher…accuracy…*[Referring to incompetent users] *more errors, these two are careless."* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| from the characteristics generated. Highly competent users were depicted as people who take pride and ownership in their work. They were also described as being committed to their departments and being happy with the fit between their job and their interests. Also, their Positive Attitude was noted by research participants.<br>Research participants viewed highly competent users as having a detailed approach in task execution (Conscientious) and a disciplined approach on time management at task execution (Efficiency at Task). They noted attention to and being attuned to accuracy as characteristic of highly competent users. They also noted their abilities to manage time well and carry out tasks efficiently.<br>Adaptability characteristics, or being open to change and able to work under a variety of conditions, were also identified as characteristics of highly competent users. Research participants highlighted these users' willingness to change as well as their taking less time to adapt to change. They were said to be flexible and were not easily frustrated. Also, they were noted to be able to work under a variety of conditions and were the ones who would look for change and embrace it.<br>Interestingly, Sense of Curiosity with IS or curious, exploratory nature was also identified as describing highly competent users. This category | (referring to adaptability)<br>[Referring to incompetent users] *"hard to adapt to change…their reaction was negative, it was hard for them to adapt to the change and accept the change. Timeframe, it took them longer to adapt to the change then other users experiencing that same change…*[Referring to highly competent user] *Easy to adapt to changes. For the short time the individual has been here, (*name of IS user element*) has been able to adapt very easily, very quickly, even initiated some of the changes and gave ideas."*<br><br>(referring to sense of curiosity with IS)<br>[Referring to highly competent users] *"contributes a little bit to curiosity with technology* [Referring to incompetent user] *as opposed to a phobia."*<br><br>[Referring to highly competent user] "*This person is inquisitive and* [Referring to incompetent users] *these people aren't…accepting of the status quo."*<br><br>(referring to open-mindedness)<br>[Referring to incompetent users] *"I don't think they could be as proficient as others because it's almost a visual thing. I can be standing right next to them and say click on File and drop down to Import or Export and literally they can't see it on the screen…*[Referring to highly competent user]*whereas others could understand the graphic layout better…* [Referring to incompetent users] *Its almost as if the information system, if it were like a hologram of sticky notes or a file cabinet or something that they could, kind of in a virtual reality, open up that they could use, its just the fact that its on a computer screen that its so flat and one-dimensional that its difficult…* [Referring to highly competent user] *really visualize something one-* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| indicates that highly competent users have a sense of inquisitiveness and curiosity about information systems. In addition, Open-mindedness of highly competent users was noted and characterizes their ability to reason about new ideas or approaches and being aware of multiple perspectives. They were noted as being able to make connections between the system and the task at hand, visualize processes, and see the big picture. They are also open to new ideas and were labeled as being creative and innovative. "*Disciplined creativity…any system requires some discipline in using it, but seeing outside the boundaries of the discipline that someone else has established and figuring out either other ways of capturing that are superior or other ways of using the data that had not been envisioned."* This finding is especially insightful as it highlights the unstructured, novel cognitive processes that a highly competent user exhibits.<br>Interesting results that emerged from other personal characteristics that were identified are Risk-taking propensity with IS as well as Confidence. Highly competent users were noted as being willing to accept risk with IS, not being afraid of doing something wrong, and not wanting to stick to only what they know. Highly competent users are also confident in themselves. Constructs identified noted that these users are secure in their abilities and are not protective of | *dimensional in a three-dimensional world…its kind of hard to put into writing but I know a lot of people, myself included, when I'm working…when I pull up a file, in my head, I see a file and it makes sense to me… but I think some people just see an icon."*<br><br>[Referring to incompetent users] *"I don't think neither one of these two were very creative thinkers, they were very transactional kind of employees…*[Referring to highly competent user] *someone who sees the relationships between context and tasks…Something about openness to new ways of doing things…*[Referring to incompetent user] *wants to do things the same way or the old way."*<br><br>(referring to risk-taking propensity with IS)<br>[Referring to highly competent users] *"They're also risk takers…in that they are willing to go out and they'll just try anything...*[Referring to incompetent users] *they just stay closer to what they already know and they don't branch out."*<br>[Referring to highly competent user] *"This person is not fearful or is willing to take risks and* [Referring to incompetent users] *these people are afraid to do something wrong or they'll break it."*<br><br>(referring to confidence)<br>[Referring to incompetent users] *"one thing they lack is their ability to make other people feel comfortable and believe in them,* [Referring to highly competent user] *very convincing …she's very confident in her abilities and who she is and* [Referring to incompetent users] *they just lack that confidence and it comes off… another way of* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| information or their reputation.<br>In summary, research participants indicated that highly competent IS users have certain personal characteristics that they believe contribute to their ability to use IS better than incompetent users. In their opinion, these users are motivated and perseverant, hold a positive outlook, and are committed. They are precise and are efficient managers of time. They tend to be adaptable and curious with abilities to visualize processes and think in novel manners. Portraying high levels of confidence, these users tend to be willing to take risks with IS. | *phrasing that is self-assurance."* |
| *Communication & Collaboration Skills & Tendencies* | |
| Communication and Collaboration Skills include the categories of Willingness to Collaborate as well as Communication Skills. These categories identify specific interactions and relations with other IS users and, therefore, are linked by the association and interaction that highly competent users have with other IS users. Highly competent users were described as inclined to share information, as well as work with and train others, which is highly dependent on their ability to communicate. The elicited constructs indicate that highly competent users have good communication skills (both written and oral), are team players and collaborators, and are good with people. Highly competent users were identified with both oral and written communication abilities. | (referring to willingness to collaborate)<br>[Referring to highly competent user] *"willing to teach other users…*[Referring to incompetent users] *unwilling to teach/unable to teach…unwillingness to share information…*[Referring to highly competent user] *willing to share, willing to update…*[Referring to incompetent user] *whereas this person would put the incorrect information in or not at all."*<br><br>(referring to communication skills)<br>[Referring to highly competent users] *"they have relatively good communication skills…both* (referring to both oral and written)…[Referring to incompetent user] *poor communication skills."*<br><br>[Referring to highly competent user] "*communicator…this would be communicating…both* (referring to both oral and written)…[Referring to incompetent users] *inability to communicate."* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| *Exposure to Technology* | |
| Exposure to Technology includes Prior Experiences with technology as well as On-going Use. These constructs identified that a highly competent user not only had high accessibility to technology, but continued to utilize technology in their job functions and in their daily lives. Research participants indicated that highly competent users were individuals who grew up with technology and have had experiences using technology. Some had extensive access to IS functions or have been heavily involved with IS implementations. These individuals have also incorporated technology and IS as a routine part of their jobs and some even as part of their lives. | [Referring to incompetent user] *"this individual, it may be their first experience with an IS* [Referring to highly competent users] *these individuals have had several experiences with IS… or… they have used at other employers…that may be a good proxy for understanding IT systems… these individuals have worked with multiple different types of IT and IS systems* [Referring to incompetent user] *whereas this person probably has limited exposure…these individuals have definitely worked with less than 5* [Referring to highly competent user] *whereas this person has worked with more than 5."*<br><br>[Referring to highly competent user] *"It becomes second-nature…grow up using something… those things are more engrained…the way to use technology is part of their lives compared to…*[Referring to incompetent users] *have to learn how to incorporate it into lives they have already established…*[Referring to highly competent user] *use everyday…people use it more everyday…*[Referring to incompetent users] *do not use everyday."* |
| *Job Experience* | |
| The Job Experience category is defined as specific experiences in job-related tasks. Constructs included in Job Experiences indicated that individuals having multiplicity in job tasks, and having specific job tasks that lend to competency in IS as well, are associated with highly competent IS users. Research participants identified that handling a wide-range of tasks and being cross-functional were important characteristics in understanding how the system | [Referring to incompetent users] *"These two have a limited set of tasks that they are responsible for,* [Referring to highly competent user] *whereas this person has a wide range of tasks…that they are responsible for…*[Referring to incompetent user] *this individual spends the majority of their day entering data in the system and these individuals almost never…another way of putting it is this person performs a repetitive task* [Referring to highly competent users] *whereas these roles are definitely not* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| functions as one unit and how processes in IS are interconnected. Research participants indicated that highly competent users had wide and varying ranges of experiences in tasks and responsibilities. Therefore, this category includes exposure to multiplicity and variation (Variety of Job Experience).<br>Unique findings were the characteristics associated with variety of job experiences. Research participants also identified specific non-IS experiences that they believed contributed to competence in IS, indicating user's ability to transfer skills to the IS domain. For example, they identified that those who were experienced in analyzing reports and data as well as those experienced in solving business issues were related to these highly competent users. | *repetitive task-oriented."*<br><br>[Referring to highly competent user] *"More practical applications of the data, such as forecasting…*[Referring to incompetent user] *manual entry of the data but not getting the output…or seeing the reports and making a decision based on what comes out…it's a task…*[Referring to highly competent user]*experience of knowing how to use the data in the right way…using the output of the data or the reports or the aggregation of the data going in…*[Referring to incompetent user] *no experience…*[Referring to highly competent users] *they would try to solve business issues, not IS technical issues…*[Referring to incompetent user] *doesn't solve business issues."* |
| *Generation Factors* | |
| The Generation Factor category recognizes that the generation one belongs to can contribute to highly competent IS users' abilities to utilize information systems differently from others. Research participants indicated that highly competent users were more likely to be from a younger generation.<br>These constructs generated are deemed to represent more general characteristics of an individual. Therefore, when these characteristics were mentioned by the participant, the constructs were recorded on their grid and additional probing questions were asked (such as "how" and "why" | [Referring to highly competent users] *"they are both younger…*[Referring to incompetent user] *older, more experienced in life."* |

| Discussion | Research Participant Comments (*selected*) |
|---|---|
| which is consistent with the laddering technique described earlier) to identify more specific characteristics relating to them. The probing results indicate that generation factors influence Exposure to Technology that was previously mentioned. | |
| *Formal Education* | |
| The Formal Education category portrays the research participants perspective that the highly competent IS users they identified for this research have some type of advanced or technical degree. After research participants provided characteristics such as these, laddering questions were employed to understand why and how education impacted competency in using IS. These subsequent characteristics that were generated are included in the other respective categories noted above such as General Learning and Cognitive Factors | *"College education-any degree – Lack of college education/High School only"*<br>*"Education-inquisitive, broad (e.g., MBA) – Education narrow"* |