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Assessing the Effects of Communication Media Affordances and the Awareness of Media Security on Knowledge Sharing Behavior

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by

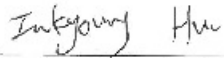
Linda Greene

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in
Information Systems

College of Computing and Engineering
Nova Southeastern University


2019

We hereby certify that this dissertation, submitted by Linda Greene, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.



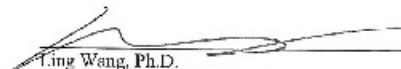
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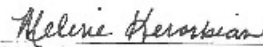
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Nova Southeastern University

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An Abstract of a Dissertation Submitted to Nova Southeastern University
in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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by
Linda Greene
July 2019

Global Software Development (GSD) team members engage in intellectual activities that involve sharing business domain knowledge and technical knowledge across geographical areas, which is crucial to the successful development of software. In global software development, media choice may influence how virtual teams create and share knowledge. As digital technology advances and organizations become more digitally transformed, current communication theories for media selection lack the explanation to the complicated phenomena with the use of advanced media technologies. There have been many studies focused on the effectiveness of media, but they did not include user's understanding of system security and its influence on knowledge sharing behavior. However, affordance theory explains the utility with both social actors and technical features. The use of media may be shaped by features of technologies and user's perception on system security. The goal of this study was to empirically assess the effects of media affordances and media security awareness on knowledge sharing behaviors among GSD team members with the lens of affordance theory. In this study, data was collected through survey from 214 GSD employees, after inviting 1000 employees to participate. The survey data was analyzed to test the effects of communication media affordance and user's awareness of media security on behavior in knowledge sharing. The analysis results show that awareness of media security had significant moderating effects on the relationships from some actualized media affordances to implicit knowledge sharing. The results of this study revealed positive relationships between perceived media affordances and actualized media affordances. The results also showed that organization tenure had a significant effect on implicit knowledge sharing, and professional tenure had a significant effect on explicit and implicit knowledge behavior. This study contributed to the body of knowledge in organizational communication literature by providing new insights into how technology properties and users' awareness on technology security shape team members' knowledge sharing practice.

Table of Contents

Abstract iii
List of Tables vii
List of Figures viii

Chapters

1. Introduction 1
 Background 1
 Problem Statement 4
 Dissertation Goal 8
 Research Questions 8
 Relevance and Significance 10
 Barriers and Issues 11
 Summary 13

2. Review of the Literature 15
 Knowledge Sharing Behavior 15
 Media and Knowledge Sharing Behavior 16
 Information Security and Knowledge Sharing 18
 Affordance Theory 20
 Media Affordances for Knowledge Sharing Behavior 23
 Capturing Tacit Knowledge 25
 Motivating Knowledge Donation 26
 Organizational Barriers 27
 Identifying Expertise 27
 Media Affordances for Information Security 28
 Summary 28

3. Methods 30
 Research Model and Hypotheses Development 30
 Research Site 40
 Survey Instrument Development 41
 Validating Survey Instrument 50

Data Collection	50
Data Analysis Plan	50
Preliminary Data Analysis	51
Measurement Model Test	51
Structural Model Test	54
Resources	54
Summary	55
4. Results	57
Data	57
Delphi Study	59
Pilot Study	59
Results of Preliminary Analysis of Primary Survey Data	60
Mahalanobis Distance and Box Plot	60
Normality and Scatter Plot	61
The Results of Measurement Model Testing	62
The Results of Structural Model Testing	65
Findings	68
5. Conclusions, Implications, Recommendations, and Summary	71
Discussion	71
Conclusions	74
Implications and Recommendations	75
Limitations and Future Studies	78
Appendices	
A. Survey Questionnaire	80
B. IRB Approval Letter	110
C. Pilot Study Results	111
D. Mahalanobis Distance Stem and Leaf Plot	112
E. Normality and Scatter Plot	115
F. PLS Factor Analysis	118
G. Structural Path Analysis	119
H. PLS Analysis Moderating Effects	121
I. Demographic Tenure - Explicit Knowledge Sharing	124

J. Demographic Tenure - Implicit Knowledge 126

References 128

List of Tables

Tables

1. Perceived media affordance survey items (adapted from Rice et al., 2017) 43
2. Awareness of media security (adapted from D'Arcy et al., 2009) 44
3. Knowledge sharing behavior survey items (adapted from Rehman et al., 2014) 45
4. Affordances of media (adapted from Strong et al., 2014) 47
5. Demographics 48
6. Participants Demographics 58
7. Factor Analysis Results of Reflective Measures 63
8. Factor Analysis Results of Formative Measures 64
9. Discriminant Validity (Fornell & Larcker, 1981) 65
10. Summary of Hypotheses Test Results 67
11. Path Coefficient (Bootstrapping) - Inner Loading (Explicit_KS) 119
12. Path Coefficient (Bootstrapping) – Inner Loading (ImplicitKS) 120
13. Path Coefficient (Bootstrapping) – Moderating Effect (ImplicitKS) 121
14. Path Coefficient – Moderating Effect on Actual Use of Editability (ImplicitKS) 122
15. Path coefficient – Moderating Effect on Actual Use of Self-Representation (ImplicitKS) 123
16. Path Coefficient – Organizational Tenure (Explicit_KS) 124
17. Path Coefficient – Professional Tenure (Explicit_KS) 125
18. Path Coefficient – Organizational Tenure (ImplicitKS) 126
19. Path Coefficient – Professional Tenure (ImplicitKS) 127

List of Figures

Figures

1. Research model of media affordances on knowledge sharing behavior 30
2. Results of research model testing 66

Chapter 1

Introduction

Background

Global Software Development (GSD) is a novel software engineering methodology that provides several benefits and challenges to organizations. Organizations have benefitted from cost advantages, being closer to customers, merger and acquisition opportunities. Other benefits include access to a plethora of skilled software engineers, completing projects in a timely manner, and global presence of the organization (Khan, Khan, Aamir, & Khan, 2013). Due to the economic imperatives driving the globalization of software development, GSD teams are formed to develop information systems for multinational corporations with established offices around the world (Casey, 2011; Lowry & Zhang, 2008). The globally distributed software teams has emerged as a new software engineering methodology called GSD (Oshri, Kotlarsky, & Willcocks, 2007).

GSD has an impact on the team knowledge sharing processes (Ambos, Ambos, Eich, & Puck, 2016). Globalization has considerably changed the ways of traditional information systems development where software is developed locally in the same geographic location, it is now outsourced and offshored worldwide. GSD project teams may experience significant complexities due to the dispersion of teams worldwide creating various knowledge sharing challenges such as distance (Zahedi, Shahin, &

Baber, 2016). Distance which includes temporal, geographical, cultural, and language differences, has a significant impact on communication, coordination, collaboration, and knowledge sharing (Ambos et al., 2016; Ghobadi, 2015; Zahedi et al., 2016). Local culture and customs of a GSD team critically affects the knowledge sharing process (Huang & Trauth, 2016).

Liebowitz and Megbolugbe (2003) identified knowledge sharing as a key element of knowledge management in support of organizational learning. At the group level, Anwar, Rehman, Wang, Amin, and Akbar (2017) recognized knowledge sharing is a key activity in the proficient performance of GSD. Knowledge sharing is a key activity of GSD (Ambos et al., 2016). Knowledge is an intellectual asset for software projects and serves as inputs and outputs to the software development process. GSD teams manage their intellectual assets by using configuration management software to maintain, track, and control their work products, and share appropriate version of deliverables with each other (Da Silva et al., 2012). The use of centralized repositories enable knowledge sharing in GSD with the use of tools such as SVN and Redmine, which assist teams in sharing information as if the they were co-located (Yague, Garbajosa, Diaz, & Gonzalez, 2016). GSD teams have used a common tool to transfer knowledge across borders and to leverage knowledge resources globally (Ambos et al., 2016). Knowledge identification and sharing can be complicated by the dispersion of teams in different locations (Vahtera, Buckley, & Aliyev, 2017). Knowledge sharing within multinational global software development teams is affected by social and cultural influences (Galbraith, 2000; Govindarajan & Gupta, 2002). The influence of cultural, social, national influences are

evident in communication, collaboration, education, skills, within GSD teams (Govindarajan & Gupta, 2002).

Rich (synchronous) and lean (asynchronous) media are used in sharing knowledge. Global teams rely heavily on various information communication technologies for communication and collaboration (Yu-Ting Caisy & Nguyen, 2008). Synchronous (rich) communication media, such as closed circuit television conferencing with audio, telephone conferencing, and online computer conferencing, allows all communicators to be present at the same time and communicating in the same time period. Asynchronous (lean) media such as asynchronous discussion forums, bulletin boards, and e-mails free both the time synchronicity and place-sharing constraints (Yu-Ting Caisy & Nguyen, 2008). The challenge communicating through asynchronous (lean) media (e.g., e-mails) includes misinterpreting messages due to absence of body language, voice tone, and slow or missing feedback (Hayward, 2002). Researchers have argued that rich media communication (e.g., video conferences) is more suitable when sharing knowledge that is equal in nature and complex. The choice of media (synchronous or asynchronous) may be associated with a particular outcome and the use of media may be shaped by featured aspects of technologies, user perceptions, and motivation (Rice et al., 2017).

Affordance is the relationship between materiality of technology and organizational members to use the material features of social media technologies to accomplish their work. Direct interaction with technology can affect user perception and action through the process of experimentation and adaptation (Gaver, 1991; Leonardi, 2011). Media affordance is the integration of media with organizational communications

and the effect on socialization, information sharing and power relations (Treem & Leonardi, 2012).

Problem Statement

Recent years have seen the evolution of a new generation of computer-mediated communication tools with new capabilities that may affect organizational performance. The choice of communication tools may change the way people communicate in an organization. For example, people show different knowledge sharing behaviors when they use emails or social media technology. Some organizations limit the use of social media technology, because of risk of data breaches. Thus, the research problem that this study addressed is that inappropriate choice and use of media may bring inefficiency and risks to employee work, organizations, and GSD (Feledi, Fenz, & Lechner, 2013).

Prior theories such as media richness and media synchronicity theory show limitations in explaining the effectiveness of media. The theories focused on the interplay of media and tasks on communication performance (Dennis & Valacich, 1999; Dennis, Valacich, Speier, & Morris, 1998). The theories treat media itself and task characteristics as factors that affect communication performance, largely ignoring users' ability or perception toward the use of media. User's knowledge may influence on knowledge sharing behavior and awareness of media security is vital to mitigating the risk of the use of communication media (Parsons, McCormac, Butavicius, Pattinson, & Jerram, 2014). The interplay of both users' media security awareness and media's property on knowledge sharing in virtual teams appears to have little attention in research.

There is a call for research on the interpretative features of, rather than, system features themselves, to explain the complex phenomenon of technology use (Burton-

Jones & Straub, 2006; Leonardi, Huysman, & Steinfield, 2013). Media Richness Theory and Media Synchronicity Theory explain the effectiveness of media on communication performance, which depends on media type and task characteristics (Daft & Lengel, 1984; Suh, 1999). It is difficult to define the types of task and communication media classified in the theories. For example, sharing knowledge could be both conveying task and convergence task. Furthermore, the impact of media use depends not only on media itself and task characteristics, but also on user's awareness on the security features of the media. For example, awareness of security regarding the use of certain media may influence on the actual use of media, thus altering information sharing behaviors. Therefore, organizations still suffer difficulties in choosing right communication media for sharing knowledge among employees. Often the use of certain media brings a threat to organizational assets (Dennis & Valacich, 1993; Leonardi, 2011; Markus, 1994; Markus & Silver, 2008; Rice, 1992; Silic & Back, 2016).

Media Richness Theory addresses the task of equivocality where task-information processing requirements are mapped to a medium's ability to convey information richness resulting in improved task performance (Dennis & Valacich, 1993). Media Richness Theory has been criticized for insufficient predictive power as a result of conceptual limitations of the theory (Dennis & Valacich, 1993; Markus, 1994; Rice, 1992). Researchers addressed that Media Richness Theory is oversimplified to evaluate the effectiveness of media technologies, because the effectiveness of media is more influenced by other factors such as social pressures or individual preferences on media choice (Markus, 1994). Researchers found problems relative to the theory instructing the mapping media to task characteristics does not improve performance (Dennis et al.,

1998). Empirical studies lacked support for media richness theory because the task-media fit was insufficient in explaining the choice of media (Dennis et al., 1998). Many researchers have summarized that media selection is impacted by the richness of factors beyond the medium. In addition, Media Richness Theory does not consider the advancement of technology and the influence of social interaction on media selection. Dennis and Kinney (1998) challenged the Media Richness Theory with empirical evidence that did not support the theory for the use of new media.

Dennis et al. (1998) proposed Media Synchronicity Theory. Media Synchronicity Theory refers to the state in which individuals share patterns of coordinated interactive behavior to transmit and process information through the use of media to accomplish a task simultaneously with multiple individuals (Dennis & Valacich, 1999; Dennis et al., 1998). The most effective media selection utilized to accomplish a task must consider two fundamental communication processes required to perform any task: conveying information and convergence (Deluca & Valacich, 2006). Conveyance is focused on how information is communicated, while convergence involves reaching a consensus. Media Synchronicity Theory is difficult for organizations to apply because of ambiguity interpreting a particular task, objective, or goal (Dennis & Valacich, 1993).

This study used affordance theory as a basis to provide insights on the choice and use of communication media in a global software development context. Affordance theory lens considers social actors' aspects as well as material features. The advancement in technology placed emphasis on the technical features in media as well as social factors, because the technology use increased social interactions (Stephens & Mandhana, 2017).

The affordance theory was used to see the effects of media features and awareness of media security on knowledge sharing behaviors.

The prior literature treated media as the level of a study, not the level of technology feature. However, the uses of media do not show certain patterns in affecting communication behaviors. Technology use is determined by not only technology's capability and users' skill to use technology (Leonardi, 2011; Markus & Silver, 2008). Media choice may be influenced by the ability of virtual team members to use media, their awareness of information security, and task characteristics. Even though media used in GSD affords high degree of communication, software development members show concerns like risk of disclosure, fear about that specialized knowledge will be stolen, and so on (Gibbs, Rozaidi, & Eisenberg, 2013; Govindarajan & Gupta, 2002). Not only does the property of media to transfer information influence on knowledge sharing behavior, but also individual's system security awareness (Shin, 2010). As such, both aspects, material agents (communication media) and social agents (media users), have an influence on the knowledge sharing behaviors. However, it is uncertain how these aspects interact each other for the success of knowledge management. The concept of media affordance is relative to building theory about the relationship between technology and communication. Media affordance as a conceptual lens focused on media technology and types of communicative practices that various media features afford in organizational relationships between people, networks and texts, creating opportunities and constraint.

Dissertation Goal

The goal of this research was to empirically assess how media affordances and users' awareness about media security affect knowledge sharing behavior among GSD team members.

Research Questions

One of the goals of this study was to identify various media affordances as perceived and actualized affordance in the organizational context of knowledge sharing. Strong et al. (2014) argued that extending the affordance theory in an organizational context. In the context of healthcare, the organizational change process was examined through the lens of affordance and actualization theory. They identified eight organizational affordances of electronic health record systems as both perceived affordances and actualizations in healthcare context. Treem and Leonardi (2012) identified four affordances of social media in the organizational context of knowledge sharing. Actualizing affordances can build knowledge and skills in ways that enable them to recognize and actualize affordances they could not before (Treem & Leonardi, 2012). This study aimed to answer the following research question by identifying affordances of media, including the affordances of social media identified in the study of Treems and Leonardi (2012), in the organizational context of knowledge sharing among team members.

- RQ1: What media affordances are perceived and actualized when global software development teams share knowledge using media?

The literature, such as Strong et al. (2014), suggested perceived affordances and actualized affordances, but their relationships were not tested.

- RQ2: What are the relationships between perceived media affordances and actualized media affordances in global software development teams?

Leonardi (2011) mentioned that perception and skills may affect actualized affordances. This study provided evidence on perception affect actualized affordance by examining the relationship of user's awareness of media security and actualized media affordance.

- RQ3: Does media security awareness moderate the relationships between perceived media affordances and actualized media affordances?

Many studies investigated the effects of media on the knowledge sharing behavior. However, the effects of each media on the organizational knowledge sharing are mixed. Carlson and George (2004) and Niinimaki, Piri, and Lassenius (2009) investigated the effects of synchronous media on communication. Schouten, van den Hooff, and Feldberg (2016) compared 3D virtual worlds and text-based chat in the performance of convergence tasks. They found that characteristics or capacity of media affects communication performance. However, it is hard to predict the effects of media used on communication performance because it is difficult to apply the characteristics or capacity of media to advanced technologies. It is also difficult to find the isolated effects of each media on knowledge sharing performance in an organization which mostly provides employees with several medias. In this research, the study of affordance theory empirically measured how affordance of communication technology features affect knowledge sharing behaviors.

- RQ4: How does media affordances affect knowledge sharing behaviors?
- RQ5: How media security awareness affects actualized media affordances and knowledge sharing behaviors?

Boardia, Irmer, and Abusah (2006) found when knowledge is shared interpersonally, organizational tenure can positively predict knowledge sharing behavior. Watson and Hewett (2006) argued that organizational tenure would be positively related to knowledge sharing behavior because as tenure increases so do trust and commitment to the organization and its process. Trust and commitment has been found to have a positive effect on knowledge sharing behavior (Chowdhury, 2005; Van den Hooff & De Ridder, 2004; Wang et al., 2007).

- RQ6: What effect does demographic variables (gender, age, organization tenure, professional tenure, etc.) have on knowledge sharing behavior?

Relevance and Significance

This study contributed to the body of knowledge in affordance theory and literature on communication media and knowledge sharing. Examining these relationships of media affordances, awareness of media security, and knowledge sharing behavior provided insight into how communication technologies and users' knowledge on system security affect the ways team members collaborate and the ways they interact to share knowledge. First, the affordance lens allows individuals' and teams' actions to be integrated with technology, allowing consideration of both users and technologies, not in isolation, to understand the knowledge sharing behavior when using various media in an organization. As perspectives of social agents, the role of awareness of media security is investigated. This study confirmed that users' awareness on media security affects actual media uses. Third, the identification of information security media affordances is a theoretical contribution. Prior literature identified media affordances, such as visibility, editability, self-presentation, pervasiveness, searchability, and awareness (Rice et al.,

2017). This research finds that some of the media affordances are closely related information security; that are visibility, editability, and self-presentation. Material properties (e.g., capability of technical features) and social agents (e.g., individual employees as well as a team) were considered to identify media affordances related to information security. In addition, this research finds that the actual media uses are moderated by users' awareness of media security on their relationships with perceived media affordances. These new finding contribute to the body of knowledge of affordance literature.

This study provided practical contribution. In organizations, media can be leveraged in knowledge sharing by user awareness of system security and identifying how tools can be utilized relative to common or different affordances. Project managers can gain insight into the roles of media affordances and team's awareness on media security in team performance. Software development teams can benefit from the alignment of media with activities for implementing requirements to develop software, communicating with internal and external stakeholders, and measuring the effectiveness of the code and application program interface (API) developed. Global software development performances are affected by multiple media affordances actualized by multiple users.

Barriers and Issues

Communication media is rapidly evolving as new technology is introduced to facilitate communication. It can be difficult to examine every type of medium in use. The distinction between different media are more ambiguous and new media possesses a variety of media capabilities. The media use and configuration determine the media's

capabilities and how media capabilities are perceived by users. It is pointless to examine the most effective media facilitating communication due to media possessing different capabilities depending upon how the media are configured and used. The different effects of media use is determined by the media capabilities and not media type. It is more meaningful to directly examine the specific media capabilities that actually cause the effects. The affordances provided by the existing communication structure and the associated technological support are not properly aligned with the communication requirements of the work and social structure. Distribution of domain knowledge within several types of the customers of the systems being developed, problems with the requirements engineering processes, and inability of the offshore development team result in a huge number of clarification queries, which are unlikely to be responded quickly. This situation causes long delays and context switching problems.

Assumptions, Limitations and Delimitation

The limitation of this study was the insufficient research of perceived affordances and actualized affordances, and the relationship between media affordance, media information security, and knowledge sharing behavior. Delimitations exist in the scope of the survey and number of invited participants and the projected number of actual participants.

Definition of terms

Affordance Theory. A socio-technical concept on how users perceive their environment and perform action; accounting for both the material features of the technology and the subjective perceptions and goals of the user.

Affordance. The potential for behaviors associated with achieving an immediate outcome from the relationship between an artifact and a goal-oriented actor or actors; a theoretical lens into media utility and sociability.

Media Affordance. The integration of media with organizational communications and the effect on socialization, information sharing and power relations.

Media Richness. The task of equivocality where task-information processing requirements are mapped to a medium's ability to convey information richness resulting in improved task performance.

Media Synchronicity. The state in which individuals share patterns of coordinated interactive behavior to transmit and process information through the use of media to accomplish a task simultaneously with multiple individuals.

List of Acronyms

- GSD – Global Software Development
- MNE – Multinational Enterprise

Summary

This chapter provides an introduction and overview of GSD and the emergence of global distributed software development teams. GSD teams are influenced by cultural, social, and national influences, but also face challenges that impact team communication, collaboration, and knowledge sharing created by distance. Rich and lean media communication and collaboration tools are selected by organizations to manage knowledge assets and to enable knowledge sharing. To explain the complex use of technology, the affordance theory provides insight on the choice and use of communication media in GSD. How media affordances and users' awareness of media

security affect knowledge sharing behavior in GSD teams is examined in the next chapter.

Chapter 2

Review of the Literature

Knowledge Sharing Behavior

Knowledge sharing behavior is an individual's choice to communicate one's intellectual capital to others within an organization, and to collect knowledge by consulting with others to share their intellectual capital (Reychav & Weisberg, 2010; Weinberg, 2015). In the context of software engineering, software development is based on the knowledge of individuals, and learning is achieved through knowledge sharing (Rehman, Mahmood, Salleh, & Amin, 2014). A software development team's success depends on knowledge sharing, and providing work environments for better knowledge sharing among employees is a high priority (Wu & Zhu, 2012).

Knowledge is usually classified into two categories: tacit knowledge and explicit knowledge. Many prior research studies investigated the relationships between actor's characteristics and knowledge sharing, not considering material aspects. Bock, Zmud, Kim, and Lee (2005), for example, explored the factors supporting or inhibiting individual's attitudes toward and intentions regarding knowledge sharing behaviors in the context of explicit and tacit knowledge. Reychav and Weisberg (2010) compared employees' intentions to share explicit and tacit knowledge through the actual process of sharing the knowledge. Kolekofski and Heminger (2003) examined employee beliefs that may contribute to an attitude towards tacit and explicit knowledge sharing behavior within an organization. Hau, Kim, Lee, and Kim (2013) analyzed the variance of

employees' tacit and explicit knowledge sharing intentions using data collected from employees in multiple industries. Suppiah and Sandhu (2011) explored the influence of various organizations types on tacit knowledge sharing behavior adopting organizational communications, personal interactions, mentoring/tutoring, and willingness to share knowledge freely as indicators.

Many researchers have explored people's internal status factors that affect knowledge-sharing behavior including self-determination and altruism (Kolekofski & Heminger, 2003; Wang & Hou, 2015; Zhang, Tsui, & Wang, 2011). Zhang et al. (2011) analyzed three factors, self-efficacy, trust and outcome expectation, that influence team members' knowledge sharing behavior in the context of product development. All the three factors have positive effect on team members' knowledge sharing behavior, and self-efficacy has a significantly positive effect on team members' outcome expectation. Ryu, Ho, and Han (2003) empirically examined the knowledge sharing behavior of physicians with factors that determine the physician's intent to share tacit explicit knowledge at the group level. Dhanaraj, Lyles, Steensma, and Tihanyi (2004) examined the effect of social embeddedness on the transfer of tacit and explicit knowledge in international joint ventures, including trust relative to the social aspects of learning.

Media and Knowledge Sharing Behavior

Several empirical studies support the findings that there are better fits between media capability and communication as a behavior of information sharing. Löber, Grimm, and Schwabe (2006) discovered that participants who used audio chat performed better on convergence task when audio to text-based chat was compared. Schouten, van den Hooff, and Feldberg (2016) compared 3D virtual worlds and text-based chat for

convergence processes, 3D virtual worlds outperformed chat. In a virtual team environment virtual teams using video and audio (high synchronicity) performed significantly better on a convergence task than did audio-only (low synchronicity) teams (Baker, 2002). Carlson and George (2004) found that participants preferred synchronous media when asked to detect deceptions (convergence) and asynchronous media when asked to engage in low-risk deceptions (conveyance). Niinimäki, Piri, and Lassenius (2009) found that global software development team members used media with higher synchronicity when requesting clarification (convergence). DeLuca and Valacich (2006) found that low synchronicity media were better for conveyance processes and that high synchronicity media were preferred for convergence processes.

Symbol variety or symbol set (e.g., verbal vs. non-verbal cues) are the ways in which the information can be communicated. Multiple symbol sets that include text, video, and audio provide users with the improved capability to facilitate coordination and interact quickly, which avoids the feelings of doubt and uncertainty in communication, thereby resulting in enhanced interactivity between users (Hwang & Park, 2007). Rehearsability enables the sender to compose a message with the exact meaning as planned. Reprocessability enables the receiver to repeatedly process message to ensure that he or she accurately understands the message as delivered (which may or may not be the message the sender intended to send), and more importantly it enables deliberation. Bacabac (2012) found problem solvers requiring immediate action used online chat to increase decision-making speeds. Real-time discussion boards or chat that support rehearsability and reprocessability may allow thought input and feedback to ease decision-making speed (Bacabac, 2012). Alexander (2012) proposed a multi-layered

writing model that allowed individual authors to work on overlapping parts of a project and then meet face-to-face to converge and discuss their written contributions. In light of a synchronous online medium, reprocessability varies depending on tools. Google Hangout, a group video-chat tool, allows screen sharing and synchronous text-based chat. An individual can view a document draft, discuss the draft, and record key discussion point using text-based chat. A team member can then go back through the text-based chat and construct meeting minutes based on the chat. If a different video-chat option was chosen excluding text-based chat capabilities, vital information could not be reprocessed. Google Docs enables both synchronous and asynchronous revision, but it lacks the reprocessability afforded by the Microsoft Word comment feature. In this case, if everyone is present during the revision process, Google Docs may be a more effective tool. Asynchronous revision would benefit from a technology such as Microsoft Word as opposed to Google docs. Media high in rehearsability such as email, allows rehearsing or editing potentially negative or face-threatening feedback prior to sending, and receivers are able to react to feedback privately; quench the initial reactions (Wolfe, 2000).

Information Security and Knowledge Sharing

Information security is protecting the confidentiality, integrity and availability or accessibility of internal and external information (Gifford, 2009; Gordon & Loeb, 2006; Ilvonen, 2013; Kim & Solomon, 2016). Information security is also concerned with managing the loss of information and the subsequent cost of that loss (Winkler, 2007). Information privacy is the ability of an individual to have control over the flow, transfer and exchange of personal information (Shin, 2010). Information privacy is interpreted as the assertion of individuals, groups, or institutions to determine the degree in which

information about them is communicated to others themselves (Belanger & Crossler, 2011; Chai, Bagchi-Sen, Morrell, Rao, and Upadhyaya, 2009; Westin, 1968).

Information privacy is a major concern for individuals in virtual environments. For example, individuals are less inclined to disclose personal information when the perception of threats to privacy are high, because of their inability to control information and protect themselves (Govindarajan & Gupta, 2002). When privacy policies are clearly documented and published, individuals are apt to disclose more personal information because their perception of low privacy risks and greater control (Gupta & Dhimi, 2015). The perception of privacy risk has been a major obstacle for information disclosure and sharing in virtual environments (Krasnova, Spiekermann, Koroleva, & Hildebrand, 2010).

Gerber and von Solms (2005) argued that organizations should apply a information security perspective on knowledge transfer. As a top-down process that encompasses business, legal and regulatory requirements, and infrastructure risks. Information security has a direct effect on usage behavior and information sharing (Lin & Lu, 2011; Shin, 2010).

User's awareness about information security and privacy affects how media is used to share information. Dinev and Hu (2007) found that technology awareness leads to positive user behavioral intention for the use of protective technologies against information security threats. D'Arcy, Hovav, and Galletta (2009) posited that user awareness of information security countermeasures directly impacts user perceptions of the certainty and severity of sanctions associated with information security misuse. In the context of teams, information security awareness does not reside with the individual

alone, nor with technology alone, but with the joint effort of human and technology (Barad, 1996). Team members through team interactions transform individual knowledge to collective knowledge and achieve information security awareness (Rehman et al., 2014). Team members benefit from information security awareness and media use in knowledge sharing.

Affordance Theory

Sociomaterial theory is based upon the theory of agential realism. It is the existence of an integrated relationship between technologies and human/institutions, where humans and artifacts interact dynamically with each other in daily practice. Sociomaterial concept was established on the top of Barad's work in 1996 on the concept of agential realism based on individual perceptions and the use of IT artifacts. The concept of "agency" is a primary element of agential realism, which is the relationship of an individual and an artifact. For example, how a technical artifact can be understood by how people use and interact with it (Barad, 1996). Barad (1996) viewed the relationship between artifacts and people as interactive. It is important to recognize that reality does not equal perception (Barad, 1996). He also noted that an individual's perception of reality is created by the artifacts. Artifacts shape people's perception and actions, shaping the meaning of artifacts (Barad, 1996). Instead agencies of observation comprise a theory of knowledge epistemological and ontological framework which emphasizes the inseparable nature of material and semiotic objects (Barad, 1996). Latour (2005) observed no intrinsic distinctions between the social and the material, in the same instance both are social and material. Orlikowski (2007) went further to describe the dependency of social and material, where neither exist without the other. Leonardi (2012)

concluded that the practice of sociomaterial is a subset of the socio-technical system, with human (social) and material agencies imbricated within the technical subsystem. Mutch (2013) argued that agential realism ignored the effect of change to practices over time, and overlooked relationships that are not mutually constitutive. Mutch (2013) proposed critical realism as an alternative to agential realism as being more appropriate for studying digital artifacts. Critical realism contends that artifacts' properties do exist independently of their observation. Critical realism also allows for the possibility of different perspectives on reality (as opposed to multiple realities) that are endlessly renegotiated with varying meanings and intentions (Putnam, 2000). In this sense, critical realism is not entirely incompatible with agential realism. Agential realism and critical realism are different in their actions towards human intent and properties of the artifact. Critical realism sees two separate entities that appear to become inseparable over time, whereas agential realism sees human agency and artifacts as being mutually constructed (Leonardi et al., 2013).

Although scholars have accepted the theory of sociomaterial, they continue to struggle with the configuration process of social and material agencies (Fayard & Weeks, 2014). Capturing the relationship between the human, technological, or social elements remains a challenge (Fayard & Weeks, 2014). Their goal is to conceptualize the interconnectedness of ideational and material elements, social and physical construction, and the work arrangement between social and material enacted through constantly changing practices (Fayard & Weeks, 2014). According to Fayard and Weeks (2014), the concept of affordance can provide a powerful lens for examining the influence of technology and environment on behaviors and practices in organizations, including the

importance of the relationship between material and social construction, artifacts, and the environments they impact.

The affordance theory was developed to describe how organisms perceive their environment and perform action (Nagy & Neff, 2015). Organisms tend to actualize diverse actions depending on how they perceive their surroundings. Gibson (1979) was the first to define the term affordance as an action possibility in relation to the capabilities of an actor in the environment. An affordance remains static whether or not the needs and goals of the actor changes. As a relational concept, affordance takes into account both the material features of the technology and the subjective perceptions and goals of the user. Rieber (1992) had a different perspective of affordances in his research of design and human-computer interaction as a design feature of an object, where the object informs how it should be utilized. Other studies found that through direct interaction with technologies affordances can appear and shape the actions of people through processes of experimentation and adaption (Gaver, 1991; Leonardi, 2011). Both views align with a relational view of affordances in that the materiality of technology influences, but does not determine, the possibilities for users. Affordance theory can be used to address the differences between the production and use of technologies. Jordan (2008) viewed affordance as a symbol of authority, whereas Shaw (2015) posited that affordance can disclose how to determine who has the authority to distinguish and manage (control, negotiate, oppose positions related to) how technologies should be utilized.

Affordances have been used as a conceptual lens in many studies where the focus has been on the technological affordances to understand the relationship between technology and organization (Fayard & Weeks, 2014; Leonardi, 2011; Markus & Silver,

2008). Affordances are initiated in relationships between people and the materiality of the things with which they connect such that the same technology may provide different affordances to different users (Treem & Leonardi, 2012).

Strong et al. (2014) proposed perceived affordance and actualized affordances. Affordances are revealed when information includes hints for operation and guidance are accessible for user's to perceive has been coined as perceived affordances (Norman, 1999). Affordances are the possibilities for action perceived in objects (Gibson, 1979), which can be both functional and relational (Hutchby, 2001). Functional affordances can enable or constrain interaction, and relational affordance is the manner in which attention is drawn. Increased awareness of information technology artifacts, increases the affordances that can be perceived (Curry, Marshall, & Kawalek, 2014). The example provides evidence of the perceived affordances for theorizing the enablement and constraint of information security. The development of an information security awareness theory of affordances is yet to be realized. The challenge is to develop a theoretical framework to study the specific ways by which the material properties of technology enable and constrain user behavior. Actualized affordances were studied by Strong et al. (2014) and Seidel, Recker, and Vom Brocke (2013). However, it appears that little attention has been provided in literature to investigate the relationship between perceived affordances and actualized affordances.

Media Affordances for Knowledge Sharing Behavior

Social media affordances are identified in the context of organizational knowledge sharing. The four affordances in organizations are visibility, association, persistence, and editability (Treem & Leonardi, 2012). Visibility affordance is associated

with the amount of effort people must expend to locate. People are less apt to seek information if information is perceived to be difficult to access, or if it's unknown whether information exist to be accessed (Treem & Leonardi, 2012). Persistence affordance of social media allows individuals to contribute technical knowledge to develop and remain accessible over time (Treem & Leonardi, 2012). Persistence is known as reviewability, recordability, and permanence of content created and stored in social media (Treem & Leonardi, 2012). Blogs and wikis are examples of social media that provide almost limitless space for communication through the addition of posts and pages. Editability affordance is when individuals can spend time and effort drafting and revising a communicative act prior to being viewed by others, or modify and revise content previously communicated me (Treem & Leonardi, 2012). Dennis, Fuller, and Valacich (2008) description of rehearsability is similar to editability, when an individual can compose a message with the exact meaning as planned. The communicator is empowered with control over the initial display of information. Media users are able to correct identified errors without late viewers ever knowing a mistake occurred.

Association affordance is established connections or social ties between individuals, between individuals and content, or between an actor and a presentation me (Treem & Leonardi, 2012). Connections established through media associations between individuals and knowledge in greater social connection (Treem & Leonardi, 2012). Media affords creating new associations between people and content with clear implications for the development of social capital in organizations and associated knowledge transfer (Treem & Leonardi, 2012). Treem and Leonardi (2012) debated over other collaborative technologies such as e-mail, instant messaging, teleconferencing, and

collaborative software afford only limited visibility and association, as well as inconsistent persistence and editability. Affordances are not only related to the design features of devices but also to the psychological and social characteristics of human–technology interaction (Nagy & Neff, 2015). Media affordance may have an effect on processes that are central to effective knowledge sharing in organization such as capturing tacit knowledge, motivating knowledge donation, and identifying expertise (Treem & Leonardi, 2012).

Media affordance may have an effect on four processes that are central to effective knowledge sharing in organization: 1) capturing tacit knowledge, 2) motivating knowledge donation, 3) overcoming organizational boundaries, and 4) identifying expertise. Because of media affordance the visibility and persistence of communicative actions, they expand the range of people, networks, and texts from whom people can learn across the organization. These affordances that can create opportunities and constrain knowledge are visibility, persistence, editability and association. Gibbs et al. (2013) found that the same technology afforded different levels of visibility, influenced behaviors in relation to forms of knowledge sharing, engagement in communication, and when the technology was accessible to colleagues.

Capturing Tacit Knowledge

The ability to capture and learn from tacit knowledge is a challenge for many organizations. The visibility of social media provides a platform for donating information and unveiling subtle differences in task, processes, and knowledge (Treem & Leonardi, 2012). Huh et al. (2007) found that blogs were useful for capturing tacit knowledge because individuals were more diligent in articulating how they performed task in a

public forum. The visibility of the medium afforded people the opportunity to turn their tacit knowledge into explicit knowledge because they knew others were watching their actions and wanted to appear competent. Huh et al. (2007) also noted that users often had an audience in mind when sharing knowledge, which implies that users took advantage of the affordance of editability when communicating.

Motivating Knowledge Donation

In practice, knowledge sharing cannot be forced or mandated, rather intrinsically encouraged and facilitated (Hassandoust, Logeswaran, & Kazerouni, 2011; Hu & Randel, 2014; Liu & Liu, 2011), through group and organizational objectives. The emotional state of an individual at a given moment, may influence his or her attitude towards knowledge sharing as well as the intent to actually share knowledge (van den Hooff, Schouten, & Simonovski, 2012). In the absence of trust between people, they are not willing to share knowledge with each other (Holste & Fields, 2010). Liebowitz (1999) benchmark study found that individuals who were not open to sharing their knowledge was not because they wanted to keep their competitive edge close to the vest, but because they would not be able to put their personal stamp on knowledge if they had to use someone else's knowledge. In this case, Liebowitz (1999) suggested a reward or incentive program could encourage knowledge sharing. The challenge is how to motivate users to donate personal knowledge (Cress, Kimmerle, & Hesse, 2006; Ling et al., 2005). In the study of social tagging, Mirzaee, Iverson, and Khan (2008) concluded that social media may not be as valuable or reliable for task-specific situations, because task are often more relational than personally oriented. Media used for project knowledge sharing is more project task-

specific and focused on project related situations. The lack of support by social media may influence donations for social exchange and not for organizational knowledge.

Organizational Barriers

Barriers in organizations prevent knowledge sharing because of difficulty understanding communication from other organizational members often because they have different vocabularies and situated understandings of work (Bechky, 2003; Cramton, 2001). Social tagging systems in organizations poses a problem in the terminology used across applications and individuals (Muller, 2004). Some individuals have difficulty understanding other members with different vocabularies and understanding work situations. This issue can be addressed through affordance of visibility, where individual activities and work groups are visible. Persistence and association affordances make it easier for individuals to connect with people or content that share their interest, and the opportunity to explore new relationships. Green, Contractor, and Yao (2006) demonstrated how a social networking application designed to create immediate associations between people and user-generated content spurred cross-boundary interactions and knowledge sharing in environmental engineering.

Identifying Expertise

Experts are individuals who own valuable knowledge that organizations find interesting and warrants eliciting (Kendal & Creen, 2006; Waterman, 1986). In the context of knowledge management, most employees can be tagged as experts, as long as their knowledge is of value to an organization (Kendal & Creen, 2006; Waterman, 1986). The expertise of others can be recognized by visibility affordance, particularly those with whom they have had little or no interaction (Shami, Sakhaee, & Shahbaznezhad, 2009).

Pan and Millen (2008) leveraged bookmarking to enable sharing knowledge with others utilizing organizational social tagging.

Media Affordances for Information Security

With information security policy, information technologies are designed to guide and control users' behavior and to express the values and sets of instructions users must follow (Hedstrom, Kolkowska, Karlsson, & Allen, 2011). Information security policy provides the framework for streamlining methods of prevention, detection and response to data breaches (Doherty & Fulford, 2005). Organizations provide users with signaling alert technical feature to respond to possible data breaches. Employees who perceive a strong information security environment in an organization would be more likely to exhibit compliant behavior in information security (Chan, Woon, & Kankanhalli, 2005).

As it relates to information security, an individual ensures that the media used to share expertise is secure and accessible only by recipients with secure media and access privileges. The recipients of the information reciprocate the same level of information security and access. Through continuous acquisition of knowledge through information security training, employees increase their ability, skills, and knowledge to satisfy information security policy requirements (Ajzen, 1991; Pavlou & Fygenson, 2006).

Summary

Chapter 2 explores an individual's behavior, attitude, and intention towards sharing tacit and explicit knowledge. An individual's attitude towards knowledge sharing may be influenced by their awareness of information security to protect the confidentiality, integrity and availability or accessibility of internal and external information. Managing the loss of information, the loss of privacy, and the cost of that

loss is also a concern of the individual to control the flow, transfer and exchange of personal information. Sociomaterial theory captures the relationship between the human, technological, and social elements, but it remains a challenge for scholars. The concept of affordance was introduced to conceptualize the relationship between people and technology, where the same technology may provide different affordances to different users. In the context of organizational knowledge sharing, media affordance may have an effect on four processes central to effective knowledge sharing: capturing tacit knowledge, motivating knowledge donation, overcoming organizational boundaries, and identifying expertise. Information security policy, a component of information security awareness, provides the framework for streamlining methods of prevention to guide and control user behavior, and to detect and respond to data breaches.

Chapter 3 Methods

Research Model and Hypotheses Development

The research strategy for this study empirically assessed the effects of media affordances and users' media security awareness on actual media use and knowledge sharing behavior among GSD team members. The strategy included the collection of quantitative data and testing the hypotheses using statistical analysis. The research model shown in Figure 1, represents media affordances and the variables used to test the hypotheses.

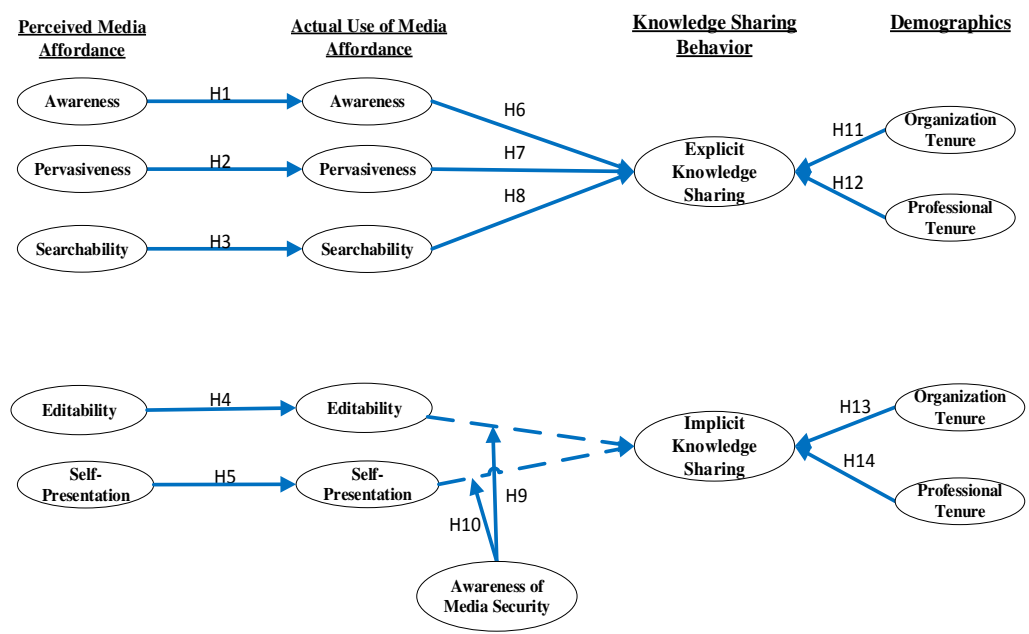


Figure 1. Research model of media affordances on knowledge sharing behavior.

The concept of affordance is a theoretical lens into media utility and sociability. Zammuto, Griffith, Majchrzak, Dougherty, and Faraj (2007) argued that a technological object has functionality but needs to be recognized as a social object, because technological possibilities of action are not given, but they depend on the intents and the perceptions of social actors enacting them (Zammuto et al., 2007). Perceived affordances represent the relationships among information, technology, and users. They may be embedded within a domain or context like organization context (Strong et al., 2014). Strong et al. (2014) extended the affordance concept to actualization, which was defined as “the actions taken by actors as they take advantage of one or more affordances through their use of the technology to achieve immediate concrete outcomes in support of organizational goals” (p. 70). An example is the study of social tagging by Mirzaee et al. (2008) which concluded that social media may not be as valuable or reliable for task-specific situations, because tasks are often more relational than personally oriented. Media used for project knowledge sharing is more project task-specific and focuses on project related situations. Imbrication of human agencies and the material agencies creates infrastructure in the form of routines and brings certain actions (Leonardi, 2011).

Because a technology carries various features, it brings a set of affordances. Treem and Leonardi (2012) address four affordances of social media technology; visibility, editability, persistence, and association. Rice et al. (2017) identified six affordances of general media that are visibility, editability, self-presentation, pervasiveness, searchability, and awareness. One of the social media affordances, association, is missing in the Rice et al. (2017), but self-presentation affordance includes

the meaning of association affordance. Persistence as social media affordance is measured through the survey item for searchability affordance.

This study viewed actual media use as the actualization of media affordances. The uses of certain media type indicate actualization of certain combinations of the media affordances. For example, the use of media such as video conferencing, teleconferencing, and text messaging indicates higher level of pervasiveness affordance in common. The use of email, Internet, Intranet, project management tool indicates the actualization of awareness affordance. Persistence or searchability media affordances may bring more use of certain types of media that have higher level of the same affordances (e.g., configuration management system, quality management system, requirements management system, global product lifecycle management system). If they view knowledge as a continual process that develops over time, people are more inclined to engage in the use of media that deliver knowledge. Thus, each of perceived media affordance brings more uses of certain types of media. The following hypotheses were developed:

H1: Awareness in the perceived media affordance is positively related to the awareness in actualized media affordance.

H2: Pervasiveness in the perceived media affordance is positively related to the pervasiveness in actualized media affordance.

H3: Searchability in the perceived media affordance is positively related to the searchability in actualized media affordance.

H4: Editability in the perceived media affordance is positively related to the editability in actualized media affordance.

H5: Self-presentation in the perceived media affordance is positively related to self-presentation in actualized media affordance.

The following hypotheses aim to test the impact of the actual use of various media technologies on different types of knowledge sharing behaviors. Actualized media use produces higher levels of affordances in media technologies such as configuration management system, quality management system, requirements management system, global product lifecycle management system. Awareness media affordance is the awareness of media used to manage knowledge sharing information. It requires awareness of information and access control (who is authorized to edit or update and add or post information in different parts of the system) to prevent unauthorized access and consumption of information but also to provide relevant role-based information to individual users (Muniraman, Damodaran, & Ryan, 2007). Not having enough information, having too much, or irrelevant information could severely affect the user's access. The information stored and communicated through media could represent trade secrets or specially developed procedures and techniques which must be protected from unauthorized employees and external users (Muniraman et al., 2007). The lack of protection could threaten the organizations' competitive advantage. In addition, information can be stolen, deleted, or accuracy changed by hackers and intruders resulting in loss of revenue or reputation (Muniraman et al., 2007).

Pervasive affordance provides knowledge of an individual's social connections and daily events. It is a consequence of the person-to-network communication that enables persistent contact and the low social presence (Hampton, 2016). Pervasive

awareness is often the result of brief, asynchronous exchanges of text or photos and can result from the use of a variety of technologies, including text messaging, blogging, and other forms of media (Hampton, 2016). Media that require shorter period of time to deliver information tend to have high level of pervasiveness affordance. They may promote explicit knowledge sharing behaviors. On the contrary, media usually with written communication offer capability to store, retrieve, and re-read, thus it gives changes to recall previous communications and rethink.

Searchability media affordance is the ability to query implicit (applied tacit knowledge) information and receive the correct information (Benaloh, Chase, Horvitz, & Lauter, 2009). For example, a health server correctly returns the record which match the query, and privacy, which means the patient can perform the search without revealing any information to the server (if the server has been compromised information security is still guaranteed). Advancement in technology has made it possible for tacit knowledge to be accessible and easily explicable. For example, the technology to codify analytical feedback from an expert is not as complex as a highly tacit knowledge such as knowledge related to improvisation or emotion would need (Kabir, 2013). Organizations are able to augment their knowledge base and enhance innovation through activities such as research and development, collaboration, patenting and licensing, merger and acquisitions, training and consulting, spin-offs and new market entry, knowledge publication and diffusion (Kabir, 2013). Through technology, media plays a crucial role in these areas to transfer tacit knowledge internally and externally to organization to be applied as implicit knowledge, such as expert systems and searchable multimedia files (Richer, 2012). Combining these two approaches with other knowledge management components can

significantly increase the capacity to capture expert tacit knowledge (Richer, 2012). The actual use of media and awareness of searchability affordance has a positive effect on implicit knowledge sharing behavior.

Explicit knowledge is transferable and searchable information that can be easily located through searchable media affordance. Query searches can be performed returning query records based on the values queried and access privileges controlled by information security policies. Users can collaborate on the value and use of the knowledge. It is possible to share, codify, and convert explicit knowledge as principles, formulae, data, processes and information (Kabir, 2013). Searchability media affordance has a positive effect on explicit knowledge sharing behavior. The following hypotheses were developed:

H6: Actualized uses of media with higher level of Awareness affordance have positive association with explicit knowledge sharing behavior.

H7: Actualized uses of media with higher level of Pervasiveness affordance have positive association with explicit knowledge sharing behavior.

H8: Actualized uses of media with higher level of Searchability affordance have positive association with explicit knowledge sharing behavior.

Implicit knowledge activities such as sharing and donating tacit knowledge is known to be more difficult than sharing explicit (Reychav & Weisberg, 2010). It is partly because the implicit knowledge itself is complicated, so it is not easy to deliver the hidden meaning and values. It may be because experts want to limit sharing their tacit knowledge under an unsafe environment. If the implicit knowledge is critical to their

work, then experts tend to resist sharing implicit knowledge using technology. Experts' awareness of media security influences their willingness to share information with team members through the media. The ability to capture and learn from implicit knowledge is a challenge for many organizations.

Global software development team members in different geographical locations should use communication technologies to share knowledge. The emotional state of an individual, such as his or her attitude towards media as well as the intent to share knowledge (van den Hooff et al., 2012), can be factors that motivate knowledge donation and at the same time can be factors that restrict knowledge sharing. This study focused on individual's ability or perception on information security issues or privacy concerns that may influence on the actual media use. GSD members come to the media with diverse goals and concerns, which make a sociomaterial practice emerge. A member's awareness of media security may alter perception on the media after realizing the features for information protection in media. Those know more about the media security features may feel comfort or discomfort in the use of the media.

Media affordances that are related to media security feature, editability, and self-presentation, may show different effects on knowledge sharing behavior, depending upon what a user is aware of security features. Editability media affordance is the ability to create, modify, and revise content by the originator or by viewers of the content (Gibbs et al., 2013; Wagner, Wagner, & Vollmar, 2014). The editability makes content easily adaptable even if it was previously generated in a different setting (Wagner et al., 2014). The awareness of editability media affordance allows team members to manage personal expressions, target content to a specific audience, and continuously refine information

quality (Treem & Leonardi, 2012). The awareness of media security has a moderating effect on the perceived use of editability media affordance relative to actual use of media. Gibbs et al. (2013) expanded editability affordance through self-presentation to explain how an individual's awareness of media security features can result in different effects of media use such as exploiting ambiguities afforded by media use. For example, team members may desire to become disengaged or less visible in collaborative interactions to better manage time or to limit knowledge sharing (Gibbs et al., 2013). Research also found that team members rarely returned email "read receipts", because to the recipient it was an invasion of privacy. The recipient would rather the sender's perception be that the email was not received as opposed to the email being ignored (Birnholtz, Dixon, & Hancock, 2012). Media may be strategically used for selective self-presentation by creating an editing messages that may lead to discriminatory practices through manipulation and selective sharing of information (Gibbs et al., 2013). Limits may be placed on media where information is archived or documented to control how information is shared and with whom (Ellison, Gibbs, & Weber, 2015). The awareness of media security has a moderating effect on the perceived use of self-presentation media affordance relative to actual use of media. Actualized media use produce higher levels of the same affordances in media technologies such as configuration management system, quality management system, requirements management system, global product lifecycle management system. Thus, the hypotheses test the moderating effects of awareness on media security on the relationships between perceived media affordances and actualized media affordances in global software development team work.

The hypothesis aims to test the belief that media affordances that relate to information security (i.e., editability, self-presentation affordances) have association with implicit knowledge activities. Editability media affordances allows time for creating comprehensive messages by enabling individuals to clearly and purposely convey their thoughts. Editability also allows ideas to be tailored according to the context in which the message will be viewed. An individual can modify or revise a pre-existing message for spelling and grammar errors or complete deletion of content (Rice, 1987). Editability allows editing of another users' information after they have posted it and to create or edit a document collaboratively. Huh et al. (2007) found that blogs were useful for capturing tacit knowledge because individuals were more diligent in articulating how they performed task in a public forum.

Self-presentation media affordances make it easier for individuals to connect with people or content that share their interest, and the opportunity to explore new relationships. It indicates that technical features that show user identity create immediate associations between people and content and promote implicit knowledge collecting and donating. The self-presentation media affordances expand the range of people, networks, and texts from whom people can learn across the organization. Experts are individuals who own valuable knowledge that organizations find interesting and warrants eliciting (Kendal & Creen, 2006; Waterman, 1986). In the context of knowledge management, most employees can be tagged as experts, as long as their knowledge is of value to an organization (Kendal & Creen, 2006; Waterman, 1986). The expertise of others can be recognized by self-presentation affordance, particularly those with whom they have had little or no interaction (Shami et al., 2009). Knowledge-sharing technologies may be used

strategically to create a delusion of an individual's expertise in an area they desire to become knowledgeable in as opposed to areas in which they have expertise (Leonardi & Treem, 2012). Therefore, the use of media that show higher level of self-presentation affordances promote implicit knowledge donation. Thus, the following hypotheses were developed:

H9: Awareness of media security moderates the relationship between editability in actualized media affordance and implicit knowledge sharing such that the positive relationship between editability in actualized media affordance and implicit knowledge sharing is stronger for users who are aware of media security is high.

H10: Awareness of media security moderates the relationship between self-presentation in actualized media affordance and implicit knowledge sharing such that the positive relationship between self-presentation in actualized media affordance and implicit knowledge sharing is stronger for users who are aware of media security is high.

Ideally, an individual's commitment to their profession would be expected to increase as their tenure in the profession increases. As tenure grows, the motivation to contribute to the profession should increase the willingness to share knowledge thereby increasing knowledge sharing behavior. The motivation to share is also subject to the availability and opportunity to utilize media technologies to facilitate knowledge sharing (Cabrera, Collins, & Salgado, 2006). In the context of organizational and professional tenure, the following hypotheses were developed:

Hypothesis 11: Organizational tenure has a positive correlation to explicit knowledge sharing behavior.

Hypothesis 12: Organizational tenure has a positive correlation to implicit knowledge sharing behavior.

Hypothesis 13: Professional tenure has a positive correlation to explicit knowledge sharing behavior.

Hypothesis 14: Professional tenure has a positive correlation to implicit knowledge sharing behavior.

Research Site

Data for this study was collected from a multinational enterprise (MNE) organization located in South Korea with GSD project teams distributed throughout the USA, Asia, and Europe. The GSD project teams are multi-cultural and share English as a common language. The participants were multi-cultural professionals from multinational corporation project teams. However, not all team members were well-versed in English and prefer to communicate in their native language. The teams consisted of diverse levels of development experience, skills, and knowledge. The communication tools used for knowledge sharing consisted of email, instant messaging, wiki, video conferencing, and product lifecycle management system. Email was used for sharing internal customer information, company business information and external customer communications. Instant messaging was used for internal meetings between distributed team members for discussions and quick responses to related issues. Individual teams used wiki to share project work instructions and specific tool qualification information for developing and

validating software. Video conferences were scheduled between distributed teams and external customers for project meeting (timing/scheduling, requirement analysis, cross functional design review, gate reviews). Due to time constraints, location, and language differences, video conferencing is most challenging. For example, distributed teams in the U.S. and South Korea have to schedule meetings either early in the morning or late in the evening due to a thirteen hour difference in time. Product lifecycle management system allows for sharing, storing and archiving requirements and other project work products.

Survey Instrument Development

First, all measures for the constructs in the research model were developed and incorporated into the survey. The variables were operationalized using multi-item measures adapted from existing measures. Media affordances are measured based on how the individual perceives media and how they use media. This study utilized the measurements developed in Rice et al. (2017). They identified five affordances of general media; editability, self-presentation, pervasiveness, searchability, and awareness. Among them, searchability, editability and self-presentation affordances are more related to information security. Based on the definition and operational definitions, pervasiveness affordance includes a signaling alert which is identified to be related to information security. The operational definitions of the media affordances defined in Rice et al. (2017) were used in this study as survey measurement items for affordances. Table 1 presents the operational variables as: Edit=Editability, S-Pers=Self-Presentation, Pervas=Pervasiveness, Sear=Searchability, and Awar=Awareness. Cronbach coefficient alpha and composite reliabilities for these variables defined in Rice et al. (2017) range

from 0.82 to 0.96, the average variance extracted (AVE) ranges from .63 to .77, and the square roots of the construct AVEs are all greater than the cross-correlations. These results provided evidence of scale reliability and convergent and discriminant validity. Table 1 represents the survey measurement items for five perceived media affordances.

The survey used in this study was measured using the 7-point Likert scale (1=strongly disagree to 7=strongly agree) for perception of communication, awareness of media security, and sharing information. The 9-point Likert scale (0=never to 8=many times a day) was used for actual use of communication technology. It reflects the idea that perceptions of affordances reflect degree or extent, rather than simple existence or non-existence. The results were categorized by affordances and counted based on the 7-point response scale and the 9-point response scale. These labels were included in the survey instrument; only used for grouping and distinguishing phrases for comparison.

This study utilized the measurement developed in the study of D'Arcy, Hovav, and Galletta (2009). They measured user awareness of three different aspects in media; technology security features through education programs, organizations' security policy on technology use, and organizations' monitoring on technology use (D'Arcy et al., 2009). This study measured users' awareness on the aspect of security awareness. The variables adapted from D'Arcy et al. (2009), were used to measure awareness of media security: S=Security awareness and P=Security policy. Cronbach coefficient alpha and composite reliabilities range from 0.96 to 0.97 above the recommended 0.70 threshold. Table 2 represents the survey measurement items for awareness of media security.

Table 1
Perceived Media Affordance Survey Items (Adapted from (Rice et al., 2017))

Editability	
Edit1	I edit others' information after they have posted it.
Edit2	I edit my information after I have posted it.
Edit3	I create or edit a document collaboratively.
Self-presentation	
S-Pres1	I include the information, photos, and other content that present my personal identity on organization's media.
S-Pres2	I adjust my organization's media profile to my preferences.
S-Pres3	I use font style, size, and color to emphasize communication with team members.
S-Pres4	I create groups for sharing information about specific projects.
Pervasiveness	
Pervas1	I get responses to my requests from others quickly.
Pervas2	I communicate with others while moving, commuting, and traveling.
Pervas3	I communicate with infrequent or less important work relationships.
Searchability	
Sear1	I search for information or people by entering search words.
Sear2	I search for information or people by following links between contents.
Sear3	I search for tags or keywords that someone else has added to content.
Awareness	
Awar1	I am aware of the information others in my project team have.
Awar2	I am aware of the information others outside of my team (cross functional teams) have.
Awar3	I am aware of project activities, opinions, and locations of others.
Awar4	I keep up-to-date with the progress of projects.
Awar5	I keep up-to-date with the policies and norms of my project team.
Awar6	I am aware of all media technologies available to my project team.

Table 2
Awareness of Media Security (Adapted from (D'Arcy et al., 2009))

Awareness of Media Security	
S1	I am aware of technology and information security issues.
S2	I am aware of computer software copyright laws.
S3	I am aware of the consequences of modifying computerized data in an unauthorized way.
S4	I am aware of computer security responsibilities.
S5	I am aware of the potential to compromise cyber infrastructure.
S6	I am aware of the consequences of accessing computer systems that they are not authorized to use.

Rehman et al. (2014) further segregated for knowledge sharing behavior (KSB). KSB was measured through Explicit Knowledge Donation Behavior (EKDB), Explicit Knowledge Collection Behavior (EKCB), Implicit Knowledge Donation Behavior (IKDB) and Implicit Knowledge Collection Behavior (IKCB) (Rehman et al., 2014). To ensure that survey items correctly measure knowledge sharing behaviors, this study included knowledge sharing behaviors with specific explicit or implicit knowledge within teams and cross-functional teams. The variables adopted from Rehman et al. (2014), task characteristics, were used to measure knowledge sharing behavior. Rehman et al. (2014) adopted survey measurements from Morgeson and Humphrey (2006). Cronbach coefficient alpha and composite reliabilities ranged from 0.64 to 0.95, and the average variance 0.87 demonstrating excellent internal consistency reliability. Table 3 represents the survey measurement items for knowledge sharing behavior that are adapted from the study of (Rehman et al., 2014).

Table 3

Knowledge Sharing Behavior Survey Items (Adapted from (Rehman et al., 2014))

Explicit Knowledge Sharing Behavior	
EKDB1	I share software information with project team members (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).
EKDB2	I share software information with cross functional teams in other locations (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).
EKDB3	I share customer communications (i.e. meeting minutes, emails, etc.) with team members.
EKDB4	I share customer communications (i.e. meeting minutes, emails, etc.) with cross functional teams in other departments.
EKDB5	I share project schedules and modifications to project schedules (e.g., milestones, timing, release dates) with team members.
EKDB6	I share project schedules and modifications to project schedules (e.g., milestones, timing, release dates) with cross functional teams in other departments.
EKCB1	Team members' share software issues with me when I ask (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, lessons learned).
EKCB2	Cross functional teams in other departments share issues that may impact software when I ask (i.e. supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).
EKCB3	Team members' share customer communications with me when I ask.
EKCB4	Cross functional teams' in other departments share customer communications with me when I ask.
EKCB5	Team members share project schedules and modifications to project schedules (milestones, timing, release dates) when I ask.
EKCB6	Cross functional teams' in other departments share project schedules and modifications to project schedules (milestones, timing, release dates) when I ask.
Implicit Knowledge Sharing Behavior	
IKDB1	When I acquire new skills (i.e. methodologies, tools, processes, etc.), I share those skills with team members
IKDB2	When I acquire new skills (i.e. methodologies, tools, processes, etc.), I share those skills with cross functional team members.
IKDB3	When I identify process issues, I share those issues with team members.

IKDB4	When I identify process issues, I share those issues with cross functional team members.
IKCB1	Team members' share acquired new skills when I ask.
IKCB2	Cross functional teams share acquired new skills when I ask.
IKCB3	Team members' share process issues and changes when I ask.
IKCB4	Cross functional teams in other departments share process issues and changes when I ask.
IKCB5	Team members' share defects identified in customer requirements when I ask.
IKCB6	Cross functional teams in other departments share defects identified in customer requirements when I ask.

Actual media use was measured by asking users about the frequency of each medium used. The media available within the organization in the survey include face-to-face one-on-one, face-to-face meetings, e-mail, telephone calls, short messages (including text messages, instant messaging, and other chat programs), teleconference without video, and teleconference with video, the organization's intranet, and external social media for work-related matters. To operationalize media affordances, each type of media technology in Table 4 was ranked (e. g. Low=1; Medium=2; High=3) based on the degree to which they enable each of the affordances. An array table was created that included the affordances and assigned ranking from Table 4. The array table was inserted into the .csv file, and aligned above (first 6 rows) the column headings for each media type. The SUMPRODUCT formula in Microsoft Excel, was used to multiply the range of actualized affordance response values with Table 4 input arrays. Columns were inserted into the .csv file with actual use of media affordance headings from the constructs in Figure 2 to store the results of the operation. Table 4 shows the main affordances of each medium used in GSD teams.

Additionally, participants' demographic information was collected, such as age, gender, educational level, professional tenure, and years of professional experience. Analyzing this information helped to: 1) describe the participants and how they fit in the study, 2) determine if identity has an effect on knowledge sharing behavior, 3) if the participants represent the population needed for the study, 4) the differences and similarities in behavior of participant, and 5) among the participants in the study who has the higher tendency to share knowledge. Bakker et al. (2006) found a positive correlation (0.19; $p < 0.05$) between team tenure and knowledge sharing with Cronbach coefficient alpha for trust measures within the ranges of .89, .61, .83, indicating the longer team member tenure the more likely the engagement in knowledge sharing behavior. Table 5 defines the operational variables as: Gen=Gender, Age=Age, Job-P=Job Position, Org-Ten=Organization Tenure, Prof=Professional Tenure, Edu=Education, and Loc=Location. Table 5 shows the demographic characteristics of each participant.

Table 4
Affordances of Media (Adapted from Strong et al. (2014))

Media	Affordances					
	Awareness	Pervasiveness	Editability	Searchability	Visibility	Self-Representation
Face-to-face (one-on-one)	Low	Low	Low	Low	High	High
Face-to-face (meetings)	Low	Low	Low	Low	High	High
E-mail	High	High	High	Low	High	High
Telephone calls	Low	High	Low	Low	Low	Low
Short messages	Low	High	High	High	Low	High
Teleconference (no video)	Low	High	Low	High	Low	Low
Teleconference (video)	Low	High	Low	High	Low	Low
Intranet	High	Low	Low	High	Low	Low

External social media	High	High	Low	High	High	High
Wiki	High	Low	High	High	High	Low
Shared Database	Low	Low	Medium	Medium	Low	Low
Version Control	High	Low	High	High	High	High
Product Lifecycle Management System	High	Low	High	High	High	High
Requirement Management System	High	Low	High	High	High	High

Table 5
Demographics

Gender

Gen1 Male

Gen2 Female

Age

Age1 I am < 30 years of age.

Age2 I am between the ages of 31 – 40.

Age3 I am between the ages of 41 – 50.

Age4 I am greater than 50 years of age.

Job Position

Job-P1 I am an Applications Engineer (e.g. Software Developer, Software Engineer, etc.)

Job-P2 I am a Systems Engineer (e.g. Systems Analyst, etc.)

Job-P3 I am an Integration Engineer (e.g. Software, Systems, etc.)

Job-P4 I am a Test Engineer (e.g. Verification, Validation, Quality, etc.).

Job-P5 I am an Engineer (e.g. Hardware, Process, Quality, etc.)

Job-P6 I am a Manager (e.g. Software, Systems, Quality, etc.)

Job-P7 I am an Executive (CEO, Vice President, Director, etc.)

Organization Tenure (years in organization)

Org-Ten1 I have been with the organization 0–2 years.

Org-Ten2 I have been with the organization 3-5 years.

Org-Ten3 I have been with the organization 6-10 years.

Org-Ten4 I have been with the organization 11-20 years.

Professional Tenure (years of experience)

Prof1 I have 0-2 years of experience as an engineering professional (Software, Systems, Hardware, Integration, Verification, etc.)

Prof2 I have 3-5 years of experience as an engineering professional (Software, Systems, Hardware, Integration, Verification, etc.).

Prof3 I have 6-10 years of experience as an engineering professional (Software, Systems, Hardware, Integration, Verification, etc.)

Prof4 I have 11-20 years of experience as an engineering professional (Software, Systems, Hardware, Integration, Verification, etc.)

Prof5 I have 20+ years of experience as an engineering professional (Software, Systems, Hardware, Integration, Verification, etc.)

Education

Edu1 I have some years of college.

Edu2 I have a 2 year degree.

Edu3 I have a 4 year degree.

Edu4 I have a Professional degree (e.g. Masters, etc.).

Edu5 I have a Doctorate degree.

Location

Loc1 I am located in Africa.

Loc2 I am located in Asia.

Loc3 I am located in Europe.

Loc4 I am located in South America.

Loc5 I am located in the Middle East.

Loc6 I am located in North America.

Validating Survey Instrument

Before conducting primary data collection, an expert panel with 5 experts was conducted to add validity and improve the clarification of the survey made to the original survey items. A pilot study was conducted to refine the survey measurement items, including structure the survey and the wording of specific statements. The pilot study with 30 participants provided valuable insights into individuals' perceptions of technologies, the likely response rate, and analytical implications for the full survey. The construct validity of measurement items was assessed through the pilot study and its data.

Data Collection

The main survey data was used to empirically assess the effects of media affordances and users' media security awareness on actual media use and knowledge sharing behavior among GSD team members. The survey respondents were GSD workers who use communication media available in the organization. For this research, 214 employees participated in the online survey, after inviting 1000 employees through emails. The survey was sent by email as a web link to all project team members with an invitation email to participate in the study. The survey was open for two weeks. Two reminders were sent to all participants who had not responded to the online survey via email.

Data Analysis Plan

Data analysis unit is individual. Partial Least Square (PLS) is a structural equation modeling tool that was used to analyze the data. Structural equation modeling enables

researchers to examine the structural component (path model) and measurement component (factor model) (Gefen, Straub, & Boudreau, 2000).

Preliminary Data Analysis

Data normality was assessed using Skewness and Kurtosis calculations. Outlier analysis was assessed using the Mahalanobis Distance metric. Mahalanobis Distance takes into account the covariance of data variables to correct for the heterogeneity and non-isotropy observed in most real data. It not only weighs the distance calculation according to the statistical variation of each feature component, but also decouples the interactions between features based on their covariance matrix to provide a useful distance metric for feature comparisons in pattern analysis. In statistical literature, the Mahalanobis Distance is related to the log likelihood under the assumption that data follow multivariate Gaussian distribution which is a reasonable approximation for most practical data.

Measurement Model Test

The measurement model is comprised of constructs for perceived media affordances, awareness of media security, and knowledge sharing behavior. This study modeled the indicators of all the constructs as formative and reflective measures. The constructs of perceived media affordance are treated as reflective measures, while the constructs of awareness of media security and knowledge sharing behavior are treated as formative measures. Thus, this study used two approaches with two different types of the construct measures: reflective measures and formative measures.

For constructs with reflective measures, confirmatory factor analysis was conducted to test the measurement model, checking for the convergent validity and

discriminant validity of the instrument items. Assessing the convergent validity and discriminant validity of the instrument items was inputs for testing the measurement model. First, convergent validity is acceptable if item loadings are 0.60 or greater (Hair, Anderson, Tatham, & Black, 1998). Second, to check the reliability of the latent variables, composite reliability (CR) and the average variance extracted (AVE) are assessed using the procedure outlined by Fornell and Larcker (1981). The reliability for CR and the AVE is acceptable if CR is 0.70 or greater and the AVE is 0.50 or greater. Third, for discriminant validity, the AVE from the construct should be greater than the variance shared by that construct and the other constructs in the model (Chin, Gopal, & Salisbury, 1997). Convergent validity is the degree to which two or more items measuring the same constructs agree (Cook & Campbell, 1979). Convergent validity or composite reliability (CR), which has been also referred to as McDonald's coefficient, is obtained by combining all of the true score variances and covariances in the composite of indicator variables related to constructs, and by dividing this sum by the total variance in the composite. Discriminant validity is the degree to which items differentiate between constructs or measures distinct concepts. To examine discriminant validity, both exploratory factor analysis (EFA) and a comparison of the square root of AVE of each latent construct and its correlations with other latent constructs was calculated. The square root of the AVE for each construct should be larger than the inter-construct correlations, and items should load more strongly on their corresponding construct than on other constructs (i.e., at least 0.10 higher than cross-loadings). Prior research suggest a number of indices to evaluate the fit between the proposed model and the sample data: Chi-square/degrees of freedom (χ^2/df), Adjusted Goodness of Fit (AGFI), Comparative

Fit Index (CFI), Tucker- Lewis Index (TLI), and Root Mean Square of Approximation (RMSEA) (Hair et al., 1998; Hair, Black, Babin, & Anderson, 2010). Reliability was assessed using composite reliability, a measure of internal consistency included in the PLS output.

Cronbach coefficient alpha and composite reliability (AVE) was calculated to test the reliability of measures and internal consistency of the questionnaire. To ensure the reliability of the study, items were adapted based on an acceptable Cronbach coefficient alpha score above 0.60, based on standard values. A three-step procedure was followed to examine the robustness of the instrument.

For constructs with formative measures, the indicators are not expected to have covariation within the same latent construct, and they are causes of, rather than caused by, their latent construct. Through test validity and reliability of all the formative measures, this study demonstrated satisfactory construct validity and the results of multicollinearity test.

This study created a weighted score for each construct using the formative weights provided by PLS results, and then created a correlation matrix consisting of the indicators and formative latent constructs. If the majority of inter-item correlations and item-to-construct correlations for a given latent construct are significant, the formative measures achieve convergent validity. If the items tend to correlate more with one another within the same construct than with items of other constructs, the formative measures achieve discriminant validity. The presence of violation, however, does not necessarily suggest that the formative construct does not have construct validity, because formative indicators do not necessarily have high correlations among them (Petter,

Straub, & Rai, 2007). If there are violations in the modified multitrait-multimethod (MTMM) matrix, efforts should be made to understand why these violations occurred. All inter-item correlations and item-to construct correlations for the measures were used to assess formative measures' adequate convergent and discriminant validity.

Very high reliability can be undesirable for formative constructs because excessive multicollinearity among formative indicators can destabilize the model (Petter et al., 2007). To ensure that multicollinearity is not a significant issue, this study assessed the Variance Inflation Factor (VIF) statistic. If the VIF statistic is greater than 3.3, the conflicting item should be removed as long as the overall content validity of the construct measures is not compromised (Diamantopoulos & Siguaw, 2006).

Structural Model Test

To test the structural model for invariance, structural equation modeling was used to examine the relationships in the research model. For the evaluation of the structural model (hypothesized links), the bootstrap resampling procedure was applied to test the significance of the path coefficients. The path coefficient in the PLS model represents standardized regression coefficient and results of bootstrapping. Standardized path coefficients should be around 0.20 and ideally above 0.30 in order to be considered meaningful (Chin, 1998).

Resources

Resources for this study consist of hardware, software, and participants. The following list displays the required resources.

- Windows 10 or later operating system

- Microsoft Word
- Microsoft Excel
- Web Browser (Google Chrome, Internet Explorer, Firefox, etc.)
- Qualtrics (Survey application)
- Participants
- Smart PLS 3.0
- IBM SPSS Statistics

Summary

Chapter 3 described the research strategy and the methods used in this study. Developing the research model was the first step to implementing the research strategy. The research model included all measures for the constructs incorporated into the web-based survey. The hypotheses developed, tested the association of media affordances with explicit knowledge activities. The hypotheses included measures to be tested for media affordances related to information security that had an association with implicit knowledge activities such as editability and self-representation. Data was collected through a web-based survey. The survey participants were multi-cultural professionals from multinational corporation project teams. An expert panel of 5 out of 10 experts solicited was conducted to add validity and to improve the clarity of the survey. A pilot study of 15 participants out of 30 invites was conducted to refine the survey measurement items. Media affordances were measured based on how the individual perceived and used media. To analyze the data, Partial Least Squares (PLS) was used as the structural equation modeling tool to examine the structural component (path model) and

measurement component (factor model). The measurement model test used two approaches with two different construct measures: reflective measures and formative measures. Confirmatory analysis tested the measurement model for convergent validity and discriminant validity. Structural equation modeling was used to test the structural model for invariance, structural equation modeling was used to examine the relationships in the research model. Data analysis results are discussed in the next chapter.

Chapter 4

Results

Data

The survey was conducted using a web-based, (See Appendix A). The survey procedures followed Institutional Review Board protocol (See Appendix B). The research data consisted of 214 valid responses which included 84.5% male and 14.5% female (See Table 6). The age groups with the highest percentage of responses was less than 30 (group = 57.9%), and older than 50 (group = 15.9%). The highest percentage of responses was found in the 3-5 year group for tenure (organizational tenure = 82.7% and professional tenure = 73.8%). Prior to the main data collection, a Delphi study was conducted, followed by a pilot study.

Delphi Study

A Delphi method was used as a validation method of the survey instrument prior to the pilot study. Five professional subject matter experts were chosen in the areas of software development, systems integration, test validation, hardware, and research and development. The experts reviewed and validated the survey measurement items for structure, redundancy, clarity, and fit. The constructive feedback received from the experts was incorporated in the pilot survey measurement items. Some measurement items were rephrased, added, or deleted based on the feedback received.

Table 6
Participants' Demographics (N=124)

Variables		Frequency	Percent	
Gender	Male	183	85.5	
	Female	31	14.5	
Age	< 30	124	57.9	
	31 - 40	31	14.5	
	41 - 50	25	11.7	
	> 50	34	15.9	
Marital Status	Married	177	82.7	
	Divorced	12	5.6	
	Unmarried	25	11.7	
Job Position	Application Engineer	58	27.1	
	Systems Engineer	9	4.2	
	Integration Engineer	17	7.9	
	Test Engineer	21	9.8	
	Hardware Engineer	31	14.5	
	Software Engineer	3	1.4	
	Quality Engineer			
	Core Process Engineer	6	2.8	
	Management Executive	26	12.1	
	Executive	7	3.3	
	Other	36	16.8	
	Organizational Tenure	0-2	24	11.2
		3 through 5	177	82.7
		6 through 10	6	2.8
		11 through 20	1	0.5
21 or more		6	2.8	
Professional Tenure	0-2	11	5.1	
	3 through 5	158	73.8	

	6 through 10	19	8.9
	11 through 20	8	3.7
	21 or more	18	8.4
Education	Some college	4	1.9
	4- year degree	143	66.8
	Graduate degree	67	31.3
Location	Asia	36	16.8
	Europe	25	11.7
	North America	153	71.5

Pilot Study

The pilot study provided valuable insight into individuals' perceptions of technologies, the likely response rate, and analytical implications for the full survey. Data was collected from fifteen participants who were invited by email to participate in the pilot study. Email invitations were sent to thirty potential participants. Fifteen participants responded and only ten were 100% completed. SPSS statistical tool was used to analyze the data. Some of the survey responses in the pilot study were incomplete, because participants would start the survey and not finish it in one session. To avoid this re-occurring, all survey items in the survey were marked as 'required'. To prepare the collected raw data for preliminary analysis, variables were assigned to represent each question and a numerical value was assigned to each option for response. The analysis was performed on groups of related variables for demographics, actual communication use, awareness of media, and sharing information. Data from all groups were tested for normality, reliability using Cronbach coefficient alpha, and Mahalanobis Distance for

outlier analysis. To ensure reliability of the study, an acceptable Cronbach coefficient alpha score was above 0.60, where $\alpha = .888$. Data normality follows normal distribution where $p \leq 0.05$. Mahalanobis Distance for outlier analysis was within the acceptable value range for normal distribution, where skewness = 1.069 and kurtosis = -1.237. See Appendix C for reliability statistics, data normality, and descriptive statistics.

Results of Preliminary Analysis of Primary Survey Data

Data for the primary study was collected from a web-based survey. Prior to sending the survey, GSD project team members were made aware of the research by cross functional managers and encouraged to participate. The survey was sent by email as a web link to 1000 professional employees with an invitation email to participate in the study. The invite was to specific GSD project team professionals who use communication media available in the organization. The expected response was 200 employees out of 1000 invitations. The actual response received was 214 (21.4%) of employees who participated. The raw data collected from all groups was assigned the same variables to represent each question and a numerical value was assigned to each option for response that was used in the pilot study. The sample dataset of 214 records was tested in IBM SPSS for normality, reliability using Cronbach coefficient alpha, and Mahalanobis Distance for outlier analysis. The IBM SPSS tool was used to test outliers, normality and also to perform descriptive statistics such as the median, mean, mode and standard deviation of the data that was collected.

Mahalanobis Distance and Box Plot

The Mahalanobis Distance was used to identify and eliminate multivariate outliers. The case for outlier analysis occurs when a point has a greater Mahalanobis

Distance from the rest of the sample population of points creating higher leverage. SPSS analysis results show that there were no outliers identified (See Appendix D).

Mahalanobis Distance was tested by creating p values using the chi-square function. Each subject was analyzed and scored separately, creating a column of p values at the end of the dataset. The critical value of chi-square at $p < .001$ was used for the calculation of Mahalanobis Distance with degrees of freedom (df) resulting in no outliers identified below $p < .001$. According to Mertler and Reinhart (2017), “the accepted criterion for outliers is a value for Mahalanobis Distance that is significant beyond $p < .001$, determined by comparing the obtained value for Mahalanobis Distance to the chi-square critical value” (p. 31).

Normality and Scatter Plot

Conducting the normality test entailed aggregating variables into independent and dependent variables. The skewness and kurtosis values are .823 and -.572 respectively (See Appendix E). Positive skewness indicates values are skewed right, which means the right tail is long relative to the left tail. Negative kurtosis means the distribution produces fewer and less extreme outliers than does the normal distribution. The analysis results from the normality test showed the Skewness and Kurtosis values to be within the acceptable range of normal distribution. According to Hair et al. (2017), the guideline for accepting a distribution as normal is if its skewness and kurtosis is in the range of -1 to +1. Mertler and Reinhart (2017) recommend leveraging other visual and graphical methods to check data for normality, linearity, and variance, such as other statistical options, data visualization and graphical methods not limited to skewness, kurtosis, Kolmogorv-Smirnov statistic with Lilliefors significance level, ANOVA, histogram,

normal P-P plot of regression. The statistical outputs and normality graphs for this showed that the data distribution was normal. The cases were almost on the diagonal line for both the normality Q-Q and normality P-P regression plots, and the scatter plot also formed a rectangular shape which shows that the distribution is normal (See Appendix E).

The Results of Measurement Model Testing

Structural equation modeling can be formative or reflective. Formative measurement modeling assumes a distributed or distribution of indicators to maximize the explained variance in the latent factor variable (Henseler, Hubona, & Ray, 2016). If the indicators cause the latent variable and are not interchangeable among themselves, they are formative. Reflective measures assume highly correlated and interchangeable indicators and should be thoroughly checked for reliability and validity (Henseler, Hubona, & Ray, 2016). This research study has both reflective and formative measurements in the same model. In this case, separate data analysis was performed on each part of the model using the Smart PLS 3.0 tool.

The measurement model included reflective measures of Explicit Knowledge Sharing, Implicit Knowledge Sharing, and Awareness of Media Security. The tests performed for reflective measures included bootstrapping, factor loading, outer weights, outer loading, and composite reliability. To determine if the indicators have significant effects on the corresponding latent variables, a boot strapping technique with 2000 times was run resulting in the outer loadings and *p*-value. The researcher checked the outer loadings to test the model's significance with *t*-values, *p*-values, and standard errors. The

outer loadings were significant where $p \leq 0.5$. The PLS algorithm was run and the factor loadings met the acceptable value of 0.70 or higher for indicator convergent validity.

Reflective measures, such as indicator loadings, p -value, and composite reliability check for reliability and validity to provide support for the suitability of their inclusion in the measurement model (See Table 7 and Appendix F). Indicator loadings which are greater than 0.7 and significant where p -values are less than 0.05, which satisfied convergent validity of the constructs (Hair, Ringle, & Sarstedt, 2011; Fornell & Larcker, 1981). Composite reliability (CR) is acceptable where $CR > 0.70$ for internal consistency reliability.

Table 7
Factor Analysis Results of Reflective Measures

Construct	Item	Loadings	Sample Mean	Stand. Dev.	<i>T</i> Statistics	<i>P</i> Values	Composite Reliability
Explicit Knowledge Sharing	Shar10	0.818	0.63	0.144	4.421	< 0.001	0.915
	Shar11	0.94	0.985	0.019	52.11	< 0.001	
	Shar16	0.908	0.885	0.103	8.85	< 0.001	
Implicit Knowledge Sharing	Shar19	0.88	0.872	0.077	11.41	< 0.001	0.895
	Shar21	0.963	0.956	0.042	23.013	< 0.001	
Awareness of media security	Awa1	0.919	0.925	0.029	31.874	< 0.001	0.967
	Awa2	0.928	0.93	0.016	58.46	< 0.001	
	Awa3	0.934	0.938	0.015	63.999	< 0.001	
	Awa4	0.921	0.92	0.022	41.304	< 0.001	
	Awa5	0.848	0.847	0.033	25.523	< 0.001	
	Awa6	0.916	0.916	0.023	39.023	< 0.001	

The measurement model included formative measures of Perceived Awareness, Perceived Pervasiveness, Perceived Searchability, Perceived Editability, and Perceived Self-presentation. Formative measures, such as test indicator weights, p -value, and collinearity of the measurements determines the significance and relevance of the measurement items to corresponding latent variables. The tests performed for formative

measures included bootstrapping, outer weights, VIF, and discriminant validity. The test results estimated outer weights are significant when $p \leq 0.5$, except for Per16 ($p = 0.352$) for Perceived Searchability. The PLS algorithm was run to determine the discriminant validity, cross loadings, and collinearity. The collinearity results, VIF values, show that all values are less than five suggesting there is no indication of collinearity between each set of predictor variables. The VIF range is between one and five indicating no significant multicollinearity, where five and above indicates an issue or problem with the model (Hair et al., 2011) (See Table 8 and Appendix F).

Table 8
Factor Analysis Results of Formative Measures

Construct	Item	Weight	Sample Mean	Stand. Dev.	T Statistics	P Values	VIF
Perceived Searchability	Per15	0.697	0.686	0.326	2.134	0.033	2.764
	Per16	0.352	0.339	0.353	0.995	0.32	2.764
Perceived Pervasiveness	Per12	0.68	0.552	0.41	1.66	0.097	1.791
	Per13	-0.629	-0.478	0.446	1.409	0.159	1.610
	Per11	0.703	0.608	0.429	1.636	0.102	1.983
Perceived Awareness	Per17	0.485	0.476	0.193	2.515	0.012	1.672
	Per21	0.304	0.3	0.166	1.832	0.067	1.821
	Per22	0.381	0.369	0.169	2.256	0.024	1.946
Perceived Editability	Per5	0.542	0.528	0.151	3.597	<0.001	1.354
	Per6	0.608	0.61	0.141	4.324	<0.001	1.354
Perceived Self-presentation	Per8	0.504	0.494	0.116	4.359	<0.001	1.142
	Per10	0.704	0.703	0.099	7.085	<0.001	1.142

Discriminant validity is established when the latent variable has a higher variance in its associated variables compared to its values when cross-loaded with other constructs in the same model (Fornell & Larcker, 1981). The results of the discriminant validity test in this study showed that the diagonal loadings are greater than all their cross-loadings. Discriminant validity is therefore evident in the measurement items of this study (See Table 9). Actualized media use affordances were calculated by multiplying degree of

media affordance shown in Table 4 (e. g. Low=1; Medium=2; High=3) and the values of the survey data on the use of each of media type.

Table 9
Actualized Media Use Affordances

Item	Construct	Explicit _KS	Implicit KS	PerAwar	PerPerv	Per_Sear	Per_Edit	Per_Self
Shar10	Explicit_KS	0.89	0.69	-0.59	-0.36	-0.48	-0.53	-0.40
Shar11	Explicit_KS	0.95	0.87	-0.68	-0.41	-0.52	-0.57	-0.38
Shar16	ImplicitKS	0.68	0.81	-0.55	-0.37	-0.42	-0.59	-0.35
Shar19	ImplicitKS	0.77	0.89	-0.73	-0.42	-0.64	-0.59	-0.44
Shar21	ImplicitKS	0.76	0.89	-0.64	-0.45	-0.56	-0.67	-0.35
Per17	PerAwar	-0.56	-0.69	0.88	0.56	0.63	0.65	0.61
Per21	PerAwar	-0.60	-0.59	0.81	0.54	0.55	0.52	0.60
Per22	PerAwar	-0.63	-0.61	0.86	0.63	0.56	0.52	0.61
Per11	PerPerv	-0.56	-0.63	0.74	0.77	0.75	0.61	0.67
Per12	PerPerv	-0.39	-0.44	0.63	0.80	0.70	0.43	0.67
Per13	PerPerv	-0.38	-0.41	0.43	0.14	0.59	0.50	0.45
Per15	Per_Sear	-0.53	-0.62	0.68	0.59	0.98	0.59	0.72
Per16	Per_Sear	-0.51	-0.57	0.59	0.62	0.91	0.58	0.62
Per5	Per_Edit	-0.58	-0.71	0.60	0.32	0.54	0.99	0.45
Per6	Per_Edit	-0.46	-0.47	0.70	0.63	0.69	0.65	0.71
Per8	Per_Self	-0.25	-0.34	0.43	0.28	0.42	0.49	0.69
Per10	Per_Self	-0.41	-0.39	0.69	0.68	0.70	0.43	0.92

The Results of Structural Model Testing

The Smart PLS 3.0 tool was used to perform Partial Least Square Structural Equation Modeling (PLS-SEM) data analysis. PLS-SEM is a valuable statistical method when conducting research with causal relationships (Bryne, 2001). Additionally, Hair, Ringle, and Sarstedt (2011) suggested that the PLS-SEM when compared to the Covariance based Structural Equation Modeling (CB-SEM) is better placed for work that has prediction-oriented goals, has more flexibility with sample sizes, and addresses the issue of whether constructs are formative or reflective.

The Smart PLS 3.0 tool was used to test the hypotheses developed in this study. Bootstrapping with a 2000 sub-sampling was performed to test the significance of the research model's paths. The bootstrapping performed produced a *t*-statistics (*t*-values)

that shows the significance in the structural path (See Appendix G and Appendix H). The independent constructs exhibited variance towards the dependent construct with explicit knowledge sharing showing 39% of the variance is explained by actual use of media affordance (awareness, pervasiveness, and searchability). Implicit knowledge sharing showed 30 % explained by actual use of media affordance (editability and actual self-presentation (See Figure 2 for the R-Square output (R^2)).

The PLS algorithm was also run for path analysis to determine the significance of the relationships between constructs by examining the path coefficients. Figure 2 illustrates the results of the analysis research model of media affordances on knowledge sharing behavior consisting of constructs, p -value, t-statistic, and R-squared values.

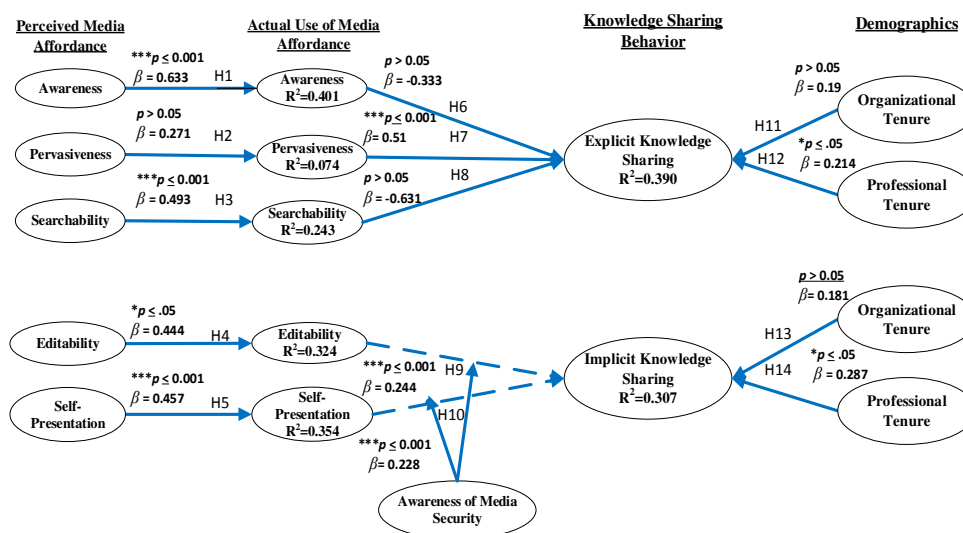


Figure 2. Results of research model testing.

* $p \leq .05$; ** $p \leq 0.01$; *** $p \leq 0.001$

The PLS structural modeling technique assessed the path coefficients using the bootstrapping procedure (Hair et al., 2011). The standardized beta coefficients provide estimates from regression analysis to determine the significance or non-significance

hypotheses paths. If the path is significant the hypothesis is supported, or if the path is not significant the hypothesis is not supported. The data supports the hypotheses, with the exceptions of **H2, H6, H8, H11** and **H13** that tested insignificant when the p -value is ≤ 0.05 . Note that the p -values for H2, H8 and H13 are somewhat marginally significant with p -values close to 0.05. Table 10 summarizes the hypotheses providing individual paths, path coefficients, t -values, p -values, and support of the hypothesis.

Table 10
Summary of Hypotheses Test Results

	Path	Path Coefficient	t Value	P Value	P Value Level
H1	PerAwar -> Act_Awar	0.633	13.34	0.001***	Significant
H2	PerPerv -> ActPerv	0.271	1.905	0.057	Marginally significant
H3	Per_Sear -> Act_Sear	0.493	7.379	0.001***	Significant
H4	PerEdit -> ActEdit	0.444	3.032	0.002*	Significant
H5	PerSelf -> ActSelf	0.457	4.556	0.001***	Significant
H6	Act_Awar -> Explicit_KS	-0.333	1.387	0.166	Non-significant
H7	ActPerv -> Explicit_KS	0.51	3.281	0.001***	Significant
H8	Act_Sear -> Explicit_KS	-0.631	1.921	0.055	Marginally significant
H9	Security -> ActEdit- ImplicitKS	0.244	4.515	0.001***	Significant
H10	Security -> ActSelf - ImplicitKS	0.228	4.605	0.001***	Significant
H11	Demo_Org -> Explicit_KS	0.19	1.322	0.186	Non-significant
H12	Demo_Prof -> ExplicitKS	0.214	2.168	0.03**	Significant
H13	Demo_Org -> ImplicitKS	0.181	1.909	0.056	Marginally significant
H14	Demo_Prof -> ImplicitKS	0.287	3.025	0.003**	Significant

* $p \leq .05$

** $p \leq 0.01$

*** $p \leq 0.001$

To calculate the effect of tenure on knowledge sharing behavior, dummy variables were created in SPSS for the groups representing tenure in organizational and professional variables (See Appendix I and Appendix J). The dummy variables were added to the original .csv file used in previous calculations and imported into Smart PLS 3. The bootstrap test was performed to test the hypotheses H11 through H14. The data showed no significance for H11 and H13. The data supports the hypotheses for testing significant when the p -values for H12 and H14 are less than 0.05.

Findings

1. The relationships between perceived affordance and actualized affordances were tested. The analysis results show
 - *H1: Awareness in the perceived media affordance has positive association with awareness in actualized media affordance ($\beta=0.633$; $p \leq 0.001$).*
 - *H2: Pervasiveness in the perceived media affordance has no positive association with pervasiveness in actualized media affordance ($\beta = 0.271$; $p= 0.057$).*
 - *H3: Searchability in the perceived media affordance ($\beta = 0.493$; $p \leq 0.001$) has positive association with searchability in actualized media affordance.*
 - *H4: Editability in the perceived media affordance ($\beta =0.444$; $p = 0.002$) has positive association with actualized media affordance.*
 - *H5: Self-presentation in the perceived media affordance ($\beta = 0.457$; $p \leq 0.001$) has positive association with actualized media affordance.*

2. The relationships between actualized media affordance and explicit knowledge was tested. The analysis results show
 - *H6: Actualized uses of media with higher level of Awareness affordance ($\beta = -0.333$; $p = 0.166$) has no positive association with explicit knowledge sharing behavior.*
 - *H7: Actualized uses of media with higher level of Pervasiveness affordance ($\beta = 0.51$; $p = 0.001$) has positive association with explicit knowledge sharing behavior.*
 - *H8: Actualized uses of media with higher level of Searchability affordance ($\beta = -0.631$; $p = 0.055$) has no positive association with actualized media affordance.*

3. The moderating effect of perceived media affordance on actualized media affordance (awareness of security to editability and self-representation) was tested. The analysis results show
 - *H9: Awareness of media security moderates the relationship between editability in actualized media affordance and implicit knowledge sharing such that the positive relationship between editability in actualized media affordance and implicit knowledge sharing is stronger for users who are aware of media security is high ($\beta = 0.244$; $p \leq 0.001$).*
 - *H10: Awareness of media security moderates the relationship between self-presentation in actualized media affordance and implicit knowledge sharing such that the positive relationship between self-presentation in*

actualized media affordance and implicit knowledge sharing is stronger for users who are aware of media security is high ($\beta = 0.228$; $p \leq 0.001$).

4. The relationship between organizational tenure and professional tenure to knowledge sharing was tested. The analysis results show
- *Hypothesis 11: Organizational tenure ($\beta = 0.19$; $p = 0.186$) has no positive association with explicit knowledge sharing behavior.*
 - *Hypothesis 12: Professional tenure ($\beta = 0.214$; $p = 0.03$) has positive association with explicit knowledge sharing behavior.*
 - *Hypothesis 13: Organizational tenure ($\beta = 0.181$; $p = 0.056$) has no positive association with implicit knowledge sharing behavior.*
 - *Hypothesis 14: Professional tenure ($\beta = 0.287$; $p = 0.003$) has positive association with implicit knowledge sharing behavior.*

Chapter 5

Conclusions, Implications, Recommendations, and Summary

Discussion

This study empirically assessed the effects of media affordances and media security awareness on knowledge sharing behaviors among GSD team members. Participants in the study were project team members including cross functional team members. The results of this study showed awareness of media security had significant effects on implicit knowledge sharing from self-presentation affordance and editability affordance. The use of media with higher levels of self-presentation affordance and editability affordance may promote implicit knowledge sharing donation. This finding suggest user awareness of media security use influences the behavior of implicit knowledge sharing. Implicit knowledge is tacit knowledge learned from experience in past projects carried out in different context, and applying that knowledge to organizational memory (Ajmal & Koskinen, 2008). The prior studies provided several findings that may explain the results of this study. Gibbs et al. (2013) found concerns of job security and data confidentiality among users are important in engaging in implicit knowledge sharing. Media was employed to combat confidentiality concerns by relying on specific media that allowed them to bound and limit their audience more easily and thus control what was shared with whom. Through the feature of “selective sharing,” concerns of job security was addressed and enabled employees to retain their expertise

and not weaken their position (Gibbs et al., 2013). Evan et al. (2017) identified several issues relating to security and legislative issues that inhibited knowledge sharing. Razzak et al. (2013) reported knowledge sharing challenges as a result of technological problems such as difficulties sharing tacit knowledge due to lack of suitable tools for visualization and synchronous collaboration. Dingsoyr and Smite (2014) found the inability to effectively use search functions for retrieving information from knowledge sharing repositories inhibited knowledge sharing. Al-Ani et al. (2011) found a lack of strategies/plans for effectively applying existing tools. Some users find communicating through media more energy and time-consuming (Chen & Kuo, 2017). Distributed members find it difficult to locate tacit information such as architectural knowledge when a central repository does not exist (Clerc, Lago, & Vliet, 2011). Media technologies in distributed environments help increase knowledge sharing by providing higher cadence and flexibility where sharing knowledge is independent of place and time (Kotlarsky et al., 2008).

The results of the PLS analysis is presented in Figure 2, it provides substantive evidence that implicit knowledge behavior is influenced by awareness of media security at 30%. The relationships between these constructs were strengthened by a moderating effect of awareness of media security on actual self-representation affordance ($\beta = 0.228$; $p \leq 0.05$) and editability affordance ($\beta = 0.244$; $p \leq 0.05$), where both showed a significant effect.

The findings in this study assessed the research questions on the relationships between perceived media affordances and actual use of media affordances in GSD teams. The results from the study showed positive relationships do exist between perceived

media affordances and actual use of media affordances. Perceived awareness affordance showed a strong relationship to actual awareness affordance ($\beta = 0.633$; $p \leq 0.05$). Strong relationships were shown between perceived searchability affordance and actual searchability affordance ($\beta = 0.457$; $p \leq 0.05$), and also between perceived editability affordance and actual editability affordance ($\beta = 0.444$; $p \leq 0.05$). Although the R squared values were low, there are relationships between perceived and actual use of all the affordances for awareness, searchability, editability, and self-presentation, except pervasive affordance. The relationship between perceived pervasive affordance and actual use of pervasive affordance showed nonsignificant relationship, but the p-value is 0.057.

Actual pervasiveness affordance shows a strong relationship to explicit knowledge sharing behavior ($\beta = 0.51$; $p \leq 0.05$). However, the findings did not show significance between some affordance relationships, knowledge sharing behavior, and awareness of media security. Actual awareness affordance and searchability affordance showed no influences on explicit knowledge sharing, but only pervasiveness affordance. This implies that media features of pervasiveness are used to contribute to explicit knowledge sharing behavior. Actual awareness and searchability affordances have no significant influence on explicit knowledge sharing. The relationship between actual awareness and explicit knowledge sharing behavior is non-significant ($\beta = -0.333$; $p \leq 0.05$). The negative non-significant association between awareness and explicit knowledge sharing may suggest that actual awareness of media may lack actualization of some media choices for explicit knowledge sharing. A users perceived awareness and actual awareness of media use may be significant ($\beta = 0.633$; $p \leq 0.001$), but choose not to

use actualized media for explicit knowledge sharing ($\beta=-0.333$; $p \leq 0.001$) for a variety of reasons. Note the relationship between actual use of searchability and explicit knowledge sharing behavior reached a marginal significance level ($\beta = -0.631$; $p \leq 0.05$). (The p -value is 0.055). The association between perceived searchability and actual searchability is significant, when the association between actual searchability and explicit knowledge sharing is marginally negative. The negative marginal significance in the association between actual searchability and explicit knowledge sharing is close to $p > 0.05$, and could be strengthened by increasing the sample size and additional testing. This weakness in significance may suggest a user's choice not to use actualized media for explicit knowledge sharing for a variety of reasons.

Organizational tenure showed no influence on explicit knowledge sharing. Keyes (2008) and Gumus (2007) research found organization tenure had no effect on knowledge sharing. The relationship between organizational tenure and implicit knowledge sharing behavior reached a marginal significance level ($\beta = 0.181$; $p \leq 0.05$). (The p -value is 0.056). Professional tenure shows a strong relationship to explicit knowledge sharing behavior ($\beta = 0.214$; $p \leq 0.05$) and implicit knowledge sharing behavior ($\beta = 0.287$; $p \leq 0.05$).

Conclusions

This study investigated personal media users' knowledge sharing behaviors. A research model of knowledge sharing behavior and media affordances was developed and tested using survey data collected from 241 GSD employees. The data analyses revealed several major findings. First, perceived media affordances have direct influences on

actualized media affordances in GSD teams' knowledge sharing context. Second, awareness of media security had moderating effects on the relationships between actualized editability and self-representation affordances and implicit knowledge sharing behavior. Additionally, professional tenure had direct correlations to both explicit and implicit knowledge sharing. However, there are no significant correlations of organizational tenure with both explicit and implicit knowledge sharing. These findings provided an enriched understanding of employees' media use and knowledge sharing behavior in the GSD context where media choice is voluntary.

Implications and Recommendations

This study focused on media affordances using a relational approach to explain the effects of perceived media affordance and actualized use of media affordance on knowledge sharing behavior. First, media affordances were identified that are perceived and actualized when global software development teams share knowledge using media. These media affordances include awareness, pervasiveness, searchability, editability, and self-representation. This finding was relative to Rice et al. (2017) study of organizational media affordances that identified the media affordances used in this study, and it is relevant to affordance research. For this study, visibility was removed to avoid multicollinearity when the VIF statistic was greater than 3.3 (Diamantopoulos & Siguaaw, 2006). Second, the relationships between perceived media affordance (awareness, pervasive, searchability, editability, and self-realization) and actualized media use affordance in global software development teams were significant. Team members are more likely to use media if their perception of media features and functionality is realized

as a benefit them (Cabrera & Cabrera, 2002). These results contribute to a current gap in the literature where the relationship between perceived media affordance and actual use of media affordance have not been examined. Third, a moderating effect of awareness of media security was found to be significant for the relationship between actual editability affordance and implicit knowledge sharing, and actual self-realization and implicit knowledge sharing. Team members with a heightened awareness of security are more conscientious when sharing knowledge with others. The more educated team members are about information technology, the more aware they become of security policy (D'Arcy et al., 2009). From a theoretical standpoint, this finding was most interesting for awareness of media to have a positive effect on implicit knowledge by way of creating, sharing and revising knowledge. This finding provided a theoretical contribution to media affordances and knowledge sharing research. Fourth, all media affordances identified in this study did not affect knowledge sharing behavior, except for actual pervasiveness affordance and actual searchability affordance that correlates with explicit knowledge sharing behavior. Team members share and donate knowledge that is locatable and searchable, when media features promote querying and social networking such as texting, blogging, etc. (Cabrera & Cabrera, 2002). Fifth, awareness of media security had a significant effect on the relationship between actual editability affordance and implicit knowledge sharing behavior, and the relationship between actual self-realization affordance and implicit knowledge sharing behavior. Team members are conscientious when sharing acquired knowledge (experience and skills derived from other companies), who they share it with, and how they represent themselves when using varying types of organizational media. The last finding, organizational tenure, correlated significantly to

implicit knowledge sharing behavior, but not to explicit knowledge sharing behavior. Professional tenure correlated significantly to explicit and implicit knowledge sharing behavior. Organizational tenure influences sharing implicit knowledge, but not explicit knowledge. Boardia, Irmer, and Abusah (2002) found when knowledge is shared interpersonally, organizational tenure has a positive influence on knowledge sharing. In contrast, Gilson et al. (2013) found that knowledge sharing moderated the relationship between tenure diversity and individual explicit knowledge. Gilson et al. (2013) did not examine the relationship between tenure diversity and implicit knowledge. In this study, tenure was examined at a broader level focusing on the correlation between organizational tenure, professional tenure, and knowledge sharing behavior. The length of time an employee works for an organization showed no effect on explicit knowledge sharing. Team members with organizational tenure are less inclined to share how to search for and locate knowledge. In theory, the length of time an employee has held a certain position and accumulated specialized knowledge, can positively affect explicit and implicit knowledge sharing behavior. This finding contributes to tenure and knowledge sharing research in predicting team members' willingness to share experience, skills, lessons learned, and work products among other team members. Future research to examine the relationship between variables of organizational and professional tenure and knowledge sharing behavior would increase contribution to literature.

Organizations should consider the internal processes of distributed teams that donate to explicit and implicit knowledge prior to selecting an appropriate media for knowledge sharing. The differences and similarities in processes should be discussed to determine if selected media can be customized for use. Security policies should include

the types of information and security level that can be shared, and who should have access to that information. The key to team member's use of media for knowledge sharing is media usability, performance, and awareness of security.

Limitations and Future Studies

In this study, research to test the relationships of perceived media affordance, actualized media use of affordance, awareness of media security, and knowledge sharing behavior was insufficient. The survey measurement was limited because it's difficult to measure change in the sample unless there is more than one survey at different entry points. Data for this study was collected through a web-based survey. The participants were cross cultural and located in diverse areas. Subjective bias and cultural bias could contribute to participant responses. The type of industry and work environment could influence participant perception and response. Focus groups or personal interviews may have been more revealing through observation and discussion. However, participant sensitivity regarding privacy concerns did not allow any observations especially of knowledge-sharing interactions. Observation would provide the opportunity to notice subtle and subconscious aspects of linguistic behavior as they occur, and therefore could have been extremely useful in studying the effect of media affordances on knowledge sharing behavior.

GSD team members are aware of the benefit of media as a key role in implicit knowledge sharing. This study confirmed a relationship exist between actual media use in implicit knowledge sharing, but identity of the effect is not clear. The causal effect may result from uncertainty about the critical nature of the information, the level of trust in

sharing with some team members, how to maximize media features to achieve optimal knowledge sharing, and uncertainty surrounding the quantity and quality of shared information. The most positive outcome of the study was that clear evidence was provided that a relationship does exist between awareness of media use and implicit knowledge sharing. With proper media selection and understanding of associated media features, could facilitate collaborative and knowledge sharing processes, with users uploading and sharing their own content and ideas for comment and discussion by others.

Future studies would benefit from researching real-world team use of a specific knowledge management or collaboration tool to examine the relationship between media use and knowledge sharing, and the effect of awareness of media security. The findings in this study, awareness of media security significant effect on implicit knowledge sharing, should be researched in more detail to determine exactly what the causal effect is of the relationship. Also extend the data gathering time to attract more participants to collect more data. In conclusion, the study confirmed the relationship between actual use of media affordance and implicit knowledge sharing behavior, and the effect of awareness of media use in implicit knowledge sharing behavior. A larger sample of team members could further validate the results of this study and possibly change the outcome of non-significant relationship.

Appendices

Appendix A:

Survey Questionnaire

Participant Letter for Anonymous Surveys NSU Consent to be in a Research Study Entitled

Knowledge Sharing Behavior: Understanding Communication Media Affordances and the Role of Awareness of Media Security

The person doing this study is Linda Greene with Nova Southeastern University College of Computing and Engineering. They will be helped by Inkyoung Hur.

You are being asked to take part in this research study because you are an employee/member of a Global Software Development Team or a Global Software Cross-Functional Project Team.

This research study is designed to specifically look at what motivates employees to share knowledge and how the use of and perceived usefulness of various technologies may influence their decision to share knowledge within an organization. You will be presented a question regarding sharing your work-related knowledge with members of your team. The primary topics include: a) *Demographics*, b) *Perception of communication*, c) *Awareness of Media Security*, d) *Sharing Information*, e) *Actual Use of Information Technology*

You will be taking a one-time, anonymous survey. The Survey will take approximately 15 minutes to complete.

This research study involves minimal risk to you. To the best of our knowledge, the things you will be doing have no more risk of harm than you would have in everyday life.

You can decide not to participate in this research and it will not be held against you. You can exit the survey at any time.

There is no cost for participation in this study. Participation is voluntary and no payment will be provided.

Your responses are anonymous. Information we learn about you in this research study will be handled in a confidential manner, within the limits of the law. Participants may choose to participate in the study by clicking the survey link or typing the survey link information into their web browser on their computer, tablet, or phone. The survey does not ask for, nor does it record any name, email, IP address, or other personally identifiable or location information. Survey data will be available to the researcher, the Institutional Review Board and other representatives of this institution, and any granting

agencies (if applicable). No confidential data will be collected. All survey data will be kept securely. All data will be stored on encrypted servers and password-protected computers. In accordance with the NSU IRB Policy, the data will be kept for a minimum of 36 months, then securely erased/destroyed using NIST Special Publication 800-88 Guidelines for Media Sanitation or other appropriate guidance.

If you have questions, you can contact Linda Greene at lindgree@mynsu.nova.edu or Inkyoung Hur at ihur@nova.edu.

If you have read the above information and voluntarily wish to participate in this research study, please access the survey at https://qtrial2018q3az1.az1.qualtrics.com/jfe/form/SV_aWDrC7yencNTC29

- I consent, begin the study
- I do not wish to participate

Demographics

Gender

- Male
- Female

Age

- < 30
- 31 - 40
- 41 - 50
- > 50

Marital Status

- Married
- Divorced
- Widowed
- Separated
- Unmarried/Single

Job Position

Select the position that applies to your job title

- Applications Engineer (Software Developer, Software Engineer, etc.)
- Systems Engineer (Systems Analyst, etc.)
- Integration Engineer (Software, Systems, etc.)
- Test Engineer (Verification, Validation, Quality etc.)
- Hardware Engineer
- Software Quality Engineer
- Core Process Engineer
- Management (Software, Systems, Quality, etc.)
- Executive (CEO, Vice President, Director, etc.)
- Other (manager or engineer position)

Organization Tenure

Select the number of years in your organization

- 0-2
- 3-5
- 6-10
- 11-20
- 21 or more

Professional Tenure

Select the number of years in your profession

- 0-2
- 3-5
- 6-10
- 11-20
- 21 or more

Education

Select the highest level of education completed

- Some college
- 2 year degree
- 4 year degree
- Professional degree
- Graduate degree (M.A., M.S., PhD, etc.)

Location (location of employment)

- Africa
- Asia
- Europe
- South America

- Middle East
- North America
- Asia Pacific Rim

Perception of Communication

Please indicate how you perceive the capability of communication media (i.e. email, instant messaging, and wiki) that you can use within your department.

I see other people's responses to other people's questions.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I see who has interactions or links with employees or their information.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I see how many others who “liked” or linked to the same content.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I edit others’ information after they have posted it. (*Edit - to make changes to information or add additional information for context and/or clarity*)

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I edit my information after I have posted it. (*Edit – for context and/or clarity*)

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I create or edit a document collaboratively.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I include the information, photos, and other content that present my personal identity on organization's media.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I adjust my organization's media profile to my preferences.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I use font style, size, and color to emphasize communication with team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I create groups for sharing information about specific projects.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I get responses to my requests from others in a timely manner.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I communicate with others while moving, commuting, and traveling.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I communicate less frequently with indirect work relationships (i.e. not project specific).

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I search for information or people by entering search words.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I search for information or people by following links between contents.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I search for tags or keywords that someone else has added to content.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of the information others in my project team have.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of the information others outside of my team (cross-functional teams) have.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of project activities, opinions, and locations of others.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I keep up-to-date with the progress of projects.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I keep up-to-date with the policies and norms of my project team.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of all media technologies available to my project team.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Awareness of Media Security

Please indicate the degree that reflects your awareness level of the security of security media in your department (email, firewall, wireless network, browser security, etc.)

I am aware of technology and information security issues.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of computer software copyright and software piracy laws.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of the consequences of modifying computerized data in an unauthorized way and limited administrative rights/authorization.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of computer security responsibilities.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of the potential to compromise cyberinfrastructure.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware of the consequences of accessing computer systems that are not authorized to use.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware that my organization has specific guidelines that describe acceptable use of e-mail.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware that my organization has a formal policy that forbids employees from accessing communication technologies that they are not authorized to use.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I am aware that my organization has specific guidelines that describe acceptable use of computer passwords.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Sharing Information

Select the option that reflects how you share and receive information with your project team members.

I share software information with project team members (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I share software information with cross functional teams in other locations (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I share customer communications (i.e. meeting minutes, emails, etc.) with team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I share customer communications (i.e. meeting minutes, emails, etc.) with cross-functional teams in other departments.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I share project schedules and modifications to project schedules (e.g., milestones, timing, release dates) with team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

I share project schedules and modifications to project schedules (e.g., milestones, timing, release dates) with cross-functional teams in other departments.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members' share software issues with me freely or when I ask (i.e. software implementation and requirement defects, supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, lessons learned).

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams in other departments share issues that may impact software freely or when I ask (i.e. supplier issues, corrective action reports, test validation reports, engineering changes, release information, best practices, and lessons learned).

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members' share customer communications with me freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams' in other departments share customer communications with me freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members share project schedules and modifications to project schedules (milestones, timing, release dates) freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams in other departments share project schedules and modifications to project schedules (milestones, timing, release dates) freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

When I acquire new skills (i.e. methodologies, tools, processes, etc.) I share those skills with team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

When I acquire new skills (i.e. methodologies, tools, processes, etc.), I share those skills with cross-functional team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

When I identify process issues, I share those issues with team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

When I identify process issues, I share those issues with cross-functional team members.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members' share acquired new skills freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams share acquired new skills freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members' share process issues and changes freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams in other departments share process issues and changes freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Team members' share defects identified in customer requirements freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Cross-functional teams in other departments share defects identified in customer requirements freely or when I ask.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Actual Use of Communication Technology

Please indicate how often you use each technology to share your knowledge (facts, information, skills acquired from experience or education) with your team members

Face-to-face (one-on-one) meeting

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Face-to-face (meetings)

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Email

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Telephones (landline and cell phone calls)

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Short messages (text messaging, instant messaging)

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Conference calls (no videos)

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Conference calls (WebEx, etc.)

- Never
- A few times a year or less
- Once a month or less
- A few times a month
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Intranet (internal social medium)

- Never
- A few times a year or less
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

External social media

- Never
- A few times a year or less
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Wiki

- Never
- A few times a year
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

SharePoint (temporary work space, etc.)

- Never
- A few times a year
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Version control (SVN, archiving project information, etc.)

- Never
- A few times a year
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Product life-cycle management system

- Never
- A few times a year
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a day
- Many times a day

Requirements management system

- Never
- A few times a year
- Once a month or less
- A few times a month or less
- Once a week
- A few times a week
- Every day
- A few times a week
- Many times a day

Thank you for participating in this study!

Appendix B:

IRB Approval Letter

□



NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: **Linda Greene**

From: **Ling Wang, Ph.D.,
Center Representative, Institutional Review Board**

Date: **October 25, 2018**

Re: **IRB #: 2018-542; Title, "Knowledge Sharing Behavior: Understanding Communication Media Affordances and the Role of Awareness of Media Security"**

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review under **45 CFR 46.101(b) (Exempt 2: Interviews, surveys, focus groups, observations of public behavior, and other similar methodologies)**. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

- 1) **CONSENT:** If recruitment procedures include consent forms, they must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.
- 2) **ADVERSE EVENTS/UNANTICIPATED PROBLEMS:** The principal investigator is required to notify the IRB chair and me (954-262-5369 and Ling Wang, Ph.D., respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.
- 3) **AMENDMENTS:** Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: **Inkyoung Hur**
Ling Wang, Ph.D.

Appendix C:

Pilot Study Results

Reliability Statistics, Tests of Normality, and Descriptives

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized	
	Items	N of Items
D.888	.874	81

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mahalanobis Distance	.245	10	.091	.	10	.000

a. Lilliefors Significance Correction

Descriptives

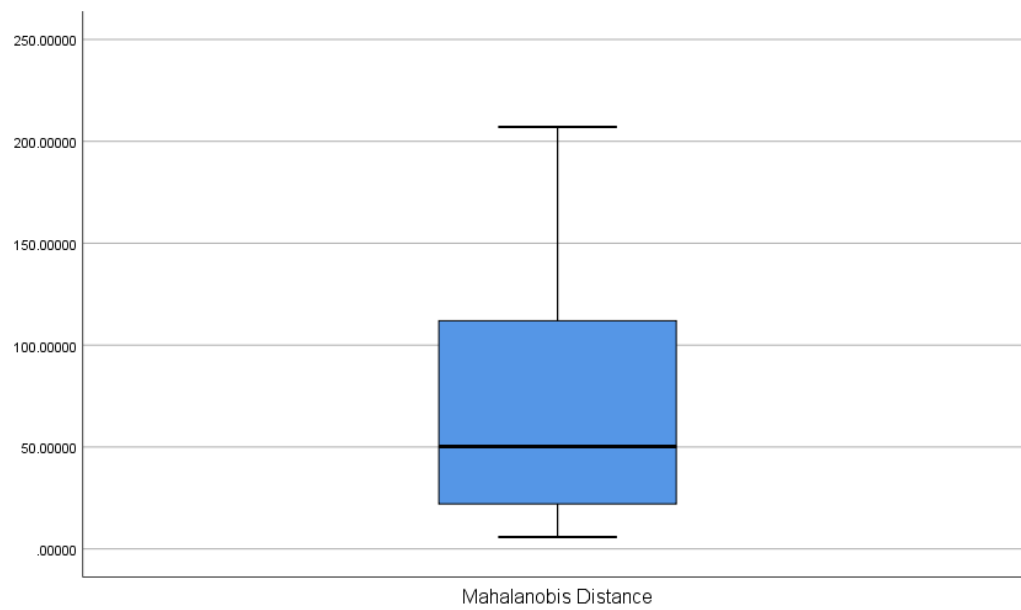
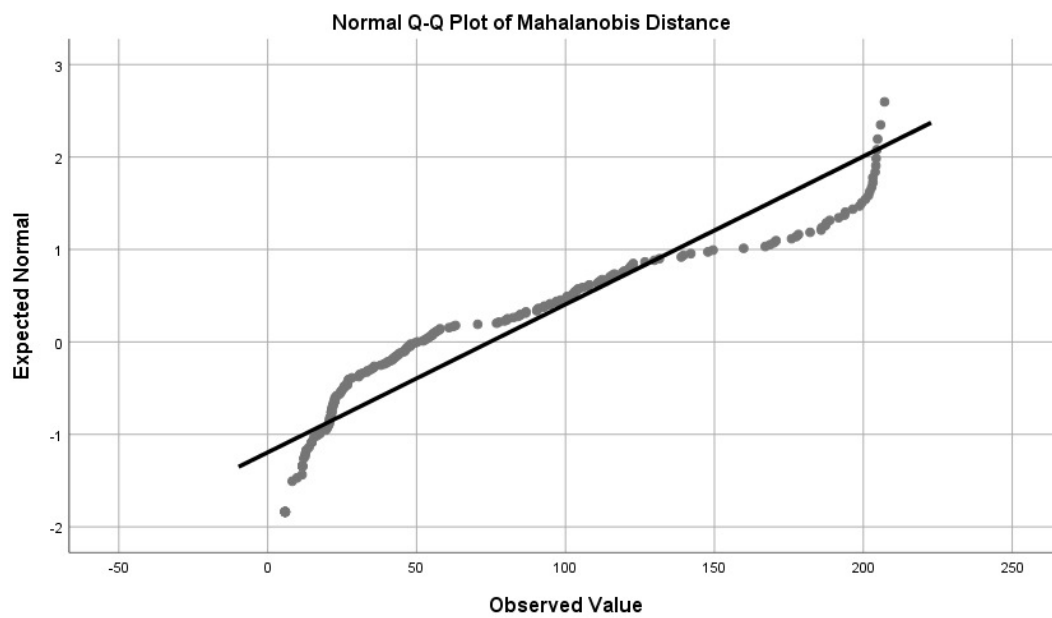
		Statistic	Std. Error	
Mahalanobis Distance	Mean	8.1000000	.00000000	
	95% Confidence Interval for Mean	Lower Bound	8.1000000	
		Upper Bound	8.1000000	
	5% Trimmed Mean	8.1000000		
	Median	8.1000000		
	Variance	.000		
	Std. Deviation	.00000000		
	Minimum	8.10000		
	Maximum	8.10000		
	Range	.00000		
	Interquartile Range	.00000		
	Skewness	1.069	.687	
	Kurtosis	-1.237	1.334	

Appendix D:*Mahalanobis Distance Stem and Leaf Plot*

		Descriptives	
		Statistic	Std. Error
Mahalanobis Distance	Mean	74.6445498	4.30079052
	95% Confidence Interval for Mean	Lower Bound	66.1662948
		Upper Bound	83.1228048
	5% Trimmed Mean	71.2645523	
	Median	50.2527438	
	Variance	3902.825	
	Std. Deviation	62.47259094	
	Minimum	5.85695	
	Maximum	207.11586	
	Range	201.25891	
	Interquartile Range	90.17238	
	Skewness	.823	.167
	Kurtosis	-.572	.333

		Extreme Values		
			Case Number	Value
Mahalanobis Distance	Highest	1	10	207.11586
		2	213	205.80593
		3	210	204.80054
		4	1	204.50646
		5	31	204.30971
	Lowest	1	200	5.85695
		2	199	5.85695
		3	197	5.85695
		4	120	5.85695
		5	119	5.85695 ^a

a. Only a partial list of cases with the value 5.85695 are shown in the table of lower extremes.



Appendix E:

Normality and Scatter Plot

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.825 ^a	.681	.504	43.450

a. Predictors: (Constant), Shar22, Shar2, Dem_8, Act4, Act10, Dem_5, Dem_3, Act11, Act1, Per14, IShar13, Dem_2, C1, Dem_4, Shar20, Act9, Dem_7, Shar14, Per13, Act8, Per20, Act6, Per4, Dem_1, Shar18, Per6, Act5, Act7, Per9, Shar16, Awa5, Dem_6, Act3, Shar15, Per16, Shar12, Per10, Per8, Act2, Shar10, Per21, Per7, Per11, Per17, Awa7, Shar5, Per22, Per19, Per12, Shar9, Shar21, Per5, Shar19, Awa3, Act12, Shar8, Per18, Shar17, Awa8, Per15, Per1, Per2, EShar1, Awa2, Act13, Awa1, Awa6, Shar11, Shar3, Shar6, Awa4, Per3, Shar7, Shar4, Awa9

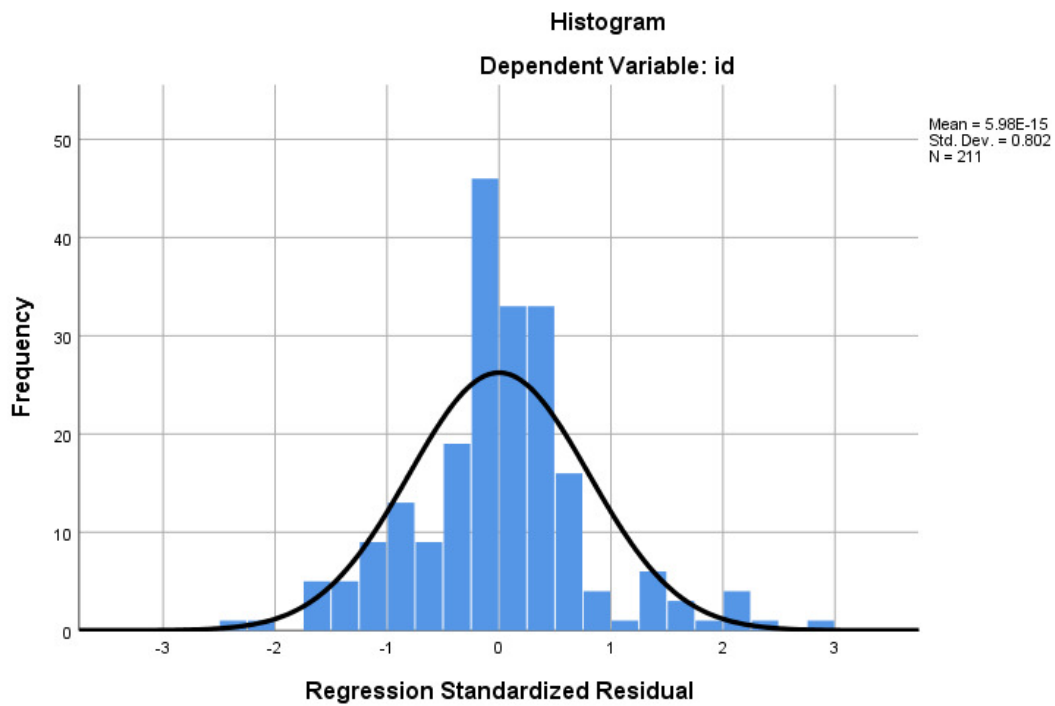
b. Dependent Variable: id

ANOVA^a

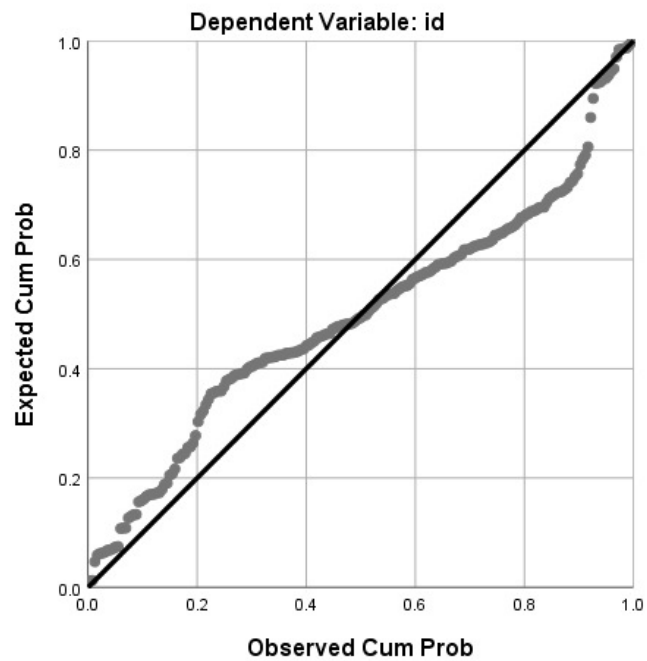
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	544079.019	75	7254.387	3.843	.000 ^b
	Residual	254870.147	135	1887.927		
	Total	798949.166	210			

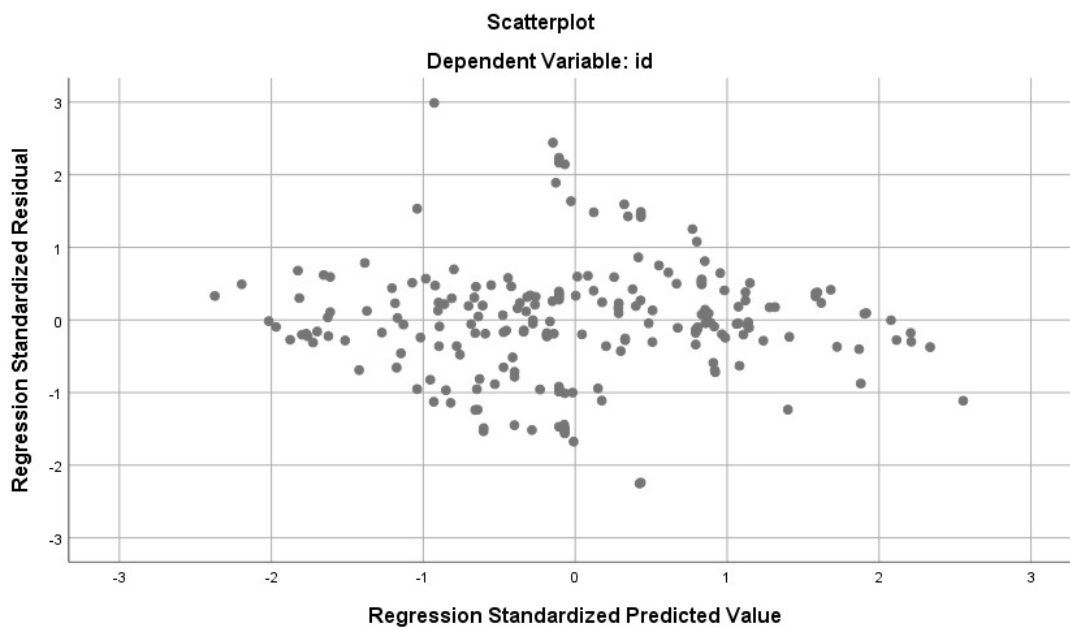
a. Dependent Variable: id

b. Predictors: (Constant), Shar22, Shar2, Dem_8, Act4, Act10, Dem_5, Dem_3, Act11, Act1, Per14, IShar13, Dem_2, C1, Dem_4, Shar20, Act9, Dem_7, Shar14, Per13, Act8, Per20, Act6, Per4, Dem_1, Shar18, Per6, Act5, Act7, Per9, Shar16, Awa5, Dem_6, Act3, Shar15, Per16, Shar12, Per10, Per8, Act2, Shar10, Per21, Per7, Per11, Per17, Awa7, Shar5, Per22, Per19, Per12, Shar9, Shar21, Per5, Shar19, Awa3, Act12, Shar8, Per18, Shar17, Awa8, Per15, Per1, Per2, EShar1, Awa2, Act13, Awa1, Awa6, Shar11, Shar3, Shar6, Awa4, Per3, Shar7, Shar4, Awa9



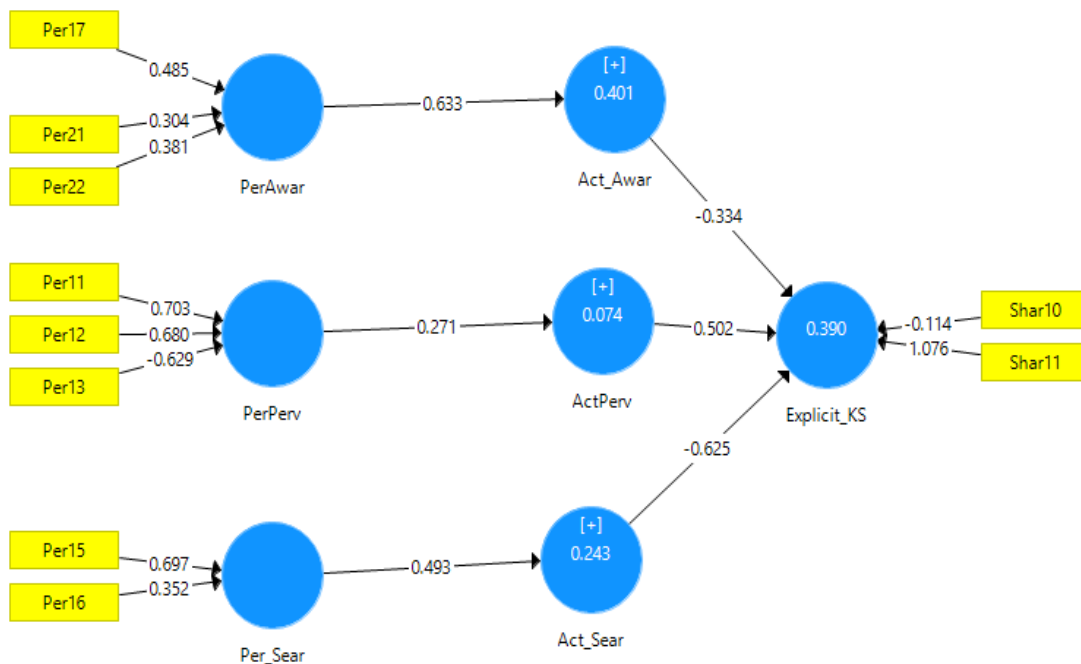
Normal P-P Plot of Regression Standardized Residual



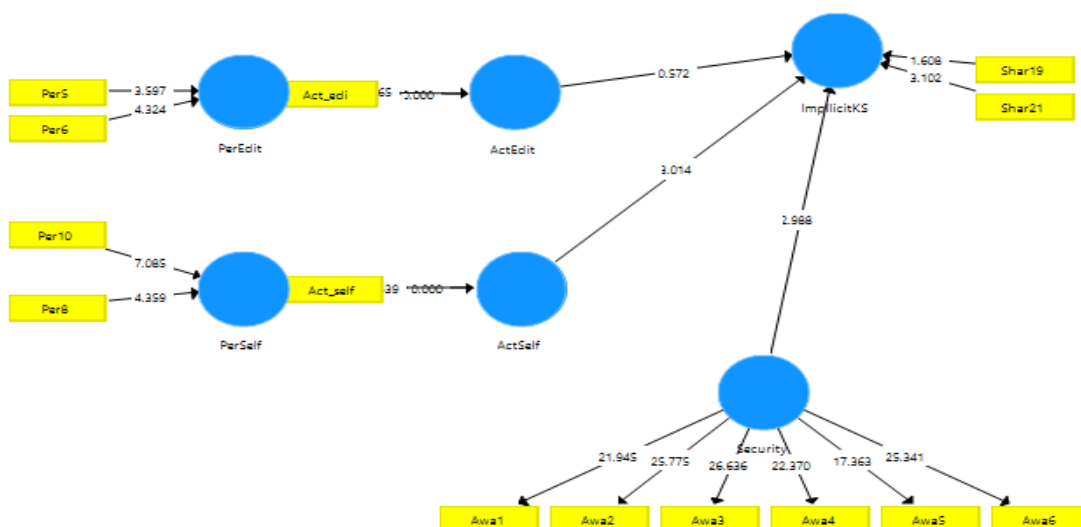


Appendix F:

PLS Factor Analysis - Explicit Knowledge Sharing



PLS Factor Analysis - Implicit Knowledge Sharing



Appendix G:

Structural Path Analysis - Explicit Knowledge Sharing

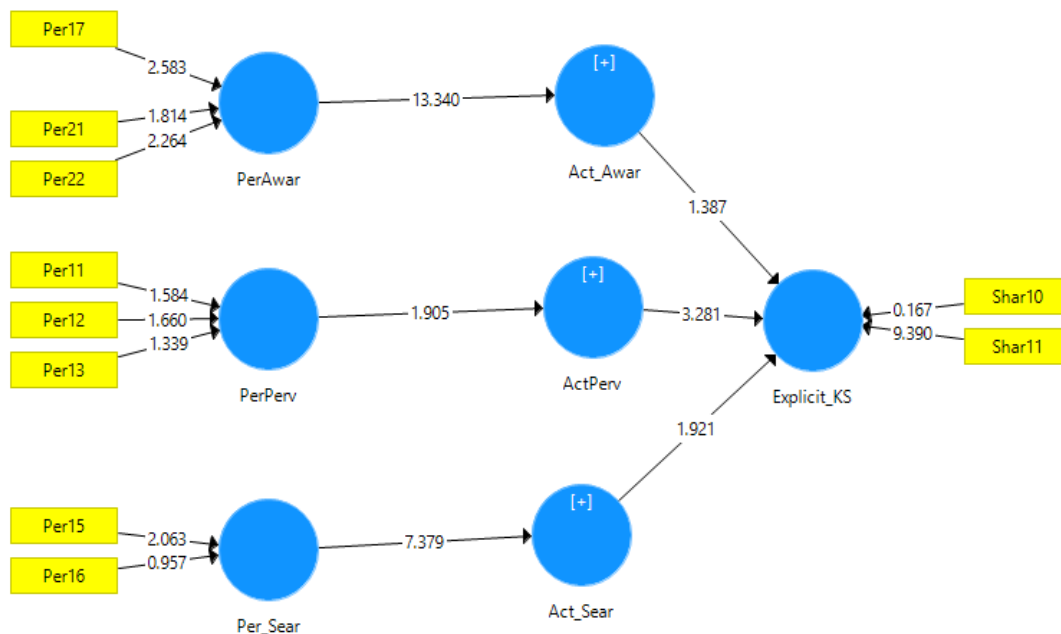


Table 11

Path Coefficient (Bootstrapping) – Inner Loading (Explicit_KS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActPerv -> Explicit_KS	0.51	0.495	0.155	3.281	0.001
Act_Awar -> Explicit_KS	-0.333	-0.345	0.24	1.387	0.166
Act_Sear -> Explicit_KS	-0.631	-0.607	0.328	1.921	0.055
PerAwar -> Act_Awar	0.633	0.643	0.047	13.34	< 0.001
PerPerv -> ActPerv	0.271	0.275	0.142	1.905	0.057
Per_Sear -> Act_Sear	0.493	0.503	0.067	7.379	< 0.001

Structural Path Analysis - Implicit Knowledge Sharing

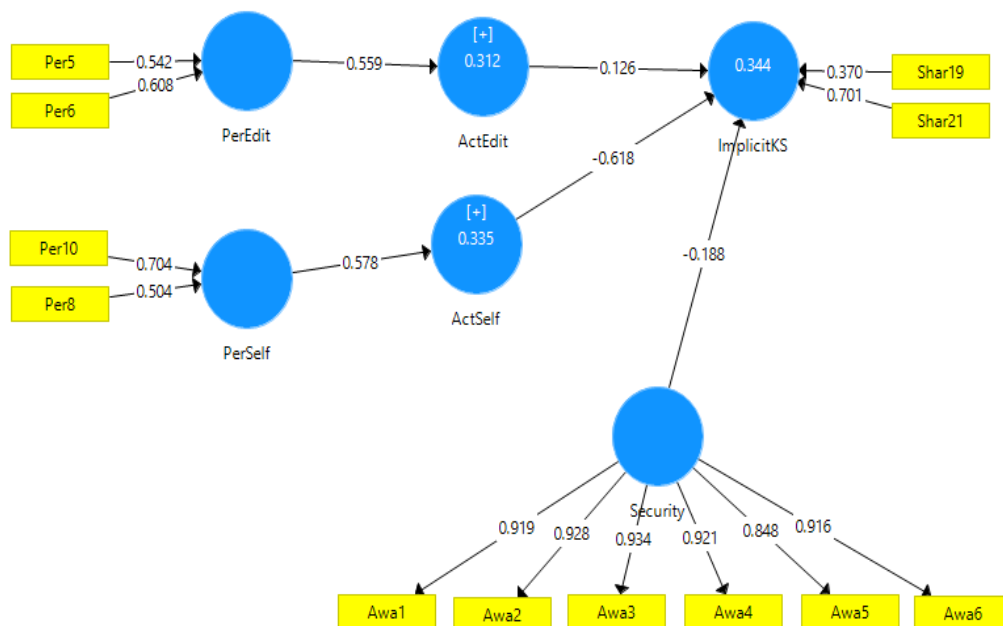


Table 12

Path Coefficient (Bootstrapping) – Inner Loading (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit -> ImplicitKS	0.126	0.126	0.227	0.558	0.577
ActSelf -> ImplicitKS	-0.618	-0.613	0.215	2.875	0.004
PerEdit -> ActEdit	0.559	0.563	0.058	9.633	< 0.001
PerSelf -> ActSelf	0.578	0.582	0.04	14.605	< 0.001
Security -> ImplicitKS	-0.188	-0.199	0.064	2.95	0.003

Appendix H:

PLS Analysis - Moderating effect of awareness of media use on actual use of editability, actual use of self-representation, and implicit knowledge sharing

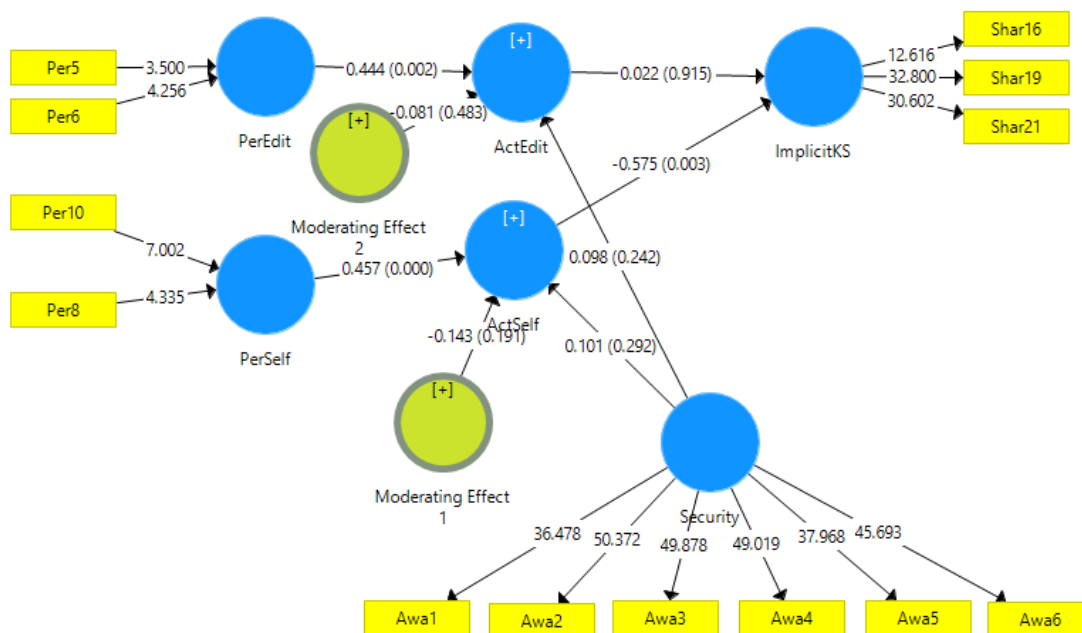


Table 13

Path Coefficient (Bootstrapping) – Moderating Effect (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit -> ImplicitKS	0.022	0.015	0.205	0.107	0.915
ActSelf -> ImplicitKS	-0.575	-0.569	0.191	3.013	0.003
Moderating Effect 1 - > ActSelf	-0.143	-0.184	0.11	1.307	0.191
Moderating Effect 2 - > ActEdit	-0.081	-0.102	0.116	0.702	0.483
PerEdit -> ActEdit	0.444	0.439	0.146	3.032	0.002
PerSelf -> ActSelf	0.457	0.438	0.1	4.556	0.001
Security -> ActEdit	0.098	0.104	0.084	1.17	0.242
Security -> ActSelf	0.101	0.114	0.096	1.055	0.292

PLS Analysis - Moderating effect of awareness of media use on actual use of editability and implicit knowledge sharing

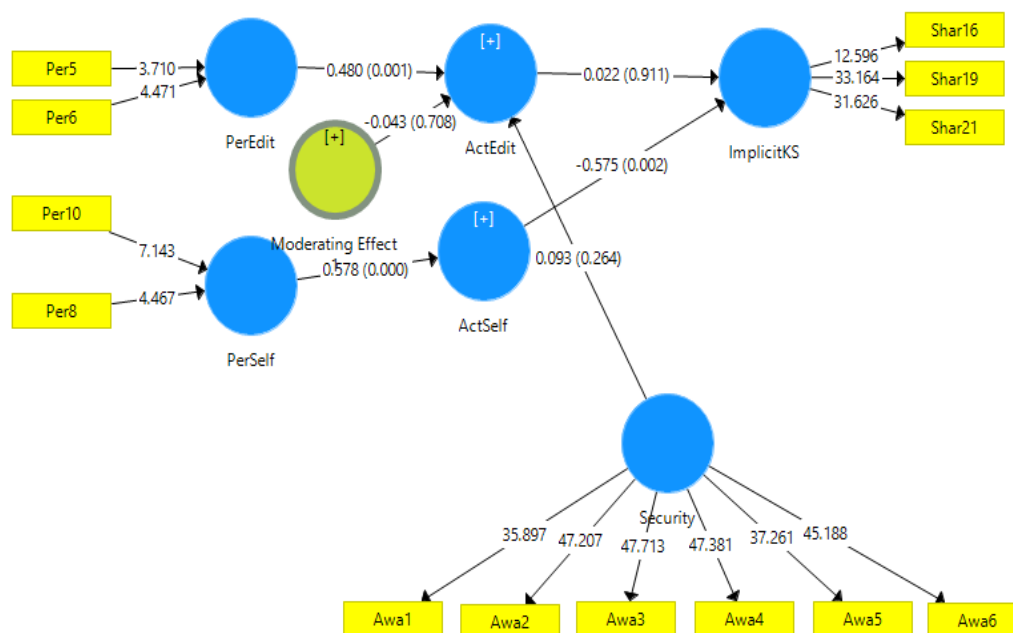


Table 14

Path Coefficient – Moderating Effect on Actual Use of Editability (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit	1	1	< 0.000	< 0.000	< 0.0001
ActSelf	1	1	< 0.000	< 0.000	< 0.001
ImplicitKS	0.894	0.896	0.023	38.888	< 0.001
Moderating Effect 1	1	1	< 0.000	< 0.000	< 0.001
PerEdit	< 0.000	< 0.000	< 0.000	< 0.000	< 0.001
PerSelf	< 0.000	< 0.000	< 0.000	< 0.000	< 0.001
Security	0.968	0.969	0.005	179.48	< 0.001

PLS Analysis - Moderating effect of awareness of media use on actual use of self-representation and implicit knowledge sharing

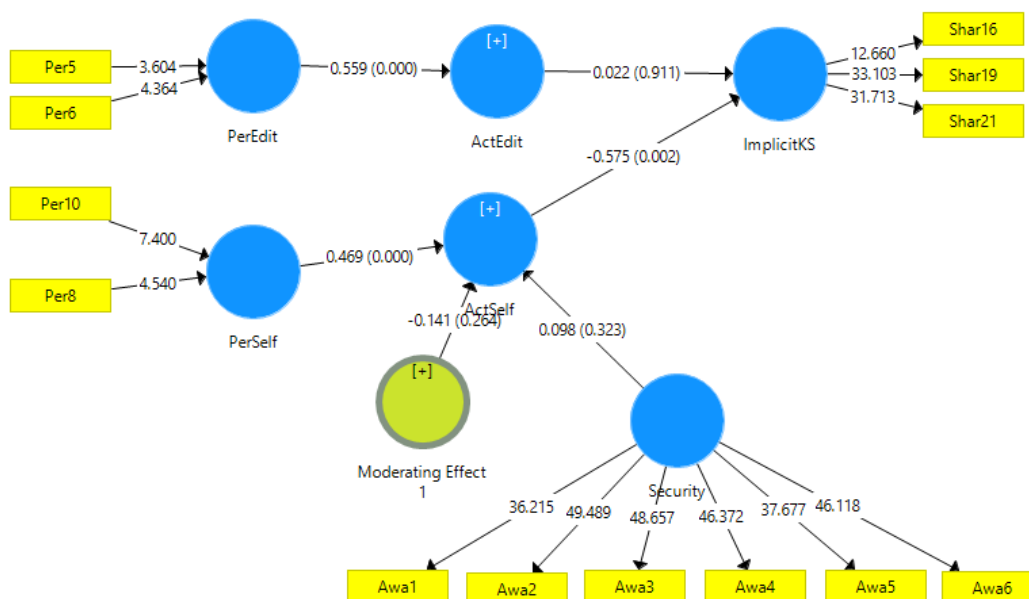


Table 15

Path coefficient – Moderating Effect on Actual Use of Self-Representation (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit -> ImplicitKS	0.022	0.016	0.196	0.112	0.911
ActSelf -> ImplicitKS	-0.575	-0.571	0.182	3.161	0.002
Moderating Effect 1 -> ActSelf	-0.141	-0.158	0.126	1.117	0.264
PerEdit -> ActEdit	0.559	0.562	0.058	9.662	0.001
PerSelf -> ActSelf	0.469	0.458	0.108	4.337	0.001
Security -> ActSelf	0.098	0.108	0.099	0.989	0.323

Appendix I:

PLS Analysis – Demographic Organizational Tenure - Explicit Knowledge

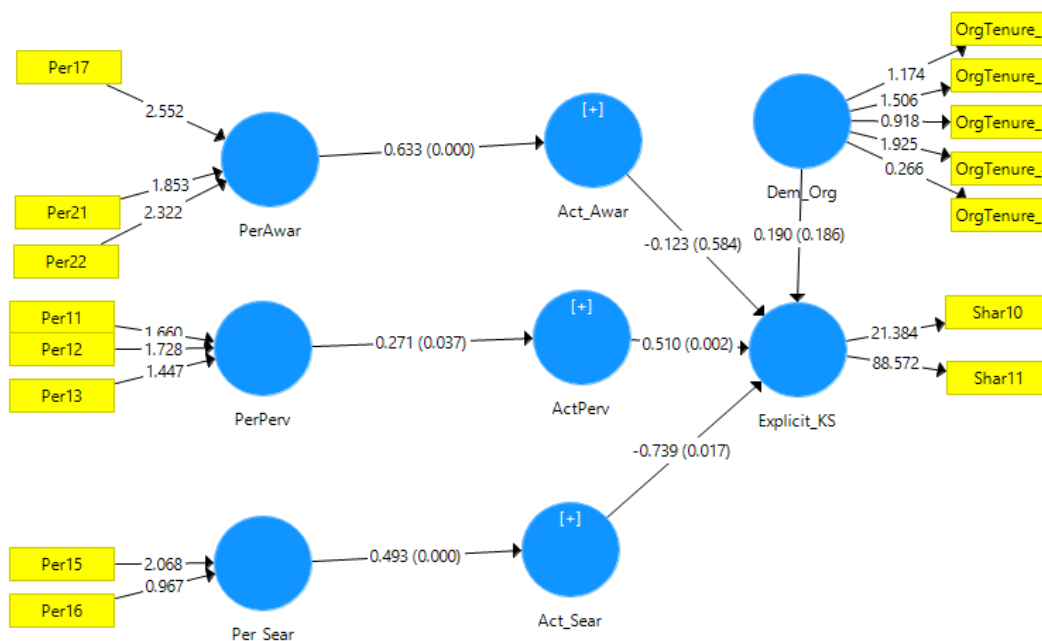


Table 16

Path Coefficient – Organizational Tenure (Explicit_KS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActPerv -> Explicit_KS	0.51	0.512	0.166	3.081	0.002
Act_Awar -> Explicit_KS	-0.123	-0.116	0.225	0.547	0.584
Act_Sear -> Explicit_KS	-0.739	-0.747	0.311	2.379	0.017
Dem_Org -> Explicit_KS	0.19	0.176	0.144	1.322	0.186
PerAwar -> Act_Awar	0.633	0.643	0.047	13.6	0.000
PerPerv -> ActPerv	0.271	0.284	0.13	2.092	0.037
Per_Sear -> Act_Sear	0.493	0.509	0.066	7.509	0.001

PLS Analysis - Professional Tenure on Explicit Knowledge Sharing

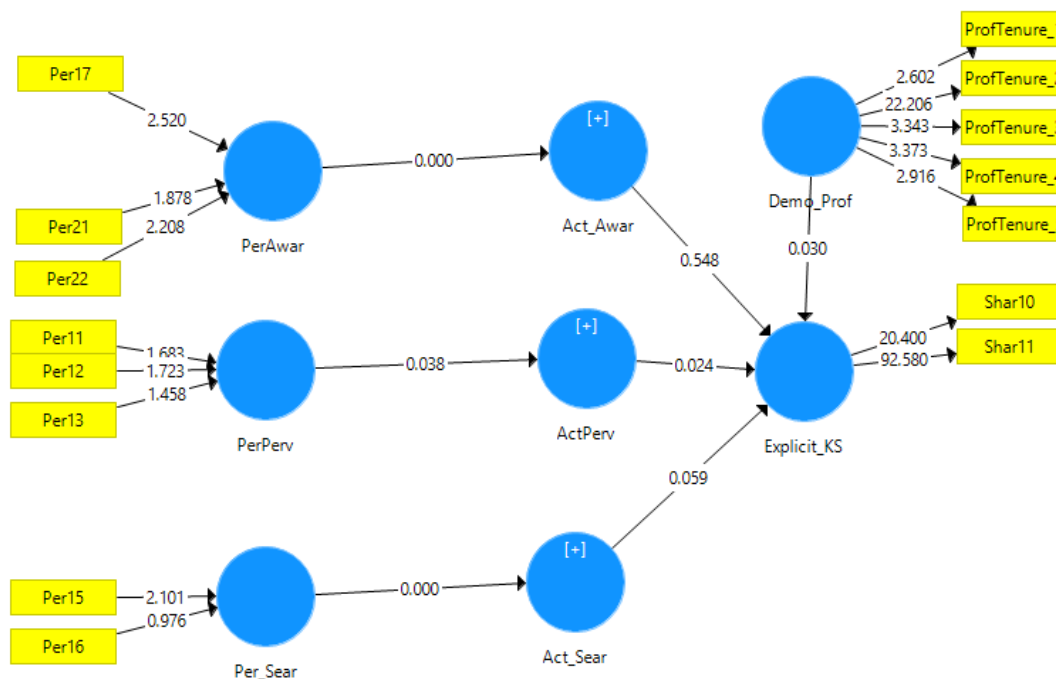


Table 17

Path Coefficient – Professional Tenure (Explicit_KS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActPerv -> Explicit_KS	0.383	0.347	0.17	2.253	0.024
Act_Awar -> Explicit_KS	-0.133	-0.116	0.221	0.601	0.548
Act_Sear -> Explicit_KS	-0.602	-0.575	0.319	1.888	0.059
Demo_Prof -> Explicit_KS	0.214	0.254	0.099	2.168	0.03
PerAwar -> Act_Awar	0.633	0.643	0.046	13.82	< 0.001
PerPerv -> ActPerv	0.271	0.282	0.13	2.081	0.038
Per_Sear -> Act_Sear	0.493	0.504	0.068	7.299	0.001

Appendix J:

PLS Analysis – Demographic Organizational Tenure Implicit Knowledge

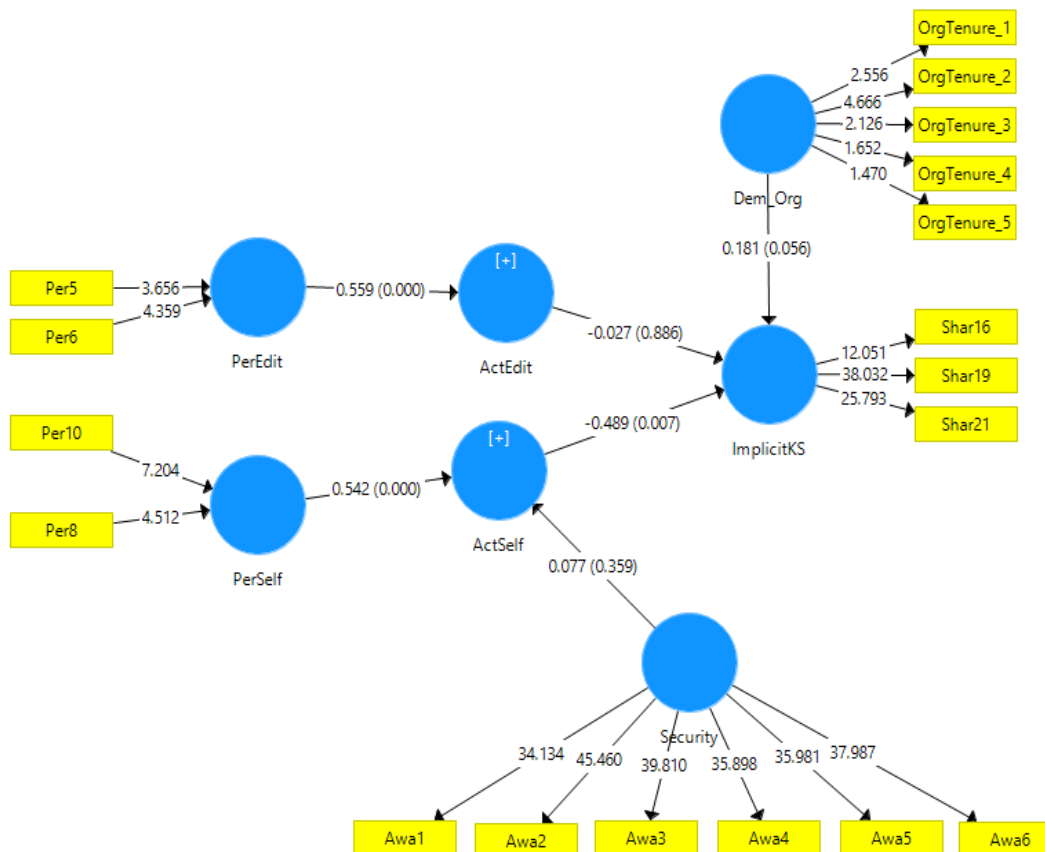


Table 18

Path Coefficient – Organizational Tenure (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit -> ImplicitKS	-0.027	-0.043	0.187	0.143	0.886
ActSelf -> ImplicitKS	-0.489	-0.469	0.182	2.685	0.007
Dem_Org -> ImplicitKS	0.181	0.207	0.095	1.909	0.056
PerEdit -> ActEdit	0.559	0.565	0.057	9.777	< 0.001
PerSelf -> ActSelf	0.542	0.548	0.059	9.255	< 0.001
Security -> ActSelf	0.077	0.077	0.084	0.917	0.359

PLS Analysis – Demographic Professional Tenure Implicit Knowledge

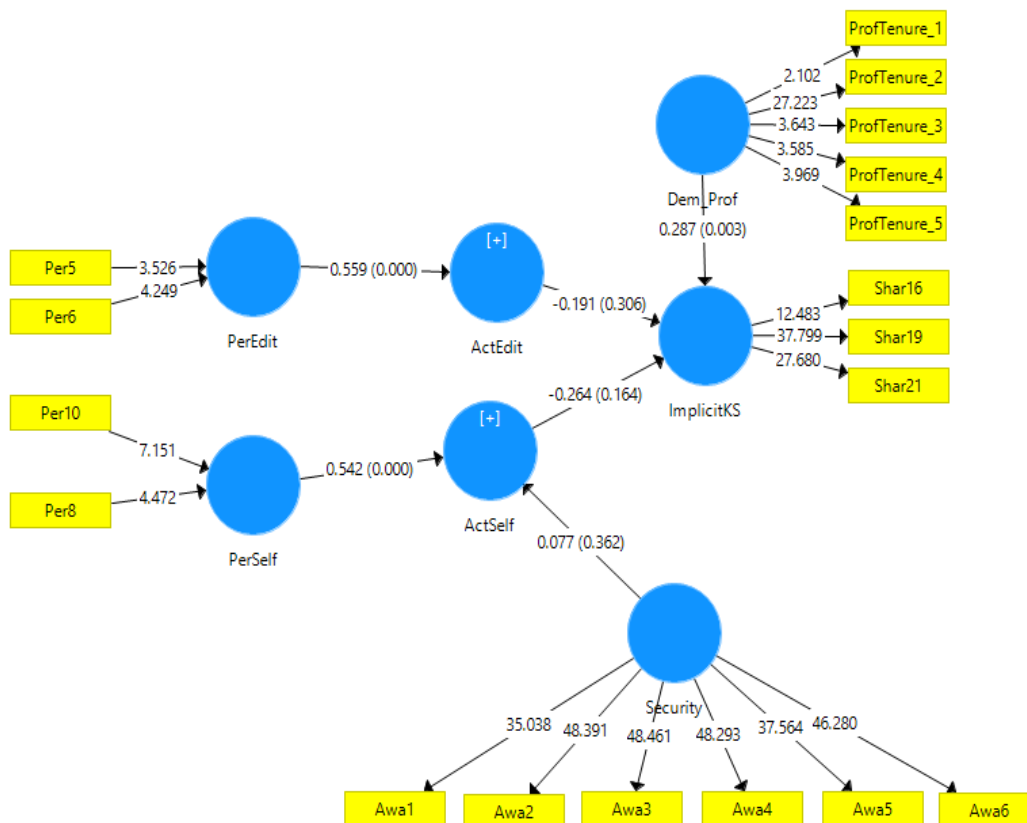


Table 19

Path Coefficient – Professional Tenure (ImplicitKS)

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
ActEdit -> ImplicitKS	-0.191	-0.205	0.186	1.024	0.306
ActSelf -> ImplicitKS	-0.264	-0.237	0.19	1.393	0.164
Dem_Prof -> ImplicitKS	0.287	0.319	0.095	3.025	0.003
PerEdit -> ActEdit	0.559	0.565	0.059	9.424	< 0.001
PerSelf -> ActSelf	0.542	0.546	0.058	9.389	< 0.001
Security -> ActSelf	0.077	0.08	0.085	0.911	0.362

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