A TACIT KNOWLEDGE SHARING MODEL TO ENHANCE STAKEHOLDER ENGAGEMENT IN REQUIREMENTS ELICITATION

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A TACIT KNOWLEDGE SHARING MODEL TO ENHANCE STAKEHOLDER ENGAGEMENT IN REQUIREMENTS ELICITATION

ABSTRACT

Elicitation is an activity that uncovers, acquires, and elaborates requirements for a software system from sources such as stakeholders, documents, systems, and others. Inevitably, missing or mistaken requirements often tend to be problematic in requirements elicitation of requirements engineering. One of the reasons is that crucial information such as business rules, goals, expectations or assumptions often remain tacit, hidden or unshared. Most studies strive to expose tacit knowledge during requirements elicitation by developing various techniques which are not universally applied. However, the issue of tacit knowledge in requirements elicitation continues to hinder the quality of the requirements attained. Consequently, it is critical to emphasize the individual characteristics of stakeholders as primary sources of requirements elicitation. This, however, can only be achieved through gaining insight into the personal factors (i.e., personal ability, relevance, and attitude) and psychological factors such as motivation and communication skills of stakeholders. These will reveal the true reason(s) behind the intention of stakeholders to share tacit knowledge, and thus more accurate and complete requirements can be obtained. There are a few studies on proposed tacit knowledge sharing models in software engineering. Regrettably, studies on relationships between the intention to share tacit knowledge and the affecting factors are still very much unexplored in the field. Hence, the purpose of this study is to provide a deeper understanding of the phenomenon. It investigates how personal factors of stakeholders influence the intention of tacit knowledge sharing. Moreover, this study aims to investigate the effect of factors (i.e., motivation and communication skills) relevant to tacit knowledge sharing. The study employs a quantitative research design

where data are predominantly gathered through an online questionnaire-based survey, comprising a set of items designed to investigate the perception of software practitioners towards how personal factors influence the intention of stakeholders to share tacit knowledge. It specifically examines the relationship between personal factors and the intention of stakeholders, and the mediating effects of motivation and communication skills on the relationship between the two, predominantly tacit knowledge during requirements elicitation. It has attracted a sample of 320 responses from practitioners in the software industry. The results of the survey are indicated in the proposed model, Tacit Knowledge Sharing (TaKS). TaKS illustrates that personal factors are of primary importance and have significant effects on galvanizing the intention of stakeholders to share tacit knowledge, which is crucial in discovering complete software requirements via the inclusion of mediator variables, namely motivation and communication skills in this study. At last, a prototype is built to validate a part of the proposed research model. This study has provided new empirical findings of the impacts of factors including personal factors, motivation, and communication skills on tacit knowledge sharing intentions, which prior research has neglected. Accordingly, greater focus should be placed on the stakeholders particularly on the personal or intrinsic aspect as stakeholders are the primary source of requirements. This insight can be utilized in practice to better support requirements elicitation to achieve a better quality of requirements in terms of completeness and correctness.

Keywords: tacit knowledge, requirements elicitation, stakeholder, personal factor, intention

MODEL PERKONGSIAN PENGETAHUAN TASIT UNTUK MERANGSANG PENGGUNAAN PIHAK BERKEPENTINGAN DALAM KEPERLUAN ELISITASI

ABSTRAK

Elisitasi ialah aktiviti yang mengupas, memperoleh dan menerangkan keperluan sesuatu sistem perisian daripada sumber seperti pihak berkepentingan, dokumen-dokumen, sistem-sistem dan lain-lain lagi. Penyonsangan, kehilangan atau kesilapan keperluan sering menimbulkan masalah dalam keperluan elisitasi keperluan kejuruteraan. Salah satu sebabnya ialah maklumat penting seperti peraturan perniagaan, matlamat, harapan atau anggapan sering kekal tasit, tersorok atau tidak dikongsi. Kebanyakan kajian berusaha membuktikan pengetahuan tasit semasa keperluan elisitasi dengan memperkenalkan pelbagai teknik yang tidak diterima secara universal. Isu pengetahuan tasit dalam keperluan elisitasi sering membantutkan kualiti keperluan yang dicapai. Oleh itu adalah penting untuk menekankan ciri-ciri individu pihak berkepentingan sebagai sumber asas keperluan elisitasi. Walau bagaimana pun ini hanya dapat dicapai melalui pendedahan secara mendalam kepada faktor peribadi (i.e. kebolehan peribadi, kepentingan dan perwatakan) dan lain-lain faktor seperti motivasi dan keupayaan berkomunikasi pihak yang berkepentingan. Ini akan menunjukkan sebab sebenar orang berkepentingan yang ingin berkongsi pengetahuan tasit serta membolehkan keputusan lebih tepat dan keperluan lengkap dicapai. Terdapat beberapa kajian cadangan pengetahuan tasit ke atas model perkongsian dalam kejuruteraan komputer. Malangnya kajian terhadap perhubungan antara keinginan untuk berkongsi pengetahuan tasit dan faktor yang mempengaruhinya masih belum diterokai dalam bidang ini. Inilah yang membawa kepada kajian ini, untuk memberikan peluang memahami dengan lebih mendalam fenomena ini. Mengupas bagaimana faktor peribadi pihak berkepentingan mempengaruhi niat perkongsian pengetahuan tasit. Lagi pun kajian ini juga bertujuan

untuk mengupas (i.e. motivasi dan kebolehan berkomunikasi) kesan terhadap faktor yang relevan kepada pengetahuan tasit. Kajian ini menggunakan corak kajian kuantitatif di mana data dikumpulkan secara dalam talian dengan menggunakan soal selidik berasaskan tinjauan, ia mengandungi satu set item yang dicipta untuk menyiasat persepsi pengamal perisian terhadap faktor peribadi yang mempengaruhi niat pihak berkepentingan untuk berkongsi pengetahuan tasit. Ia secara khususnya menyelidik kaitan antara faktor peribadi dan niat pihak berkepentingan dan kesan perantaraan motivasi dan kebolehan berkomunikasi antara kedua-dua ini, terutama sekali pengetahuan tasit semasa keperluan elisitasi. Ia telah menerima maklum balas daripada 320 pengamal dalam bidang industri perisian. Keputusan kaji selidik dalam model yang dicadangkan terdapat dalam, Perkongsian Pengetahuan Tasit (TaKS). TaKS menunjukkan faktor peribadi adalah kepentingan asas dan mempengaruhi pihak berkepentingan untuk merangsang niat mereka untuk berkongsi pengetahuan tasit. Ini penting bagi mengenal pasti keperluan perisian dengan memasukan perantaraan variabel, terutama sekali motivasi dan kebolehan berkomunikasi dalam kajian ini. Akhir sekali prototaip dibina untuk membuktikan sebahagian daripada model cadangan kajian. Kajian ini membawa kepada penemuan emperikal baru bagi kesan faktor yang termasuk faktor peribadi, motivasi dan kebolehan berkomunikasi bagi niat perkongsian pengetahuan tasit yang tidak diendahkan sebelum ini. Seharusnya pihak berkepentingan diberi perhatian terutama sekali dari aspek peribadi atau intrinsik sebab mereka adalah sumber utama keperluan. Penjelasan mendalam ini boleh digunakan untuk memberikan sokongan tambahan kepada keperluan elisitasi bagi mencapai kualiti yang lebih baik dari segi kelengkapan sepenuhnya dan ketepatan.

Kata kunci: pengetahuan tersirat, keperluan elisitasi, pihak berkepentingan, factor peribadi, niat.

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LIST OF SYMBOLS AND ABBREVIATIONS

AMOS	:	Analysis of Moment Structures
ANOVA	:	Analysis of Variance
AVE	:	Average Variance Extracted
C.R.	:	Critical Ratio
CFA	:	Confirmatory Factor Analysis
CFI	:	Comparative Fit Index
CMIN/df	:	Chi-Square / Degree of Freedom Ratio
CR	:	Composite Reliability
df	:	Degrees of Freedom Ratio
DV	:	Dependent Variable
F	:	F-ratio
GFI	:	Goodness-of-Fit Index
IV	:	Independent Variable
MIM	:	Mobile Instant Messaging
p	:	Significance Level
PAB	:	Personal Ability
PAT	:	Personal Attitude
PR	:	Personal Relevance
r	:	Correlation Coefficient
R^2	:	Squared Correlation between the Observed and Predicted Values of Dependent Variable
RE	:	Requirements Engineering
RMSEA	:	Root Mean Square Error of Approximation
RQ	:	Research Question

S.E.	:	Standard Error
SEM	:	Structural Equation Modeling
SI	:	Stakeholder Identification
SLR	:	Systematic Literature Review
SPSS	:	Statistical Package for Social Sciences
t	:	obtained value of the t-statistic
TaKS	:	Tacit Knowledge Sharing
TPB	:	Theory of Planned Behaviour
TRA	:	Theory of Reasoned Action
χ^2	:	Chi-Square
β	:	beta values

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CHAPTER 1: INTRODUCTION

1.1 Background

Requirements Engineering (RE) is a multi-disciplinary and human-centred process (Nuseibeh & Easterbrook, 2000; Pacheco & Garcia, 2008) which consists of four core activities**:** elicitation, analysis, specification, and validation (Sommerville, 2001).

Requirements elicitation is important to a series of subsequent phases in the software development lifecycle, as the required information is extracted and collected from stakeholders to formulate software requirements during this phase. It aims to integrate the stakeholders' diverse viewpoints, concepts, and goals into shared, correct, and complete software requirements.

Hence, there are a wide-ranging variety of requirements elicitation models (Alawairdhi & Aleisa, 2011; Durugbo & Riedel, 2013; Finkelstein, Kramer, Nuseibeh, Finkelstein, & Goedicke, 1992; Holbrook III, 1990; Hanneghan, Merabti Colquhoun, 2000; Laporti, Borges, & Braganholo, 2007; Nuseibeh, Kramer, & Finkelstein, 1994; Ohshiro, Watahiki, & Saeki, 2005; Shan, Liu, & Peng, 2008; Shibaoka, Kaiya, & Saeki, 2007; Sommerville, Sawyer, & Viller, 1998) and techniques such as interview, card sorting, and others which were introduced in the prior studies during the process of elicitation.

Noticeably, requirements elicitation is one of the most critical and knowledge-rigorous activities in RE. Therefore, getting the right stakeholders to participate in the activity of requirements elicitation is one of the ways to improve the execution of elicitation.

On the other hand, a poor execution of elicitation will almost certainly yield inaccurate and incomplete requirements which subsequently, will increase the software project's failure rate. Enlisting the right stakeholders is therefore important, as they are the primary source for gathering information on tacit needs and requirements. Correspondingly, the stakeholder's engagement in the requirements elicitation is equally important, as the user's needs and context of use become increasingly significant towards the software development. In view of that, the active engagement of stakeholders can facilitate in gathering a better understanding of the software requirements.

Regrettably, inadequate efforts were made to determine the characteristics of the stakeholders which, if done so, would enhance the stakeholder's engagement in the existing requirements elicitation models and techniques. Hence, it is argued that the stakeholder's engagement in requirements elicitation is the key to formulate more accurate and complete requirements.

1.2 Problem Statement

Missing or mistaken requirements often tend to be problematic in requirements elicitation. This is partially due to the fact that crucial information, such as business rules, goals, expectations or assumptions often remain tacit, hidden or unshared.

Most studies strive to uncover tacit knowledge during the process of requirements elicitation by employing various techniques (Hickey & Davis, 2003; Stone & Sawyer, 2006; Sutcliffe & Sawyer, 2013).

Unfortunately, these techniques have not been universally applied, thus allowing issues regarding tacit knowledge to continue to hinder the quality of the requirements attained. Therefore, it is crucial to place emphasis on the individual characteristics of the stakeholders, who are the primary sources of data for requirements elicitation.

Stakeholder identification methods proposed in literature withal confine their task to indicating the right stakeholders based on their priority interests towards the software project, their knowledge, skills, types and roles, but discount the individual characteristics of the stakeholders that could possibly heighten their engagement.

Noticeably, the stakeholder's engagement is a significant determinant towards a successful requirements elicitation as it develops an understanding and the acknowledgment of the importance of user problems and user requirements (Garmer, Ylvén, & MariAnne Karlsson, 2004; Martin, Clark, Morgan, Crowe, & Murphy, 2012; Stelzer & Mellis, 1998).

Most research acknowledges the importance of the stakeholder engagement and it is often associated with successful software development projects (Baroudi, Olson, & Ives, 1986; Drew Procaccino, Verner, Overmyer, & Darter, 2002; Ives & Olson, 1984; Jiang, Klein, & Chen, 2006; Kujala 1, 2008). Oftentimes, these successful

software development projects would claim to have met the requirements of users and their satisfaction, amidst their timely completion and being within budget.

Furthermore, prior studies (Ives & Olson, 1984; Pacheco & Garcia, 2012) have agreed that by engaging stakeholders during requirements elicitation can enhance the quality of the software requirements. This is because they have detailed knowledge and first-hand experience of the strengths and weaknesses of the current processes.

Moreover, Bandura (1986) had underlined that most human actions are thought to be goal-directed in his social-cognitive theory. This means that stakeholders have the potential to engage more when sharing their tacit knowledge if they believed that the new software system is important and relevant to them on a personal level. In other words, the greater the personal value of the foreseen outcomes by the new software system, the greater the likelihood of the stakeholders' engagement in requirements elicitation for the purpose of personal gain.

Thus, more effort in sharing tacit knowledge will be expended in their pursuit. In this sense, stakeholders feel that they are or may be immediately affected by the new software system when they have a direct stake in it, ergo view the system as relevant to their personal values. They will then give a substantial level of commitment to sharing their tacit knowledge during the requirements elicitation.

Besides personal attitude and relevance, another key component of knowledge sharing is the ability to share, having it been acknowledged in several prior studies (Hansen, 1999; Reagans & McEvily, 2003; Reinholt, Pedersen, & Foss, 2011;

Siemsen, Roth, & Balasubramanian, 2008). Despite the willingness of stakeholders to engage in tacit knowledge sharing, they may be unable to share it with ease because of the inherent disparity of viewpoints, concepts or goals that needs to be conveyed.

On the other hand, resource issues, particularly involving the stakeholders' time availability, was found to be the main obstacle against the stakeholders from engaging in requirements elicitation. For that reason, stakeholders will most probably provide requirements which do not justify any real need due to the time constraint.

Hence, the ability to share tacit knowledge is closely associated to the stakeholders' willingness to invest greater time, energy and effort in sharing knowledge (Lee, Cheung, Lim, & Sia, 2006) as tacit knowledge is difficult to express (Reagans & McEvily, 2003).

Even though personal factors such as ability (Hansen, 1999; Reagans & McEvily, 2003; Reinholt et al., 2011; Siemen et al., 2008), attitude (Bock, Zmud, Kim, & Lee, 2005; Chang, 1998; Joseph & Jacob, 2011; Seba, Rowley & Lambert, 2012), and relevance are important drivers in this particular process, it is important to explore the stakeholders' motivation and communication skills in order to maximize their engagement in the tacit knowledge sharing process and its achievement.

There are numerous problems such as the issues of communication skills that would arise between the stakeholders and the development team during tacit knowledge

sharing in requirements elicitation. This issue has remained consistent, having existed for over a decade (Urquhart, 1998). In the same vein, it is widely accepted that poor communication hinders the identification and definition of the stakeholders' problems and needs (Coughlan, Lycett, & Macredie, 2003; Qurban & Austria, 2009; Saiedian & Dale, 2000).

In addition, effective communication skills would help to ease some of the more common problems that would occur during requirements elicitation such as, poor communication, time restraint, problems of expertise, and problematic differences in perspectives (Saiedian & Dale, 2000). In the meantime, effective communication skills also nurture a better relationship and communication between the stakeholders and the development team. As a result, it enables the stakeholders to clearly communicate their intent to others, thus bettering the quality of software requirements.

Besides communication skills, motivation has been identified as one of the key factors underlying the stakeholders' engagement to share their tacit knowledge (Kankanhalli, Tan, & Wei, 2005; Wasko & Faraj, 2005). Similar to the use of the theory of reasoned action (TRA) to study human behaviour, the act of sharing knowledge and motivational perspectives have also been widely used to understand human behaviour.

In addition, motivation has been revealed to significantly influence the degree of sharing knowledge (Hung, Durcikova, Lai, & Lin, 2011; Lin, 2007; Ning, Fan, & Feng, 2005). Individuals are more likely to engage if they have expectations of being rewarded (Ryan & Deci, 2000). This means that stronger personal factors will

encourage the pursuit of the foreseen outcomes while also possessing the potential to overcome the hindrances of a new software system implementation when there is adequate motivation for tacit knowledge sharing.

It is therefore important to explore the personal factors of stakeholders besides organizational factors such as, organizational structure and culture which would influence the success of knowledge sharing behaviour (Lee & Hong, 2014). Personal factors such as personal attitude, ability, and relevance should be included as prerequisite criteria in the stakeholder identification process because these factors could help enhance the stakeholders' engagement to share tacit knowledge.

Nonetheless, studies on the relationship between knowledge sharing and personal factors are still uncommon in the discipline of requirements engineering. Albeit the importance of understanding the factors to an individual's propensity to share knowledge, this topic remains an understudied area in the requirements engineering field. However, through proper identification and understanding of the stakeholders, it is likely to be able to elicit high-quality software requirements.

1.3 Aim and Research Objectives

This study aims to explore the effects of personal and psychological factors such as motivation and communication skills towards the intention of stakeholders to share tacit knowledge. This study hopes to enhance the understanding of the antecedents of one's intention to share tacit knowledge in requirements elicitation.

Moreover, the examination of both motivation and communication skills as the mediating variables are foreseen to contribute to the findings of this study, later for use of maximizing the stakeholders' engagement and the achievement of an ideal behaviour in the tacit knowledge sharing process.

The study consists of one main objective and six sub-objectives. The main objective is to formulate a conceptual model as guidelines to improve stakeholders' intention to share their tacit knowledge. The sub-objectives of the main objective above are as below:

i. To examine the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge.
ii. To investigate whether personal ability, attitude and personal relevance are factors to influence stakeholders' intention to share their tacit knowledge.
iii. To investigate mediating effects of the expected mediator, motivation on the relationship between personal factors and stakeholders' intention to share their tacit knowledge.
iv. To investigate mediating effects of the expected mediator, communication skills on the relationship between personal factors and stakeholders' intention to share their tacit knowledge.
v. To evaluate the effectiveness of motivation on stakeholders' intention to share their tacit knowledge.
vi. To evaluate the effectiveness of communication skills on stakeholders' intention to share their tacit knowledge.

1.4 Research Questions

This study consists of one main research question and six sub-research questions. The following is the main research question of this study:

Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?

In the meantime, the main research question is further divided into six sub-questions (sub-RQ1, sub-RQ2, sub-RQ3, sub-RQ4, sub-RQ5 and sub-RQ6) in order to explain the main research question comprehensively:

sub-RQ 1: What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?

sub-RQ 2: What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?

sub-RQ 3: What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

sub-RQ 4: What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

sub-RQ 5: What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?

sub-RQ 6: What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?

1.5 Significance of Research

There is little empirical research conducted to examine how individual attributes (e.g. ability, relevance, and attitude) and psychological factors such as motivation and communication skills may render the intention of stakeholders to share their tacit knowledge during requirements elicitation in the requirements engineering field.

The significance of this study is to close the gap present in the current literature. This study attempts to contribute a degree of knowledge to the discipline of requirements engineering by exploration and the understanding of the relationship between personal and psychological factors such as motivation and communication skills, alongside their effects towards the stakeholders' intention to share tacit knowledge in the form of empirical evidence.

After all the aforesaid factors have been studied, this study seeks to establish a model of Tacit Knowledge Sharing (TaKS) in efforts to heighten the engagement of stakeholders in requirements elicitation. It is believed that this model constitutes a firm guideline for the existing requirements elicitation models to identify ideal stakeholders for the involvement in requirements elicitation, as only the ideal stakeholders will be more willing to engage in sharing tacit knowledge, which is crucial in the discovery of complete software requirements.

1.6 Definition of Terms

All the terms used in this study are theoretically and operationally defined in this section to give a clear understanding to the reader about the essentials of this study.

1.6.1 Tacit Knowledge

Tacit knowledge is defined as hidden (Matthew & Sternberg, 2009), personal (Fernie, Green, Weller, & Newcombe, 2003; Gacitua et al., 2009; Koskinen, Pihlanto, & Vanharanta, 2003; Osterloh & Frey, 2000), intuitive, and experience-based knowledge (Matthew & Sternberg, 2009; Vásquez-Bravo, Sánchez-Segura, Medina-Domínguez, & Amescua, 2014) that resides in the minds of the stakeholders (Allee, 1997; Basir & Salam, 2015). For that reason, it is, therefore, difficult to express, convert, communicate and share.

In this study, tacit knowledge refers to the knowledge rooted in routines, processes, business policies, rules, and expectations. Also, it is defined as the users' ideas or insights which are to be included as part of the software system.

1.6.2 Stakeholder

The definition of a stakeholder varies in different contexts and to different researchers. Nonetheless, "can affect", "is affected", "direct influence", and "indirect influence" are usually the descriptions used in the definition of a stakeholder (Pouloudi, 1997; Sharp, Finkelstein, & Galal, 1999). However, the term of a stakeholder in this study refers to a "user" who has a stake or interest

in the software application; or who may affect or be affected by its development and use.

1.6.3 Personal Factors

Personal factors are defined as individual aspects (Rebelo-Pinto, Pinto, Rebelo-Pinto, & Paiva, 2014) that involve needs, importance, interests, and values that would affect behaviour (Schwartz & Sagiv, 1995). In this study, the definition of personal factors is extended to cover three individual aspects (i.e., personal ability, relevance, and attitude).

1.6.3.1 Personal Ability

Ability represents an individual's skills, proficiency or knowledge in solving problems (Rothschild, 1999). It is used extensively to predict or determine an individual's performance in executing a task in previous studies (Hunter & Schmidt, 1996; Schmidt & Hunter, 1981; Steel & Van Scotter, 2003). In this study, ability is operationally defined as the ability of a user to codify and share one's tacit knowledge in requirements elicitation.

1.6.3.2 Personal Attitude

Attitude is defined as a predisposition or tendency of an individual to respond positively or negatively towards an idea or object (Ajzen, 2005; Washburne, 1971). In addition, prior studies (Ostroff, 1992; Velnampy, 2008) have revealed

that attitude is an important factor in determining an individual's behaviour and response on various occasions. In this study, the definition of attitude is the degree of which a user would display either a favourable or an unfavourable reaction to sharing tacit knowledge in requirements elicitation.

1.6.3.3 Personal Relevance

As stated by Schiller (1912), relevance is simply the process of selecting the relevant and humanly valuable proportion which ultimately is dependent on the personal purpose of the moment. On the other hand, some researchers (Celsi & Olson, 1988; Zaichkowsky, 1985) perceived relevance as the essential characteristic of involvement to which the degree of relevancy of the product to an individual on a day-to-day basis will determine their level of involvement with that product as the individual foresees the benefits of the product meeting their personal goals and needs (Celsi & Olson, 1988; Richins & Bloch, 1986). In this study, personal relevance refers to certain factors that will boost inherent interest in sharing tacit knowledge if only the user foresees the benefits of the software application meeting their personal goals and needs.

1.6.4 Motivation

Motivation has been one of the most studied factors in knowledge sharing (Bock et al., 2005; Kankanhalli et al., 2005; Lin, 2007). There are two categories of motivation: extrinsic and intrinsic motivation. Both categories of motivation have been examined across various contexts and studies (Feng, Fu, & Qin, 2016;

Kim & Drumwright, 2016; Kuvaas, Buch, Weibel, Dysvik, & Nerstad, 2017; Shibchurn & Yan, 2015).

Extrinsic motivation focuses on goal-driven reasons (e.g. rewards, benefits), while intrinsic motivation focuses on inherent satisfaction-driven reasons (e.g. esteem, pleasure). Both categories can lead to very different behaviour and performance. In this study, motivation is operationally defined as the desire of the user to share tacit knowledge in order to gain inherent rewards (e.g. pleasure, enjoyment) and tangible rewards (e.g. reward points, status).

1.6.5 Communication Skills

Despite the number of definitions of communication in literature, communication is generally defined as a process of exchanging information that involves four elements, they are the sender, receiver, communication channel, and feedback (Iksan et al., 2012).

There are two common methods of communication, namely verbal and non-verbal. The ability of users to communicate and share knowledge depends on their communication skills (Hendriks, 1999), especially when sharing tacit knowledge (Chen & Cheng, 2012) that is rooted in daily routines, processes, business policies, rules, and expectations.

In regards to fostering a good elicitation process, Saiedian & Dale (2000) suggested several communication skills to facilitate information transfer

dialogue such as actively participating in the discussion among users and listening to them to help improve the gathering of requirements.

In this study, communication skills consist of listening skill (e.g. paying close attention to what a person says), nonverbal communication (e.g. body language, conveying the message in a friendly tone), friendliness to encourage engagement in the communication, empathy (e.g. listening to and empathizing with the other person to convey respect for the person's opinions or ideas), open-mindedness (e.g. being willing to enter into any conversation with a flexible and open mind, eventhough when there may be disagreements in the conversation), feedback (e.g. being able to appropriately give and receive feedback, as well as give praise to increase motivation to engage in the conversation), and choice of medium (e.g. choosing the right form of communication to use).

1.6.6 Intention to Share Tacit Knowledge

Atkinson (1964) defines intention as a determination to engage in a particular behaviour. Likewise, according to Fishbein and Ajzen (1975), intention is understood as an indication of the individual's willingness and readiness to engage in a particular behaviour.

Additionally, the intention of an individual is the most important factor in determining the individual's execution of a given task (Chen, Chuang & Chen, 2012). Hence, the concept of intention has been widely adopted and extended to combine with other theories to predict and determine the engagement of an

individual in a particular behaviour in various contexts and studies (Bock et al., 2005; Chen et al., 2012; Hau, Kim, Lee, & Kim, 2013; Seba et al., 2012; Untaru, Ispas, Candrea, Luca, & Epuran, 2016; Yun, 2013). In this study, the intention to share tacit knowledge operationally refers to the degree of the user's willingness to engage in the act of sharing tacit knowledge.

1.7 Thesis Organization

This thesis consists of seven chapters, and each of these chapters is organized as follows:

Chapter 1: Introduction

This chapter discusses the problem context and the reasons for undertaking the research. It states the aim and research objectives of the study. It is then followed by the research questions that address the study's specific objectives. Next is the significance of research; later, the discussion of the limitations of research. Last but not least, the definition of terms used in this study is presented to give clear understanding to the reader about the essentials of the study.

Chapter 2: Literature Review

Chapter Two presents the literature related to this study to establish a conceptual framework. It outlines the gap in the previous research and provides an adequate justification to demonstrate that this study fits into the existing body of knowledge. This chapter is structured into eleven sections. The first section of this chapter sets up a context for the research and is followed by the provision of terminologies used in this study with supporting materials from previous studies including knowledge,

requirements, and stakeholders presented in the chapter's second, third, and fourth section respectively. The fifth section of this chapter discusses the existing stakeholder identification approaches, while the sixth section reviews various requirements elicitation models. The gap that exists in the scholarly literature is identified over this comprehensive review of the literature. The seventh section discusses the influences of tacit knowledge sharing in requirements elicitation. The eighth section illustrates the conceptual framework of this study. Finally, a summary of the chapter is presented in the ninth and concluding section.

Chapter 3: Research Methodology

Chapter Three presents a detailed explanation of the materials as well as the research methodology used in this study. Chapter Three is structured as follows: the first section of this chapter gives an overview of the research approach to this study. The second section describes the research design, followed by the research setting that describes the environment in which the research is carried out, later detailed in the third section of this chapter. The fourth section expounds the research population and sample. The fifth section explains the data collection instruments and procedures of this study. The sixth section presents the data analysis of this study, which includes descriptive and inferential analysis. Finally, the last section would consist a summary of Chapter Three.

Chapter 4: Results

Chapter Four presents the findings of this study in chronological order based on the methodology applied to gather information. It summarizes the findings of this study with the aid of complementing figures, graphs, and tables.

Chapter 5: Discussion

Chapter Five interprets and describes the significance of the research findings and explains new insights about the research problem being investigated. The discussion of findings is structured in light of the research questions examined.

Chapter 6: Conclusion

Chapter Six summarizes the aim and objectives of this study, then briefly discusses the works that were undertaken. It provides implication of this study for practice, supplies recommendations for further research, and explains how this research may be furthered to be able to take a broader perspective than that of this study before the conclusion is drawn.

1.8 Summary

Herein this chapter lays the foundations for this study. It contains the research background, problem statement, aim and research objectives, research questions, significance and limitations of research, the definition of terminologies, and the structure of the thesis. Further investigations and discussions will be presented in the following chapters.

CHAPTER 2: LITERATURE REVIEW

2.1. Overview

Researchers have made significant contributions in developing various methods and tools for different processes in Requirements Engineering (RE). However, some processes still demand further research to resolve ongoing issues.

Requirements elicitation is one of the key processes that require attention from these researchers. One of the key challenges in requirements elicitation are the issues in eliciting knowledge, particularly tacit knowledge. The issues may include poor requirements, the impairment of software project, and ultimately face cancellation or delays from going over budget or falling behind schedule.

All these issues are not foreign to RE. Tacit knowledge is an important element in the requirements for such software projects (Buitrón, Pino, Flores-Rios, Ibarra-Esquer & Astorga-Vargas, 2017, Ryan & O'Connor, 2013). Nonetheless, tacit knowledge has not been given full attention at the requirements elicitation stage, regardless the claims of many factors impacting on the issue of poor requirements.

Notably, RE is heavily dependent on stakeholders. Most, if not all projects have resource limitations and time constraints, alongside the stakeholders' different influences at diverse levels. Moreover, the fact that different stakeholders having different influences on the software requirements is often overlooked by mainstream methods.

Hence, this strengthens the fact that more attention should be paid towards the stakeholders. Indeed, stakeholders are the important source that conveys detailed information about issues, business processes, as well as requirements for the new software system (Sharma & Pandey, 2014).

Stakeholders may have the potential to influence the quality of software requirements (Seth, Mustonen-Ollila, Taipale, & Smolander, 2012). These influences could happen in different ways, for instance, conscious or unconscious attitudes can influence other psychological processes (Gawronski, Hofmann, & Wilbur, 2006) that may impede their enthusiasm to engage in requirements elicitation.

It is, therefore, crucial to note the importance of the stakeholders' engagement. It is one of the frequently cited factors to overcoming software project development failure, because it gains the stakeholders' commitment, avoids resistance, and ensures that the software requirements are met.

Despite so, intervening variables such as communication skills and motivation that may moderate engagement effect must not be overlooked, as they contribute to the success of the software system. With this in mind, the linkage between the stakeholders' engagement and the indicators of the system's success is reviewed.

In view of that, a comprehensive stakeholder analysis is obligatory. Yet again, identifying relevant stakeholders is the prerequisite to having a comprehensive stakeholder analysis. It is also a crucial (Sadiq & Jain, 2014) and challenging

part (Pacheco & Garcia, 2008) of the requirements elicitation stage. Therefore, it is necessary to put the focus on stakeholder identification to prevent issues that may be difficult to resolve later on.

Hence, the purpose of this review of literature is to present relevant discussions related to the objectives of this study under the following directions:

1. Knowledge
2. Requirements
3. Stakeholder
4. Literature on Stakeholder Identification
5. Literature on Requirements Elicitation Models
6. Influences of Tacit Knowledge Sharing in Requirements Elicitation
7. Conceptual Framework of Study

The chapter concludes with a summary of the chapter.

2.2. Knowledge

Knowledge is a stream of information (Fernie et al., 2003; Osterloh & Frey, 2000; Wang & Noe, 2010); and there requires an understanding of that information (Rus & Lindvall, 2002). There are many definitions of knowledge across different disciplines, however, there has yet to be a consensus on the distinctions of definition for knowledge (Fernie et al., 2003; Lin, Wu, & Lu, 2012).

Most, if not all have categorised knowledge into explicit knowledge and tacit knowledge, even though both explicit and tacit knowledge are hardly ever separate in practice. Still, there are some significant differences between explicit and tacit knowledge.

2.2.1. Explicit Knowledge

Explicit knowledge (Gacitua et al., 2009; Vásquez-Bravo et al., 2014) is the formal and systematic knowledge which can be easily expressed, written down or understood without ambiguities; and codified in various kinds of written documents, such as reports, files or instruction manuals (Anand, Ward, & Tatikonda, 2010; Hau et al., 2013; Osterloh & Frey, 2000; Vásquez-Bravo et al., 2014).

Thus, eliciting explicit knowledge is easier than tacit knowledge because it is known by everyone and widely shared. Thus, sharing explicit knowledge requires less effort and time compared to tacit knowledge (Hau et al., 2013).

2.2.2. Tacit Knowledge

The concept of tacit knowledge was first introduced by a philosopher of science, Michael Polanyi who defined the term of tacit knowledge as "we can know more than we can tell" (Polanyi, 1966). Since then, the concept of tacit knowledge has received considerable attention from scholars in a

range of disciplines including psychology, education, organization, and management (Matthew & Sternberg, 2009).

Tacit knowledge is the hidden, personal (Fernie et al., 2003; Gacitua et al., 2009; Koskinen et al., 2003; Osterloh & Frey, 2000), intuitive, and experience-based knowledge (Matthew & Sternberg, 2009; Vásquez-Bravo et al., 2014) that resides in the minds of stakeholders (Allee, 1997; Basir & Salam, 2006).

In addition, according to Allee (1997), *tacit knowledge relies on experience, hunches, and insights*. Therefore, it cannot be easily expressed, written down or understood (Osterloh & Frey, 2000; Ryan & O'Connor, 2013) because it highly depends on factors such as attitude, communication, motivation, commitment, and trust (Koskinen, 2000; Koskinen et al., 2003; Wang & Noe, 2010).

Tacit knowledge is a job knowledge (Schmidt & Hunter, 1993) as it is an individual's know-how and experience from work routines (Yang & Farn, 2007). Furthermore, tacit knowledge is often viewed as being specific to an individual (Kim & Lee, 2006) and it is difficult to imitate and elicit (Reychav & Weisberg, 2010; Yang & Farn, 2007). Therefore, it gives a competitive advantage (Gacitua et al., 2009; Reychav & Weisberg, 2009) to the individual who possesses it within an organization, as tacit knowledge consists of competent and experiential components (Koskinen et al., 2003).

It is also an asset of expertise that relates to income (Starbuck, 1992). Hence, stakeholders are commonly not willing to share tacit knowledge for fear of losing their competitive advantage, as that knowledge is considered as a valuable and important source of which makes up the individual within their organization (Yang & Farn, 2009).

Tacit knowledge is accumulated from experiences and is closely related to skill learning (Yang & Farn, 2009); it is a compiled knowledge that was once explicit knowledge but having been practised repetitively until stakeholders are accustomed to it. Hence, there requires acquired core thinking skills (Marzano & et al., 1988) to facilitate the elicitation process of tacit knowledge.

2.3. Requirements

Requirement is *"a condition or capability needed by a user to solve a problem or achieve an objective"*, as states a definition in the ISO/IEC/IEEE standard 24765 ("Systems and software engineering – Vocabulary," 2010). Formation of requirements happens at the earliest stage of the software development life-cycle (Kotonya & Sommerville, 1996).

Requirements are the statements of expected needs or wants (Robertson, 2001) of the sponsor, customer, and other stakeholders that a system must meet and possess to solve a problem (Kotonya & Sommerville, 1996; Rzepka, 1985). Requirements can be categorized into two, functional and non-functional

(Kotonya & Sommerville, 1996; Lee, 2013). Non-functional requirements are always coupled with functional requirements in software development.

2.3.1. Functional Requirements

The ISO/IEC/IEEE standard 24765 defines functional requirement as *"a function that a system or system component must be able to perform"*. Functional requirements are not only associated with functions but also tasks or behaviours that the delivered system must be able to perform (Lee, 2013). They are the features of the system-to-be.

2.3.2. Non-Functional Requirements

Non-functional requirements describe how well a system will perform its functions, this according to its definition in the ISO/IEC/IEEE standard 24765 ("Systems and software engineering – Vocabulary," 2010). Non-functional requirements, also known as quality requirements, relate to a system's attributes such as usability, reliability or other specific qualitative attributes (Song, Duan, & Tian, 2010).

They are basically the constraints placed on the attributes of functions, tasks or behaviours that the delivered system must be able to fulfil. For example, constraints on the efficiency of a given task (Glinz, 2008).

2.4. Stakeholder

The definitions of a stakeholder vary in different contexts and to different researchers. For instance, Mitchell et.al (1997) generated a list that contains 27 definitions of a stakeholder which were defined from the year 1963 to 1995.

However, a stakeholder can be generalized as any groups or individuals who can affect or be affected by the consequences of an organization's decision (Achterkamp & Vos, 2008; Freeman, 2010; Mitchell, Agle, & Wood, 1997; Pouloudi & Whitley, 1997; Sharp et al., 1999). The terms "can affect" and "affected" are usually employed in the definitions of a stakeholder. This is certainly one of the most general definitions in the literature.

In RE, the term of a stakeholder refers to the "client", "customer", and "user" involved in the requirements elicitation in the '90s (Glinz & Wieringa, 2007). Each of them has a different role in the software project development (Nuseibeh & Easterbrook, 2000).

Furthermore, Glinz and Wieringa (2007) defined the term stakeholder as "a person or organization who influences a system's requirements or who is impacted by the system" (p. 19). This definition reveals that any stakeholder can support or impede the software project. It concludes that stakeholders are the important source of requirements (Ballejos & Montagna, 2008; Pacheco & Garcia, 2008) as well as the source of the software project risk (Woolridge, McManus, & Hale, 2007; Xiaohong & Liu, 2009).

Stakeholders and requirements have established themselves as closely related concepts in RE, as the discipline was established to identify the right stakeholders, discover the needs of stakeholders, and document the desired goals and functionalities as requirements of the software (Ballejos & Montagna, 2008).

The scope of responsibilities of the stakeholders is wide, and the involvement and contributions of each stakeholder can differ considerably due to personal and psychological factors (i.e., motivation and communication skills). Therefore, theories and methods related to the stakeholder identification process were introduced in the prior studies to identify relevant stakeholders.

Most of the existing stakeholder identification approaches are based on different aspects such as roles (Alexander & Robertson, 2004; Glinz & Wieringa, 2007; Sharp et al., 1999), position and status (Coughlan et al., 2003) or authority and responsibilities over resources (Alexander, 2006; McManus, 2004; Xiaohong & Liu, 2009; Yu & Choi, 2014) due to the project constraints on time, budget, and resources.

Ideally, the approach should be structured upon the basis of domain knowledge and skills that will later be needed to integrate into the software system (Coughlan et al., 2003). Hence, sample subjects were chosen with the intention to best represent the requirements of the entire group.

2.5. Literature on Stakeholder Identification

In prior studies, researchers (Achterkamp & Vos, 2008, Brown & Jones, 1998) have agreed that software project failure is generally due to the issues with stakeholders, and not the result of ineffective project management practices. Stakeholder identification is essential in order to have a comprehensive stakeholder analysis (Jepsen & Eskerod, 2009; Missonier & Loufrani-Fedida, 2014). It is an important (Pacheco & Garcia, 2012; Saqid & Jain, 2014) and challenging activity (Pacheco & Garcia, 2008) in requirements elicitation. Despite its importance, the identification of stakeholders has received less attention than the other areas within the software project development (Pacheco & Garcia, 2012; Pacheco & Tovar, 2007).

Many software projects are impaired and ultimately cancelled or delayed due to issues of over budgeting or falling behind schedule. Top of the list of major causes, as revealed in the CHAOS Report 1995 ("The Standish Group Report: CHAOS," 1995) are incomplete requirements and lack of user involvement.

Later, in the CHAOS Report 2011 (Chacun, 2013), the situation is still yet to be resolved, with 63% of software projects either over budget, behind schedule or cancelled. One of the consequences of failed software projects is that more losses are incurred due to the additional cost spent to resolve the incomplete requirements (Pacheco & Tovar, 2007). This is probably due to the mistakes made when identifying the stakeholders for the software project.

Thus, identifying the right stakeholders would help to improve requirements elicitation (Nuseibeh & Easterbrook, 2000; Pacheco & Garcia, 2012) through better understanding the needs of the stakeholders (Sadiq & Jain, 2012), thereby eliciting accurate and complete requirements (Pacheco & Tovar, 2007; Woolridge et al., 2007) particularly when the stakeholders (e.g. clients, customers and users) should have diverse interests (Missonier & Loufrani-Fedida, 2014; Pacheco & Tovar, 2007), priorities (Pacheco & Tovar, 2007; Robertson, 2001), goals, and belief systems (Nuseibeh & Easterbrook, 2000) for the software project.

The impacts of the stakeholder identification on the quality of requirements are obvious (Pacheco & Tovar, 2007; Woolridge et al., 2007), because according to the CMMI, needs and expectations of stakeholders are the basis to develop a set of requirements ("Capability Maturity Model® Integration (CMMI®) Version 1.1," 2002). Nonetheless, identifying an appropriate stakeholder is still an unresolved issue in the requirements elicitation activity (Pacheco & Tovar, 2007).

Many researchers (Bajic & Lyons, 2011; Gacitua et al., 2009) focused their research on minimizing the negative effects issued by tacit knowledge through tackling them using different types of requirements elicitation techniques. This statement is made notwithstanding researchers who are aware of the significance of stakeholders in requirements elicitation (de la Vara, Hoyos, Collado, & Sabetzadeh, 2012; Decker, Ras, Rech, Jaubert, & Rieth, 2007; Pacheco & Garcia, 2012; Sharma & Pandey, 2014; Sutcliffe & Sawyer, 2013).

However, amongst the repertoire of research done, there were no further discussions on how to identify stakeholders through their characteristics and its influences on the quality of requirements as mentioned earlier, which is one of the many causes leading to software project failure.

These researchers deliberated different concerns, who for instance, Decker et al. (2007) highlighted the importance of the stakeholder's participation and investigated the ways to adapt an approach to support stakeholder participation in RE; de la Vara et al. (2012) emphasized the importance of customer-based, requirements engineering practices; Sutcliffe and Sawyer (2013) conducted a survey to investigate the elicitation techniques, representations, models, and support tools; last but not least, Sharma and Pandey (2014) discussed the issues and challenges of the different types of requirements elicitation techniques. The importance of the stakeholders is acknowledged, yet these studies show no discussion on the stakeholder identification process.

Indeed, some initiatives provided different stakeholder identification methods under different circumstances. Stakeholder identification methods are not structured, as they describe the process according to their viewpoint. In brief, the current stakeholder identification methods are not systematic, lack a common framework, and in need of a uniform description (Pacheco & Garcia, 2008, 2009; Pacheco & Garcia, 2012). In addition, the high level of heterogeneity of the studies on stakeholder identification, without clear guidelines, makes it hard to initiate the stakeholder identification process (Pacheco & Garcia, 2012).

There were various stakeholder identification approaches proposed in prior studies, however, existing approaches are very diverse. Carla Pacheco & Garcia (2012) have conducted a review of stakeholder identification methods in requirements elicitation and characterized 40 studies on these methods in RE into three different categories. Each category focuses on a different aspect, for instance, the first category exclusively describes stakeholders; the second category emphasises on the interaction between stakeholders; and the third category focuses on the studies that include an assessment of stakeholders (Pacheco & Garcia, 2012).

So far, there is yet to exist a method to be used as an indicator to measure the important attributes of the stakeholder(s) to identify the right ones to involve in requirements elicitation. There is no classification of these approaches to understanding their common characteristics and limitations.

In addition, these approaches are not uniform in terms of the process activities and stakeholders' attributes. In view of that, a survey was conducted in order to provide an overview of the existing stakeholder identification approaches, and subsequently to propose a taxonomy of the approaches of stakeholder identification. It was developed based on the results of a review of the existing literature (Pacheco & Garcia, 2012) as there is still no systematic way to analyse and compare existing approaches.

The results of the review are presented in Table A.1 (refer to Appendix A on page 230). A total of eight primary studies have been selected out of 27 studies retrieved from five data sources. A cross-check with the existing SLR (Pacheco

& Garcia, 2012) led to the selection of nine studies from 40 relevant papers, which were then added to the list of primary studies. The nine selected studies were either not found during the initial search process, or had been excluded based on their title or abstract reviews during the screening process of this study. Another four studies selected from the snowballing process were included in the final tally of the study selection. There were altogether 21 studies selected for this review.

It is worth noting that this survey is limited to the literature available in the Computer Science discipline published between the years 1993 to 2016. The rationale for selecting 1993 as the starting year for the search process of this review is because the year marks the first RE symposium (Pacheco & Garcia, 2012).

Table A.1 (refer to Appendix A on page 230) consists of details including stakeholder type, stakeholder role, and approach. A basic set of different criteria and dimensions of workspace environment are used to identify the type of stakeholders, while roles are used to define details of the associated responsibilities of the stakeholders during the software project. The typical stakeholder identification process covers these two main components, which are the stakeholder type and the stakeholder role. However, attributes or roles held by the stakeholders may vary in stakeholder identification studies. The stakeholder identification method or technique is generally the focus of this discussion.

The criteria initially considered in the classification of stakeholder identification are functional, geographical location, knowledge, hierarchical level, abilities, attitude, relevance, power, legitimacy, and urgency. On the other hand, the criteria which are not presented in Table A.1 (refer to Appendix A on page 230) will be grouped as others. Each criterion is described below:

1. Functional criterion is the functions, processes or tasks that will be affected by the execution of the software project, either directly or indirectly. Accordingly, stakeholders who are affected by these functions, processes or tasks will be nominated to obtain their diverse perspectives (Ballejos & Montagna, 2006, 2008).

2. Geographical location criterion identifies stakeholders who are located in different geographical places with cultural and idiomatic differences (Ballejos & Montagna, 2006, 2008).

3. Knowledge criterion presumes that stakeholders own a certain level of knowledge about the software project implementation domain (Ballejos & Montagna, 2006, 2008). Knowledge is a stream of information (Fernie et al., 2003; Osterloh & Frey, 2000; Wang & Noe, 2010). There are many definitions of knowledge across different disciplines, nonetheless, most definitions have categorized knowledge into explicit knowledge and tacit knowledge.

4. Hierarchical level criterion is required, according to (Mintzberg, 1981), as the perspectives of stakeholders may vary at different hierarchical

levels of an organization. Accordingly, stakeholders must be selected from every hierarchical level of each organization to ensure inclusiveness (Ballejos & Montagna, 2006, 2008).

5. Abilities criterion refers to the cognitive ability, which is not only the ability applicable to work but also the ability to learn on the job (Hunter & Schmidt, 1996). Although there are other abilities that are significant to various jobs, the review of other abilities is beyond the scope of this study. In the psychology discipline, ability refers to intelligence, not of the genetic potential, but rather the level of ability developed over time (Hunter & Schmidt, 1996; Oliveira-Castro & Oliveira-Castro, 2003). Conversely, according to (Ennis, 2008), this criterion suggests that the individual practises knowledge, skills, behaviours, and personal characteristics to perform work tasks in a given role or position, and are causal-related to job performance.

6. Attitude criterion is defined as an individual's predisposition to respond to a concept or an object in a consistently favourable or unfavourable manner (Ajzen, 2005; Washburne, 1971). Attitude is perceived as a strong predictor of behavioural intention in a wide range of studies (Armitage & Conner, 2001; Millar & Shevlin, 2003). An individual establishes the intention to execute behaviour towards what he or she has a positive attitude of.

7. Relevance criterion, as stated by Schiller (1912), is simply a process of selecting the relevant and humanly valuable part, with ultimate

dependence upon the personal purpose of the moment. Indeed, relevance belongs inalienably to one's behaviour (Schiller, 1912). Meanwhile, some researchers (Celsi & Olson, 1988; Zaichkowsky, 1985) perceived personal relevance as the essential characteristic of involvement, with the degree of relevancy of the product to an individual on a day-to-day basis determining their level of involvement with that product. This is because the individual foresees the benefits of the product meeting their personal goals and needs (Celsi & Olson, 1988; Richins & Bloch, 1986).

8. Power criterion implies that stakeholders who possess power over resource allocations including knowledge within organizations (Salancik & Pfeffer, 1974) would have the capacity to influence outcomes of the software project as to their desire.

9. Legitimacy criterion reflects the intuition of the stakeholders' moral consideration when making a decision (Phillips, 2003). Pragmatic, cognitive, and moral are potential bases of legitimacy (Jones, Felps, & Bigley, 2007). Philips (2003) concluded that "s*takeholders who retain the ability to affect the organization are legitimate; but that this legitimacy is derived from the moral obligation owed [to] other stakeholders".*

10. Urgency criterion defines as "*the degree to which stakeholder claims call for immediate attention"* (Mitchell et al., 1997). Urgency happens when a claim or a relationship is of a time-sensitive nature, critical or highly important to the stakeholders (Mitchell et al., 1997).

In this discussion, stakeholder type refers to the classification of sets of stakeholders sharing the same criterion, which are then divided into three dimensions of workspace environment: internal, inter-organization, and external (Ballejos & Montagna, 2006, 2008). The stakeholders of the internal workspace are those who are "members" of the business organization while the stakeholders of the inter-organization workspace are those who pursue inter-organizational goals and represent the network interests, which differ from those of individual organizations. In contrast, the stakeholders of external workspace environment are those who are not part of the organization.

The significance of the contribution of this section is to provide an overview of the existing stakeholder identification approaches, and subsequently, to propose a taxonomy of the approaches of stakeholder identification. It is worth noting that 15 of 21 selected studies have used role perspective to categorize stakeholders, that is, by relating stakeholders to projects within the organization. On the other hand, seven out of 21 selected studies have employed the salience model of Mitchell et al. (1997) to classify and identify stakeholders.

Remarkably, there are only two studies (Ballejos & Montagna, 2008; McManus, 2004) that used personal factors, such as the abilities criterion in the classification model. Identification of stakeholders is accompanied by the classification process all the same; nonetheless, the prevailing classification models presented in Table A.1 (refer to Appendix A page 230) are insufficient to identify stakeholders because of their different viewpoints and evolution over

time. Hence, the inclusion of personal factors as a criterion in the existing classification model should be taken into consideration.

2.6. Literature on Requirements Elicitation Models

Requirements elicitation is one of the activities in RE (Sharma & Pandey, 2014) concerned with understanding the needs of the stakeholders (Soo Ling & Finkelstein, 2012; Zowghi & Coulin, 2005). It is also the most important and challenging activity in the software development because it could have an influence on its success (Hickey & Davis, 2003; Zowghi & Coulin, 2005).

Requirements elicitation is a human-centred activity (Bourque & Dupuis, 2004; Pacheco & Tovar, 2007; Sommerville, 2011) often known as requirements discovery (Sommerville, 2011) which serves to find, uncover, and acquire sources of requirements for a software project (Hickey & Davis, 2003). These requirements include problem domain, stakeholders, documentation, and other existing software or hardware systems (Apshvalka, Donina, & Kirikova, 2009; Zowghi & Coulin, 2005).

Although stakeholders are the important source of requirements (Sharma & Pandey, 2014), they are as well the source of the software project risk (Woolridge et al., 2007). This implies that requirements elicitation is very much dependent on human decisions (Carrillo de Gea et al., 2012). It is more obvious since there are human factors embedded in the requirements (Fuentes-Fernández, Gómez-Sanz, & Pavón, 2010). Therefore, identifying the appropriate stakeholders and their requirements are important to guarantee the

success of this activity (Sharma & Pandey, 2014; Soo Ling & Finkelstein, 2012).

Theoretically, requirements are to be gathered and elicited in a planned manner. Nonetheless, good communication skills are important (Zowghi & Coulin, 2005) to resolve contingencies such as interruption, negotiation about requirements, and other unforeseen incidents during requirements elicitation (Coughlan et al., 2003). Also, stakeholders' thoughts, opinions, concerns, needs, and knowledge can be easily conveyed and uncovered with good communication skills (Pohl & Rupp, 2011).

Many techniques, approaches, and tools can be or have been employed for requirements elicitation, where some more broadly used than others in various disciplines (Zowghi & Coulin, 2005). However, it is difficult to summarize the techniques, approaches, and tools for requirements elicitation in a standardized manner because each of them has its own purpose of usage. Hence, choosing a technique, an approach or a tool often is a key factor in determining the success of requirements elicitation (Zowghi & Coulin, 2005).

Despite so, the examination of personal and psychological factors (i.e., motivation and communication skills) should be a part of the technique, approach, or tool for requirements elicitation because requirements elicitation is a human-centred process, heavily dependent on human decisions. However, these factors are hardly found in existing studies.

Moreover, there is no standard definition developed for requirements elicitation (Sutcliffe & Sawyer, 2013; Zowghi & Coulin, 2005). Requirements elicitation typically comprises of activities (Zowghi & Coulin, 2005) such as understanding the application's domain, identifying sources of requirements, analyzing the potential stakeholders, selecting techniques, approaches, and tools that would be used for requirements elicitation, and eliciting requirements from stakeholders and other sources.

Models are created as guidelines to optimize software processes (Beecham, Hall, & Rainer, 2005). The models discussed in this section are primarily intended for requirements elicitation. As mentioned earlier, requirements elicitation is about identifying the needs of stakeholders. The majority of models of requirements elicitation focus on specific methodologies or techniques that follow paradigms of goal-oriented, scenario-based, or viewpoint-oriented. There are various paradigms in existence, however, only a few common paradigms were chosen to be discussed in this section.

A number of different goal-oriented models (Ohshiro et al., 2005; Shan et al., 2008; Shibaoka et al., 2007) have been developed to support requirements elicitation. In 2005, Ohshiro et al. introduced a method called the goal-oriented idea generation to support goal decomposition and refinement activities that involve stakeholders in the process of eliciting requirements.

Similarly, GOORE (Shibaoka et al., 2007) is also a goal-oriented method which combines an ontological technique to support goal decomposition and refinement in requirements elicitation.

Other goal-oriented requirements elicitation method such as MEGORE (Shan et al., 2008) couples with multimedia to relate goals of scenarios to media clips, demonstrating partial or complete scenario descriptions when appropriate.

In literature, goal-oriented requirements elicitation methods are related to goal decomposition and refinement activities without the support of stakeholder identification (SI). However, the most recent work (Sadiq & Jain, 2014) did introduce SI in the goal-oriented requirements elicitation method.

Besides the goal-oriented requirements elicitation method, there are a number of studies (Alawairdhi & Aleisa, 2011; Holbrook III, 1990; Laporti et al., 2007) that elicit initial requirements using scenario-based paradigm.

Holbrook III (1990) proposed a methodology that develops an initial set of requirements based on the use of scenarios. It employs a scenario generation procedure to elicit an initial set of requirements and refine it via an iterative communication amongst users and designers.

Laporti et al. (2007) introduced a method which starts with group storytelling and progressively evolves into a more formal representation by extracting scenarios from stories generated at the earlier stage, then transforming the scenarios into use cases done collaboratively by the stakeholders involved.

Alawairdhi and Aleisa (2011) also proposed a scenario-based requirements elicitation approach that comprises three stages. In this approach, stakeholders

describe examples and stories, then apply Carroll's model to analyse the scenarios and convert the scenarios into use cases, finally generating a scenario model in Business Process Modelling Notation.

There are many viewpoint-oriented approaches (Durugbo & Riedel, 2013; Finkelstein et al., 1992; Hanneghan et al., 2000; Nuseibeh et al., 1994; Sommerville et al., 1998). However, most of the approaches support the requirements analysis or requirements validation rather than requirements elicitation.

PREview, introduced in 1998, gears towards requirements elicitation. It summarizes partial information about requirements of a software system elicited from stakeholders (Sommerville & Sawyer, 1997).

Durugbo et al. (2013) proposed the ViPaTe requirements elicitation model which consists of acquisition representational of a phase that incorporates the system and stakeholders' viewpoints during requirements elicitation.

Although various requirements elicitation models have been introduced, these approaches are still inadequate based on their lack of consideration for human factors when selecting stakeholders to be involved in requirements elicitation.

2.7. Influences of Tacit Knowledge Sharing in Requirements Elicitation

The purpose of this section is to explore the factors that may have an influence on the intention of stakeholders to share tacit knowledge in requirements

elicitation, as well as to lay an initial groundwork to determine if what is being observed might be explained by the existing theories.

2.7.1. Theoretical Framework of Study

This section presents the theoretical framework, of which the theoretical base is that generates the conceptual framework of the study. The theoretical framework in Figure 2.1 provides direction for the investigation of the study's research problem. It includes the variables intended to measure and the relationships sought to understand.

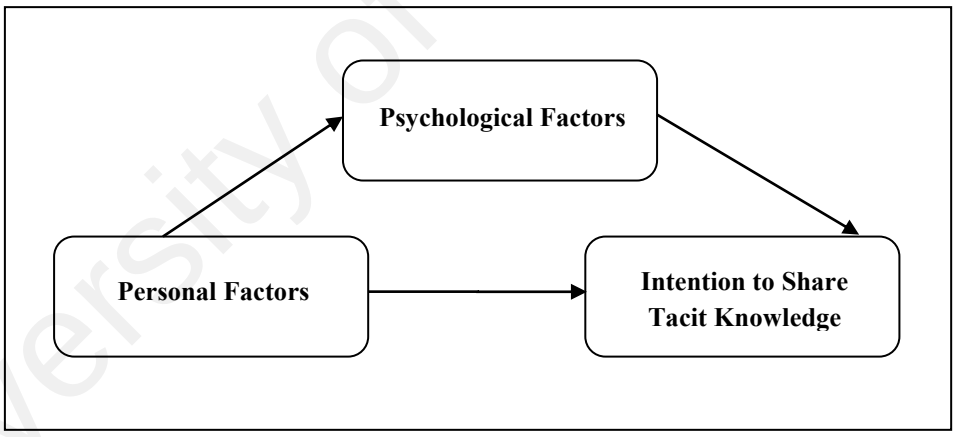

Figure 2.1: Theoretical framework of the study

2.7.2. Knowledge Sharing

The literature shows a wide range of definitions of knowledge that arose across different disciplines. However, there has yet to be a consensus on the discrepancies faced in defining knowledge (Fernie et al., 2003; Lin et al., 2012).

For instance, knowledge defined as "*justified true belief"* (Nonaka, 1994) would lend importance to revealing knowledge as a human action justifying personal beliefs. Similarly, Polanyi denoted human knowledge as *"know[ing] more than we can tell"* (Polanyi, 1966) and had classified it into explicit and tacit knowledge (Bartol & Srivastava, 2002)..

The more important point is, tacit knowledge denotes human actions in the forms of commitment (Koskinen, 2000), involvement (Nonaka, 1994), evaluation, and attitudes of an individual in a specific context (Koskinen et al., 2003). The classification of knowledge in the existing literature deepens the understanding of the individual's intent to share knowledge. In addition, the knowledge sharing intention is one of the strong predictors of the actual stakeholder knowledge sharing behaviour (Ajzen, 2005).

Knowledge sharing is a human-centred knowledge management process (Ryu, Ho, & Han, 2003). It is critical towards one's success in the competitive environment because knowledge resides within individuals (Nonaka & Konno, 1998). More specifically, the residing tacit knowledge is personal (Fernie et al., 2003; Gacitua et al., 2009; Koskinen et al., 2003; Osterloh & Frey, 2000), intuitive, and experienced-based (Matthew & Sternberg, 2009).

2.7.3. Theories and Methods Related to Knowledge Sharing

Knowledge sharing is a key process in software products development. Regrettably, domain knowledge is mostly tacit, which in comparison to explicit knowledge is difficult to share with another by means of either writing it down or verbalising it. Domain knowledge is required by experts in developing software. This highlights the necessity for knowledge sharing which would enable the software organization to share domain knowledge effectively between the users and the development team in order to identify the software system requirements. Therefore, various theories and methods were realised due to the needs as mentioned above.

Tacit knowledge sharing has yet to reach maturity in software engineering domain, despite the tremendous amount of research it has engendered. In addition, knowledge sharing mechanisms in software engineering are likely to focus on effective knowledge sharing within the development team rather than the users (Hsu, Yang, & Huang, 2011; Mohamed, 2008; Razzak, Ahmed, & mite, 2013).

For instance, Mohamed (2008), one of the researchers, contributed in developing the descriptive process model for knowledge sharing that serves to capture explicit and tacit knowledge. However, he revealed that there exist barriers to obtaining tacit knowledge, where some are caused by the human psychological behaviour (Mohamed, 2008). Still, he did not embed a solution to resolve the human psychological behaviour

issues in this model. For that reason, there is indeed a need to give attention to the personal and psychological factors (i.e., motivation and communication skills) of software users to make the existing knowledge sharing models in software engineering more holistic and to increase its ability to achieve better results in requirements elicitation.

Studies in other domains (Bavik, Tang, Shao, & Lam, 2017; Bock et al., 2005; Choi, Lee, & Yoo, 2010; Lee, Gillespie, Mann, & Wearing, 2010; Milne, 2007; Park & Lee, 2014; Wasko & Faraj, 2005) have rather different approaches to tacit knowledge sharing and place their focus on different factors such as the organizational culture, human behaviour, social environments, among others.

Park & Lee (2014) have proven that trust and feelings of dependence can effectively improve tacit knowledge sharing in information systems projects with the support of empirical evidence in their research work.

In addition, some researchers argue that an organizational culture that encourages tacit knowledge sharing can be cultivated with either an appropriate reward and recognition programme (Bock et al., 2005; Milne, 2007), leadership (Bavik et al., 2017; Lee et al., 2010), or information technology (Choi et al., 2010; Wasko & Faraj, 2005).

Despite the fact that there have been considerable efforts contributed towards developing methods of tacit knowledge sharing in software engineering domain, there remain significant, influential attributes of

human psychological behaviour that should not be neglected in order to develop a process model that encourages effective tacit knowledge sharing.

2.7.4. Literature on Personal and Other Factors in Knowledge Sharing

2.7.4.1. Personal Ability

The first personal factor is the personal ability. Literature (Ennis, 2008; Holloway,1988; M.Hurtz & Donovan, 2000; Mache, Vitzthum, & Groneberg, 2015; Nicholls, 1978; Nicholls, Patashnick, & Mettetal, 1986) abounds in the definition of personal ability. Unfortunately, each of these authors defines personal ability in a significantly different way. Hereafter, terms such as "ability", "competency", and "capability" are used interchangeably.

In the early 1970s, McClelland stated that abilities or individual characteristics are the predictors of job performance (Mcclelland, 1973). As stated by Nicholls et al. (1986), ability plays an important role in the success of a task performance. Steel & Van Scotter (2003) used self-ability, personal goals or goal clarity, and self-competence as core constructs for predicting task performance in their study. Likewise, the Hunter-Schmidt model also used skills and abilities as main constructs for determining job performance (Steel & Van Scotter, 2003). As noted above,

these studies have indicated that personal ability is undoubtedly a key determinant for predicting task performance.

In addition, prior studies (van Dijk, Eysink, & de Jong, 2016) have mentioned that individuals of different ability levels are expected to be different in drawing accurate conclusions because they vary in terms of how skilful one is to relate and integrate new information into existing knowledge schemas and determining its significance and implication. van Dijk et al. (2016) have indicated that the knowledge schemas of high ability individuals were indeed higher compared to average and low ability individuals.

Moreover, high ability individuals prefer thought-provoking and open-ended tasks which can generate more than one solution. Prior studies (Schmidt & Hunter, 1992) have stated that differences in ability are more important when finding out the individual differences in performance of individuals who do not differ in experience.

Hunter & Schmidt (1996) have proven that ability does not disappear once individuals have earned experience. In fact, the ability differs over time (Hunter & Schmidt, 1996). In their studies (Hunter & Schmidt, 1996), it is revealed that the predictive validity of ability is almost three times higher than the predictive validity of experience. Additionally, research findings

have shown that abilities are a significant determinant of job performance (Hunter & Schmidt, 1996; Schmidt & Hunter, 1981).

Previous studies have assessed the influence of ability on behaviour in different extents such as consumer decision making, work performance (Brennan, 2008), and knowledge sharing (Siemsen et al., 2008). Specifically, ability is referred to as skills and proficiencies of an individual required to share knowledge with co-workers (Siemsen et al., 2008), to interpret brand information in an advertisement (MacInnis, Moorman, & Jaworski, 1991), and to solve problems (Rothschild, 1999). However, the prior knowledge necessary to perform the given task must be available and accessible to provide a primary element for ability implementation (MacInnis et al., 1991).

On the other hand, Motivation-Opportunity-Ability framework stated that opportunity and ability are variables complementary to each other. Succinctly, when an individual has insufficient time (referring to opportunity) to share knowledge, motivation, and ability, they are thus blocked from having an influence on knowledge sharing (Brennan, 2008).

Therefore, time availability may be the reason knowledge sharing intention and personal ability are hindered. That is to say, the intention of stakeholders to share tacit knowledge becomes

stronger with an increase in the time allowed for participation during the knowledge sharing session. Furthermore, evidence in support of this point can be found by Bock et al. (2005) who states, "*individuals will adopt particular behaviour when the evaluation of their capability is adequate to accomplish the task*".

2.7.4.2. Personal Attitude

Attitude is defined as an individual's predisposition to respond to a concept or an object in a consistently favourable or unfavourable manner (Ajzen, 2005; Washburne, 1971). Attitude is perceived as a strong predictor of behavioural intention in a wide range of studies (Armitage & Conner, 2001; Millar & Shevlin, 2003). An individual establishes the intention to execute behaviour in reliance towards what he or she has a positive attitude of.

Additionally, prior studies (Ostroff, 1992; Velnampy, 2008) have revealed that attitudes are an important factor in determining an individual's behaviour and response on various occasions.

The theory of reasoned action (TRA) and theory of planned behaviour (TPB) have been used extensively to predict human behaviour (Millar & Shevlin, 2003). The theory of reasoned action posits that a behaviour (e.g. sharing knowledge) is predicted by reasoned intentions to engage in certain behaviour.

In addition, one's intention is also influenced by personal attitudes (Millar & Shevlin, 2003).

The theory of planned behaviour is an extension of the theory of reasoned action; and the intentions to engage in certain behaviour are still a significant factor as in the original theory of reasoned action (Ajzen, 1991; Armitage & Conner, 2001). Although, the theory of planned behaviour incorporates an additional construct, namely perceived behaviour control (Ajzen, 1991).

Hence, intention is an indicator of how hard an individual is willing to try or how much effort is he or she willing to invest, in order to perform the behaviour if the behaviour is perceived to attain a valued outcome (Ajzen, 1991). This is based on the rationale that the more favourable the attitude towards the behaviour, the stronger the individual's intention to perform it.

Previous studies (Bock et al., 2005; Chang, 1998; Joseph & Jacob, 2011; Ryu et al., 2003; Seba et al., 2012) have evidence that shows attitudes as an important factor in influencing the intention of knowledge sharing. Similarly, in the theory of reasoned action (TRA), it is remarked that attitudes are a significant predictor of organizational behaviour intentions (Lin, 2007).

According to (Alavi & Leidner, 2001), it states that *"In many organizations, a major cultural shift may be required to change employee's attitudes and behaviour so that they willingly and consistently share their knowledge and insights"*. This statement highlights particularly the role of attitude in the success of knowledge sharing practices.

Besides that, researchers (Jones, Cline, & Ryan, 2006) have noted that the employee's attitudes are important to promote a knowledge sharing culture in an organization. Hence, it is important to understand the stakeholders' attitudes towards knowledge sharing because knowledge sharing is a determinant of a successful software application implementation.

2.7.4.3. Personal Relevance

The question of how to encourage individuals to share their knowledge still remains under examination. In fact, there are many reasons why individuals are often resistant towards sharing their knowledge and will choose to keep such knowledge to themselves (Yang & Farn, 2009). Knowledge is, after all, a competitive advantage (Gacitua et al., 2009; Reychav & Weisberg, 2009). It is also a source of power for individuals who own it. Indeed, individuals are more likely to participate in knowledge sharing when they foresee the benefits of the product

meeting their personal goals and needs (Celsi & Olson, 1988; Richins & Bloch, 1986).

Therefore, the primary motivation for personal behaviour is personal relevance, as individuals would do their best to maximize individual convenience. In addition, individuals have extensive control over what information they can and cannot recall (Lightle, 2016). Similarly, stakeholders are more willing to share more of their knowledge and would feel useful doing so during the requirements elicitation if they perceive there to be more benefits from practising the sharing behaviour, as according to the rational action theory (Hau et al., 2013).

Additionally, based on the assumption of individual rational choice, individuals are more likely to engage in knowledge sharing when the gain of benefits exceeds the related costs (Tsay, Lin, Yoon, & Huang, 2014).

Celsi and Olson (1988) alongside Zaichkowsky (1985) perceived personal relevance as an essential characteristic of involvement to which the degree of relevancy of a product to an individual on a day-to-day basis will determine their level of involvement with that product.

On that matter, there is a general consensus that involvement would mean personal relevance (Greemwald & Leavitt, 1984), in

which involvement is an individual-level variable in determining if the product is effectively relevant to the individual (Bloch & Richins, 1983; Greenwald & Leavitt, 1984; Judith, 1986; Zaichkowsky, 1985).

Notwithstanding, personal relevance in the theoretic sense may influence the intention to share knowledge. Thus far, previous studies have not considered and empirically tested this assumption.

2.7.4.4. Motivation

Motivation has been identified as a significant determinant of general behaviour (Deci & Ryan, 1987). Two general categories of motivation, extrinsic and intrinsic have been defined and examined across various contexts and studies (Feng et al., 2016; Hung et al., 2011; Kim & Drumwright, 2016; Shibchurn & Yan, 2015; Teo, Lim, & Lai, 1999).

Extrinsic and intrinsic motivation are distinguished based on the different reasons or goals that give rise to an action. The most basic distinction of extrinsic motivation refers to doing something with the knowledge that the action leads to separable consequences such as tangible or verbal rewards. Meanwhile, intrinsic motivation refers to doing something for its inherent satisfaction or enjoyment (Gagné & Deci, 2005) by intensifying

self-efficacy or confidence in one's ability without the need for any extraneous incentives to do so (Lin, 2007).

The positive experiences in intrinsic motivation are associated with exercising and augmenting one's capacities (Ryan & Deci, 2000). On the contrary, the extrinsically motivated behaviour is based on one's perceptions of the value in association with the efforts involved in an activity, that is to say, both the rewards expected in exchange and the effort required of that activity are weighed (Lin, 2007). In other words, the satisfaction derived from an extrinsic motivation stems from the extrinsic consequences of completing the activity (Gagné & Deci, 2005).

Motivation influences an individual's engagement and behaviour to achieve in the activities chosen, efforts consumed, persistence in tasks, and performance achieved respectively. Three motivational variables that have been consistently related to cognitive strategies, used in many situations and tasks, are self-efficacy (Bandura & Cervone, 1983; Bandura & Schunk, 1981), achievement goals (Dweck, 1986; Elliot, 1999), and perceived instrumentality, in which tasks are perceived as instrumental in accomplishing personally valued future goals (Miller & Brickman, 2004). Markedly, there is a strong interrelationship between motivational and cognitive components during the task performance process.

Bandura (1991) underlined that goals increase the individual's cognitive and affective reaction performance attainments. Goals may motivate individuals to use their existing ability and automatically set stored task-relevant knowledge into awareness, which then motivates people to search for new knowledge (Locke & Latham, 2006). Self-set goals and self-efficacy (task-specific self-confidence) are associated with task performance, and this relationship replicates the typical goal-setting theory.

However, self-efficacy beliefs and self-set goals are noteworthy variables that affect the self-regulation of motivation and its subsequent influence upon the accomplishment of a performance (Zimmerman, Bandura, & Martinez-Pons, 1992). That would mean that the individuals' beliefs in their efficacy for self-regulated task performance affects their perceived self-efficacy for achievement, which in turn influence the goals they have set for themselves and their task performance achievements.

In summary, motivation may promote the disclosure of intentions. Hence, the motivation theories are important in guiding goal-directed behaviour. Notably, prior studies (Gagné, 2009; Hau et al., 2013; Lin, 2007) have indicated that motivation is an antecedent to knowledge sharing intentions.

2.7.4.5. Communication Skills

Communication in requirements elicitation means to develop a shared understanding of an ambiguous situation. However, it is widely recognized that communication may ground the delay and failure of software projects if the requirements are not well communicated (Curtis, Krasner, & Iscoe, 1988). In addition, it is important to note that prior research (Edstrom, 1977) has revealed a significant relationship between effective communication and system success.

Inadequate software requirements reflect ineffective communication between stakeholders (Bostrom, 1989), that is to say, requirements elicitation involves activities which are communicative (Coughlan & Macredie, 2002). This also means that stakeholders must be able to communicate their needs in the context of a system known to the analysts, and vice versa, the analysts must be able to communicate the specifications generated based on their understanding back to the stakeholders for validation.

Understanding stakeholders, their needs, and how they operate within the context of the proposed system can greatly increase the chance of successful projects, particularly in terms of increased accuracy and completeness of the requirements. The degree of

understanding the stakeholders, nevertheless, depends on effective communication skills.

Simultaneously, to be successful in understanding the stakeholders and satisfying their needs, stakeholder-centred communication techniques are obligatory to encourage the involvement of stakeholders and subsequently for them to share their knowledge in requirements elicitation (Saiedian & Dale, 2000). With this in mind, an effective communication tool is another point to be considered. As an example, social media applications are increasingly accepted, serving as an efficient and economical communication tool across industries such as health (Di Maida et al., 2017), education (Gikas & Grant, 2013), and others.

Moreover, social media applications provide collaborative and engaging opportunities to share information through photos, video recording and messages. It also creates a faster exchange of ideas as opposed to the time-consuming pace of an old-fashioned discussion. Thus, effective communication facilitates the exchange of information that is essential for the derivation of systems requirements.

Saiedian & Dale (2000) suggested a number of communication skills for promoting meaningful information transfer dialogue. For instance, active participation in the discussion with

stakeholders and listening to them can help to improve requirements gathering. Some tips for better communication such as re-stating what was heard or understood, and spending the time to learn about stakeholders may help recognise their needs, while simultaneously helping to develop a good rapport and communication between the stakeholders and the development team. In short, an effective communication works to benefit both parties.

2.7.4.6. Intention to Share Knowledge

An intention is generally understood as a determination to engage in a particular behaviour (Atkinson, 1964). The theory of reasoned action (Fishbein & Ajzen, 1975) has been widely used as a model for the prediction of behavioural intentions or/and behaviour. It was designed to give explanations of motivational influences on behaviour.

A review of the literature shows that the theory was often adapted, extended or used in combination with some other theories to explain the users' behaviour in relation to various contexts and studies (Bock et al., 2005; Kolekofski Jr & Heminger, 2003; Kin, 2007; Untaru et al., 2016).

Fishbein & Ajzen (1975) stated that intention influences behaviour which determines the implementation of the actual

behaviour. Moreover, intention is commonly affected by social norms and attitude, where attitude, in turn, is influenced by the belief in performing the behaviour (Kolekofski Jr & Heminger, 2003). Therefore, understanding the intention of stakeholders to share their knowledge in requirements elicitation will help inform the outcome of the knowledge sharing session.

It is worth noting that the earlier research (Constant, Kiesler, & Sproull, 1994) has provided an empirical demonstration that shows attitude significantly affecting tacit knowledge sharing. The individual's decision to engage in a specified behaviour is determined by their intention to perform the behaviour, which in turn is determined jointly by their attitude and the subjective norm regarding the behaviour. Thus, this finding provides strong support for the view that implementation of intention improves the predictive power of sharing tacit knowledge behaviour in requirements elicitation.

According to the theory of reasoned action, an intention is perceived as an immediate antecedent of the actual sharing knowledge action. That is to say, the stronger the individual's intention to share knowledge, the more productive the sharing knowledge session is predicted to be. However, the degree of success is influenced not only by the individual's desire or intention to share knowledge, but also relies on other aspects such

as personal factors (Amoako-Gyampah, 2007), motivation (Lin, 2007), and communication (Bock et al., 2005).

2.8. Conceptual Framework of the Study

The conceptual framework of this study is formulated based on the study's theoretical framework, of which was generated based on the synthesis of the researcher's interpretation of literature and the previous knowledge of other researchers' perspective on the research subject. It serves as a guide towards realizing the objectives of this study.

In this framework, intention to share tacit knowledge is the dependent variable in the relationship between three personal factors (i.e. ability, attitude, and relevance as independent variable), with motivation and communication skills as the mediating variables. Figure 2.2 illustrates the variables involved in the conceptual framework of this study.

It is important to note that this study consists of one main research question, which is further divided into six sub-research questions (sub-RQs) to allow tackling this study in a step-by-step manner. Meanwhile, sub-research question five (sub-RQ5) and sub-research question six (RQ6) are formulated to validate sub-research question three (sub-RQ3) and sub-research question four (sub-RQ4).

Figure 2.2 comprises research questions as aforementioned in different colour lines in order to improve the readability of the diagram. As shown in Figure 2.2,

the main research question is within the orange colour frame. Five other colour frames are contained within the orange colour frame: the green colour frame with the dotted line that consists of the three independent variables and one dependent variable; the red colour dotted line frame consists of three independent variables; the black colour dotted line frame contains a dependent variable; the blue colour frame consists of a mediator variable, which is motivation; and last but not least, the purple colour frame comprises of a mediator variable, which is communication skills.

The scope of each sub-research question (sub-RQ) is further described below:

1. sub-research question one (sub-RQ1)

   The extent of sub-research question one (sub-RQ1) includes three personal factors (i.e. ability, attitude, and relevance) as the independent variable and the intention to share tacit knowledge as the dependent variable. The objective of sub-RQ1 is to examine the relationship between independent variables (the three personal factors of personal ability, personal relevance, and personal attitude) and the dependent variable (intention of stakeholders to share tacit knowledge).

   In other words, sub-RQ1 examine whether the independent variables (all the three personal factors of personal ability, personal relevance, and personal attitude) possess positive value of correlation coefficient towards the dependent variable (intention of stakeholders to share tacit knowledge) or not. If there is a positive value of correlation coefficient, it means that the intention to share tacit knowledge

increases when personal attitude, relevance or ability increases; or vice-versa.

2. sub-research question two (sub-RQ2)

   The scope of sub-research question two (sub-RQ2) involves the association of the independent variables to the dependent variable, which is indicated by the red dotted line arrow pointing from the red colour dotted line frame to the black colour dotted line frame as shown in the Figure 2.2.

   The objective of sub-RQ2 is to investigate whether personal ability, attitude, and personal relevance affect stakeholders' intention to share their tacit knowledge. In summary, the results of sub-RQ2 would ascertain how intensely each independent variable influences the dependent variable.

3. sub-research question three (sub-RQ3)

   The extent of sub-research question three (sub-RQ3) involves paths M_0, M_1 and M_2 in Figure 2.2, which describes the process underlie an observed relationship between three independent variables and the dependent variable via the inclusion of a third hypothetical variable, known as a mediating variable. Figure 2.2 shows that the mediating relationship is one in which the path connecting the independent variable (all three personal factors of personal ability, personal relevance, and personal attitude) to the dependent variable (intention

to share tacit knowledge) is intervened by a mediating variable (motivation).

In the sub-RQ3, a mediating variable (motivation) explains how or why there is a relation between the independent variables (personal factors) and the dependent variable (intention to share tacit knowledge). A mediating variable can be a potential mechanism by which an independent variable can produce changes on a dependent variable when it is the partial mediation. Conversely, the independent variable no longer affects the dependent variable after mediating variable has been controlled when it is the complete mediation. Hence, the sub-RQ3 serves to investigate the mediating effects of expected mediator, motivation on the relationship between personal factors (independent variables) and stakeholders' intention to share tacit knowledge (dependent variable).

4. sub-research question four (sub-RQ4)

The paths C_0, C_1, and C_2 in Figure 2.2 are the extent of sub-research question four (sub-RQ4). The sub-RQ4 serves the same objective as sub-RQ3, nonetheless the mediating variable to intervene the relationship is communication skills in sub-RQ4. Mediation tests whether the effects of independent variable (all three personal factors of personal ability, personal relevance, and personal attitude) on the dependent variable (intention to share tacit knowledge) operate through a mediating variable (communication skills). This way, the

mediating variable explains the causal relationship between two variables or "how" the relationship works.

Therefore, sub-RQ4 investigates the mediating effects of expected mediator, communication skills on the relationship between personal factors (independent variables) and stakeholders' intention to share tacit knowledge (dependent variable).

5. sub-research question five (sub-RQ5)

   The blue colour frame in Figure 2.2 indicates the scope of sub-research question five (sub-RQ5). The initiative of formulating sub-RQ5 is to validate sub-RQ3, which to evaluate the effectiveness of motivation on the intention of stakeholders to share their tacit knowledge by conducting the pre-test and post-test in quasi-experimental research.

6. sub-research question six (sub-RQ6)

   The extent of sub-research question six (sub-RQ6) is bounded within the purple colour frame as shown in Figure 2.2. The purpose of having sub-RQ6 is to validate sub-RQ4, which to evaluate the effectiveness of communication skills to improve the intention of stakeholders to share their tacit knowledge during requirements elicitation process by conducting the pre-test and post-test in true-experimental research.

It is clear that there is good knowledge of the main research question of this study after having described all the six sub-research questions separately in a detailed manner. Figure 2.2 was designed to explain how all the six sub-research questions (sub-RQs) works between the parts of a whole.

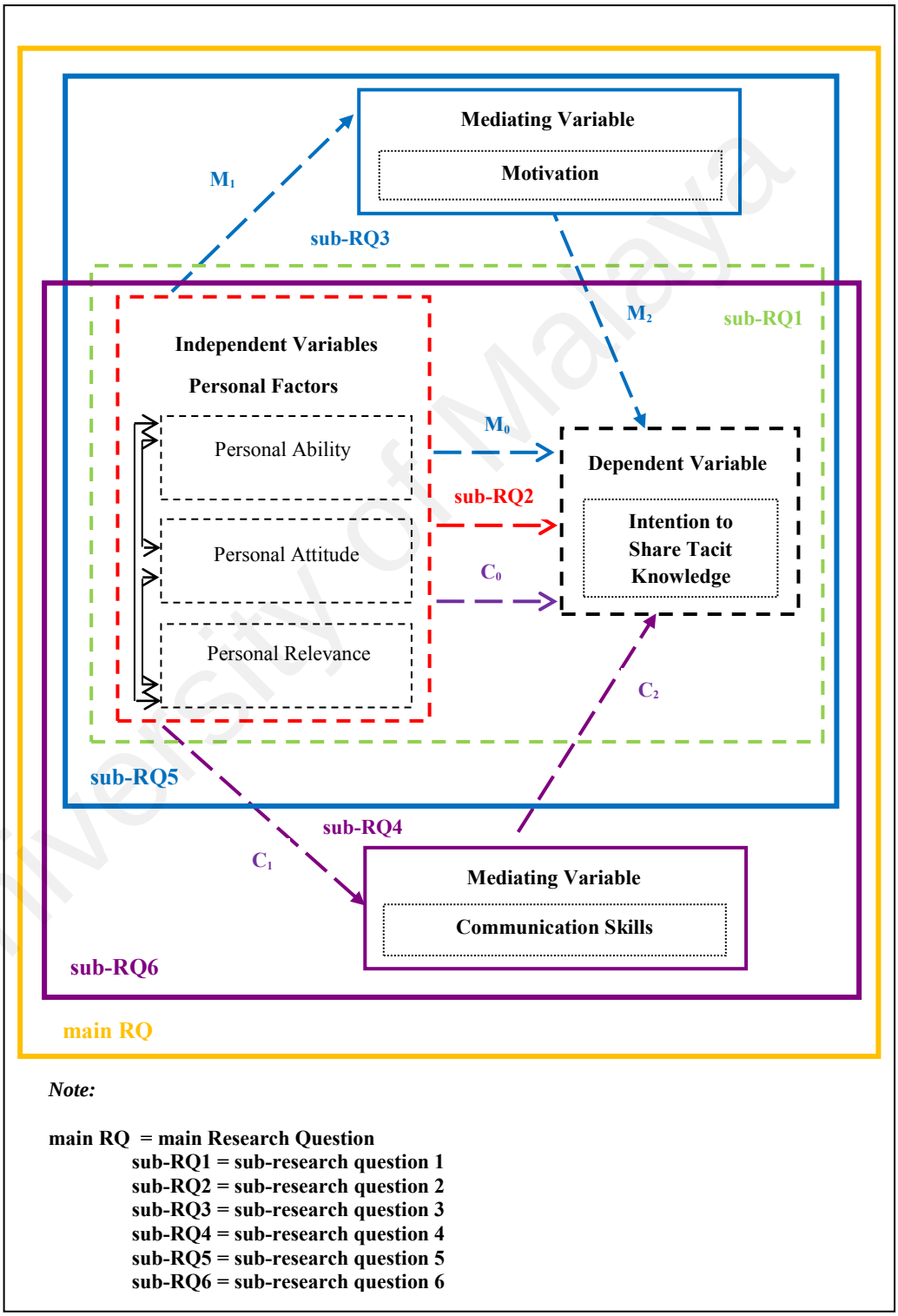

Figure 2.2: Conceptual framework of the study

2.9. Summary

This chapter has provided an overview of the literature relevant to this study. This literature review uncovered the past requirements elicitation models' lack of consideration towards human factors in selecting stakeholders, which could, in fact, help to enhance the stakeholder's engagement in sharing tacit knowledge during requirements elicitation.

Indeed, stakeholders are the important source of requirements to convey tacit knowledge (e.g. issues, business processes), as well as the source of requirements for the new software system. Researchers in the prior studies have also agreed that the software project failure is generally due to the issue of stakeholders lacking engagement to share tacit knowledge in requirements elicitation.

Therefore, engagement of stakeholders is the key to success in requirements elicitation. Nonetheless, the existing stakeholder identification and tacit knowledge sharing approaches in the software engineering domain have made the issue of uncovering more accurate and complete requirements an unresolved one in requirements elicitation. Hence, this proves that personal and human psychological factors (i.e., motivation and communication skills) deserve attention in order to develop a process model that encourages effective tacit knowledge sharing, to bridge the gap revealed through the literature review.

Aside from providing guidance used to formulate the conceptual framework, the contents of literature were used as references in designing the present study,

as well as used to develop the research methods and data analysis. Chapter 3 provides the design and methodology for this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Overview

Tacit knowledge is more difficult to share than explicit knowledge because it costs a significantly larger amount of time and effort. Thus, sharing tacit knowledge continues to be a problem in requirements elicitation. The purpose of this study is to examine the influencing factors such as personal factors, motivation, and communication skills mainly to answer the following research questions:

The following is the main research question of this study, which are followed by six sub-research questions (sub-RQs):

Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?

sub-RQ 1: What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?

sub-RQ 2: What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?

sub-RQ 3: What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

sub-RQ 4: What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

sub-RQ 5: What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?

sub-RQ 6: What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?

This chapter provides detailed descriptions of the research methodology used to achieve the stipulated aim and objectives of this study. The structure of this chapter is arranged as follows:

1. Research Design
2. Research Setting
3. Research Population and Sample
4. Data Collection Instruments and Procedure
5. Data Analysis That Includes Descriptive and Inferential Analysis

This chapter concludes with a summary of the chapter.

3.2 Research Design

Research design is a plan of study that provides the logical structure that guides to address research problems and answer research questions as unambiguously as possible (Flick, 2007; Lavrakas, 2008). Research design is classified into two types which are experimental and non-experimental designs (Chua, 2012).

According to Chua (2012), a research can be conducted using several different designs and is not restricted to one design per research. Hence, this study

employed two different types of research design, non-experimental and experimental designs, to enrich the existing bodies of knowledge with quantitative data. The overview of the research designs of this study is shown in Figure 3.1. The details of quasi experimental and true experimental research design of this study are shown in Figure 3.2 and Figure 3.3 respectively.

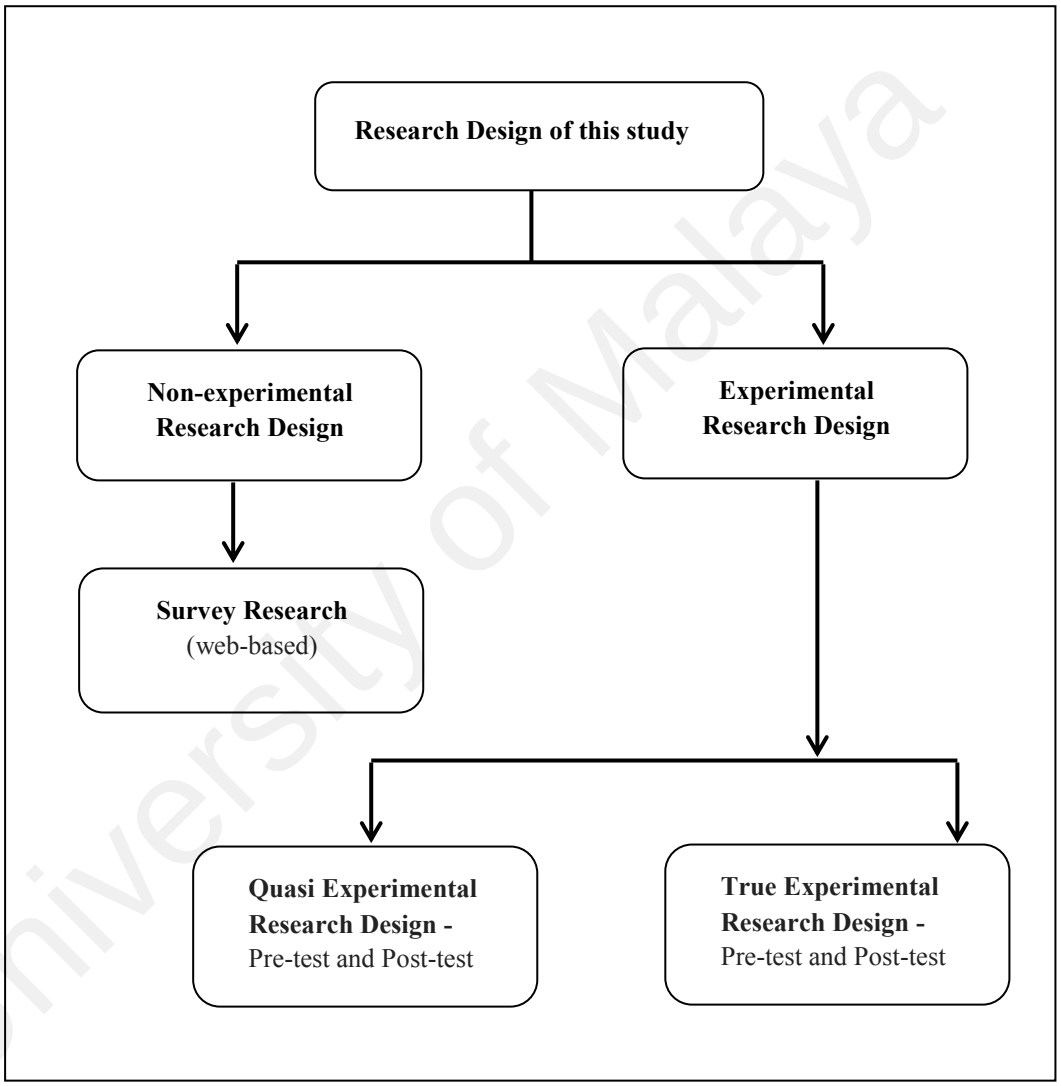

Figure 3.1: Overview of research design of the study

3.2.1 Survey Research Design

A survey research design was employed to answer main research question, which includes sub-research question one, two, three and four. Survey research

is one of the most prevalent non-experimental designs, broadly used in various fields of studies. Numerous survey instruments are available including pen-and-paper questionnaires, online questionnaires, telephone interviews, and face-to-face interviews.

These instruments are suitable for elaborating the views of the subjects, as well as predicting the relationships between concepts in the study (Chua, 2012). In light of these characteristics, this study applied the survey research to answer the research questions, thus allowing assessment of the effects of relationships between the variables (i.e. independent, mediating, and dependent).

Besides the aforementioned reason, survey research was employed in this study to answer main research question, which includes sub-research question one, two, three and four because it can be conducted with minimal costs and is easy to conduct in the form of an online questionnaire. It is also suitable to answer research questions that concern issues of attitudes, behaviour, views, beliefs, and feelings. Moreover, results of the survey research can be generalized accurately because it can be conducted anonymously on large samples (Andres, 2012; Chua, 2012).

This study's survey research investigated the description (e.g. age, gender, educational level, and years of experience) and opinions (e.g. views about the factors that influence the intention of tacit knowledge sharing in requirements elicitation) of practitioners in the software industry.

The description or the demographics of practitioners involved, besides their opinions, was considered to be a part of the survey research, serving to strengthen the survey research design. Survey research contains variables involved in the conceptual framework of this study, which is the intention to share tacit knowledge as the dependent variable, three personal factors (ability, attitude, and relevance) as the independent variables, and motivation and communication skills as the mediating variables.

In addition, the fact that the survey research of this study was conducted anonymously improved reliability and accuracy of feedback, potentially boosting the response rates compared to other types of research methodologies. As a result, the anonymity of survey research and the use of large samples permit the generalization of this study's results.

3.2.2 Experimental Design

An experimental design was used to answer sub-research questions five and six. The experimental research design is also incorporated as part of the research design of this study. It involves experimental manipulation (a treatment condition or an intervention) which was introduced with the intention to determine the cause-and-effect relationship between two variables.

In the experimental research design, an intervention is introduced and the effect of intervention on the aspect or subject of an experiment is then observed. It is often used to evaluate the effectiveness of an intervention (Chua, 2012).

There are two different forms of experimental research design: true experimental and quasi-experimental. Both designs involve an experimental manipulation but only the true experimental design uses the random assignment that has the ability to uncover cause-and-effect relationships. The most commonly used five true experimental research designs are post-test design, pre-test and post-test design, Solomon four-group design, treatment replacement design, and factorial design.

In this study, pre-test and post-test design of true experimental research design was chosen to further validate the outcomes of research sub-questions five and six which were derived from the survey research of this study. The true experimental research design was chosen because it can be used in different situations.

As an example, sub-research question five was made to investigate the effectiveness of motivation to improve the intention of stakeholders whereas sub-research question six was set to examine the effectiveness of communication skills to improve the intention of stakeholders to share their tacit knowledge during requirements elicitation process.

Both research questions served different investigative purposes in different situations. Furthermore, only one specific variable was tested at a time, thus the results are more relevant than some other forms of research design. The effects of intervention can be clearly seen when analysing the data collected because pre-test and post-test design measures the dependent variable twice (before and

after the independent variable is manipulated) in order to find out how much it was affected by the intervention condition.

Between-group pre-test and post-test design was chosen to compare the intervention effects on the engagement of participants in requirement elicitation between two groups (low-motivation and high-motivation groups) (Spector, 1981). The design answers sub-research question five.

Similarly, sub-research question six adopted the same research design of between-group pre-test and post-test design to compare the influence of intervention on the intention of participants in requirements elicitation between two groups (with communication skills and without communication skills). On the other hand, the survey research instrument of pen-and-paper was used to validate the results of sub-research questions three and four, which were derived from an earlier survey research of this study.

An independent variable defines as the variable that is changed or controlled in an experiment (Salkind, 2010). A change in the independent variable directly causes a change in the dependent variable (Salkind, 2010; Suter, 2012). The independent variables of the sub-research questions five and six of this study are motivation and communication skills respectively. The intention to share tacit knowledge is the dependent variable for both research questions.

Interventions of this study were varied for sub-research questions five and six. The following is the description of the experimental design for sub-research question five (sub-RQ5). The pre-test was administered to both groups (low-

motivation and high-motivation groups) before the introduction of gamification as an intervention. Later, post-test was administered to both groups after exposure to an intervention programme.

The purpose of applying the gamification concept is to address the motivational problems such as engagement of participants to share tacit knowledge in requirements elicitation. GameIt is a web application; a requirements elicitation tool used as an instrument in this experiment. Gamification is embedded in GameIt to intervene the intention of participants to share their tacit knowledge. The effect of gamification on participants was observed through points gained in accordance with their contributions at the end of the pre-test.

Accordingly, the behaviour of participants was presumed to change due to the implementation of game mechanics such as points, thus leading to an increase in the behaviour of desire during the study.

There was a 15-minute interval between pre-test and post-test in this study as Spector (1981) highlighted that interruption may occur when drawing definitive conclusions if the time period between pre-test and post-test is long. There also shows a decline of validity and reliability in this study due to boredom and tiredness of some participants, especially with a prolonged interval time.

In addition, distortions may occur as some participants might attempt to respond actively in requirements elicitation overtime if they know they are being studied. Table 3.1 illustrates between-group pre-test and post-test design for sub-research question five. The overview of research designs of quasi experimental research

design - pre-test and post-test (for sub-research question five) is shown in Figure 3.2.

Table 3.1: Experimental Design of sub-Research Question Five

Group	Pre-test	Intervention	Post-test
Experimental	O	X	O
Control	O		O

Note: O = measurement; X= gamification

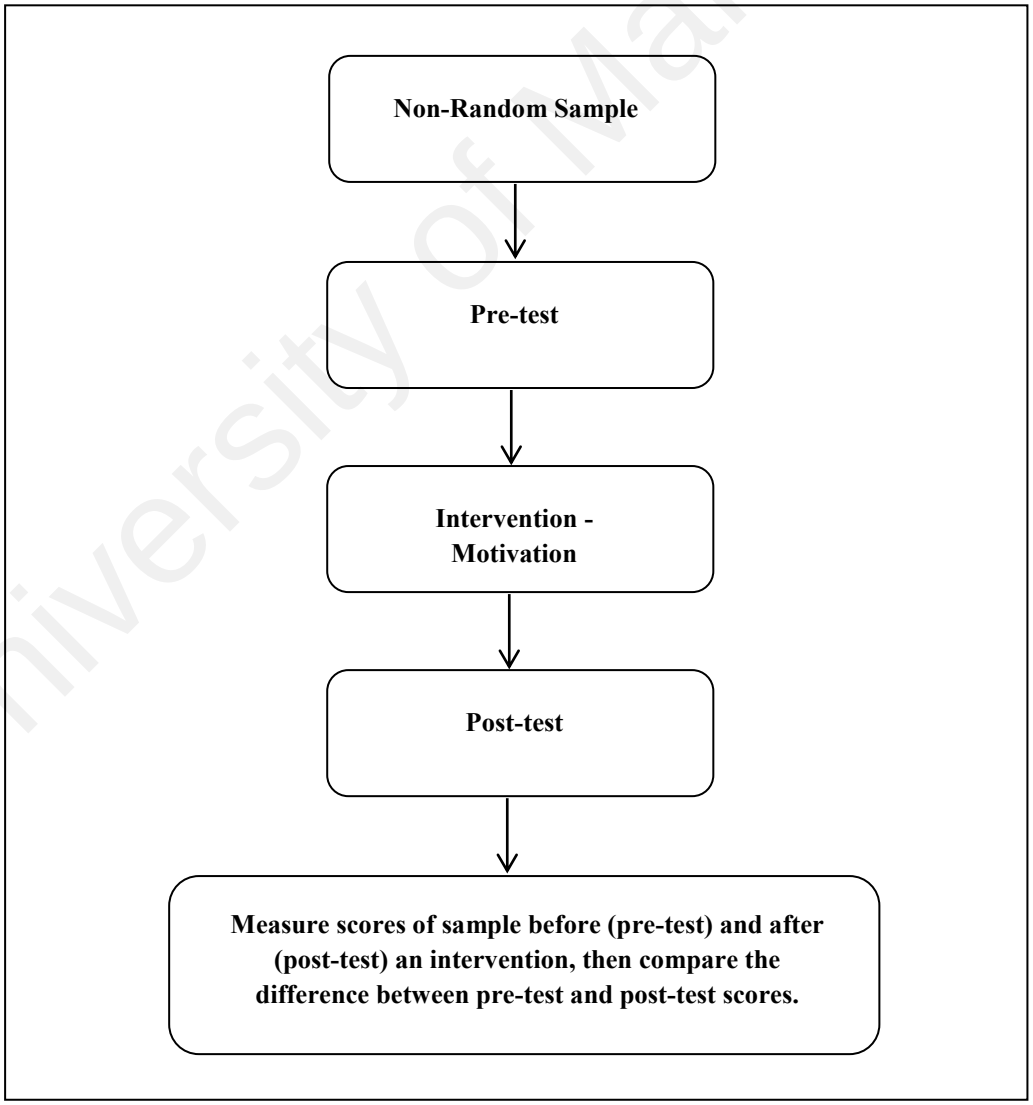

Figure 3.2: Overview of research design of quasi experimental research design – pre-test and post-test

The following is the description of the experimental design for sub-research question six. The aim of sub-research question six is to examine how communication skills are used effectively to engage participants to share their tacit knowledge during requirements elicitation.

A two-group pre-test and post-test experiment was conducted accompanied by the intervention of communication skills. Both groups used a mobile instant messaging (MIM) app, WhatsApp, as a communication tool.

The facilitator posted questions to the participants to elicit requirements from both groups. However, the facilitator applied communication skills to encourage the participants of the experimental group to respond to the posted questions on WhatsApp.

The experimental group received better communication compared to the control group. The communication skills applied to the control group were limited to greetings only at the beginning of the experiment whereas techniques of reflection and clarification were applied to the experimental group throughout the experiment.

Table 3.2 illustrates between-group pre-test and post-test design for sub-research question six. The overview of research designs of true experimental research design - pre-test and post-test (for sub-research question six) is shown in Figure 3.2. The details of the participants and the procedure are described in the subsequent sections.

Table 3.2: Experimental Design of sub-Research Question Six

Group	Pre-test	Intervention	Post-test
Experimental	O	X	O
Control	O		O

Note: O = measurement; X= communication skills

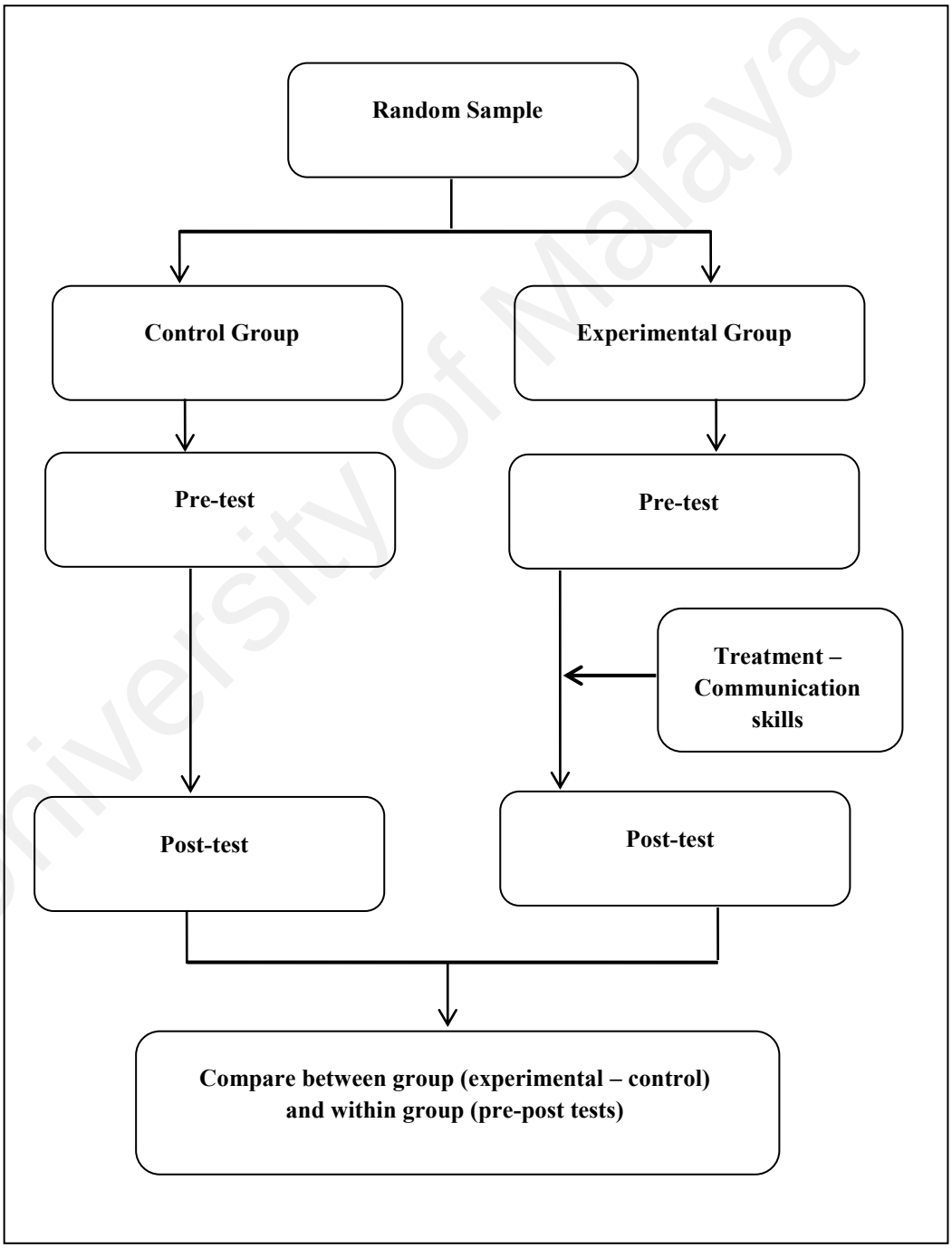

Figure 3.3: Overview of research design of true experimental research design – pre-test and post-test

3.3 Research Setting

Research setting refers to a place where the study is conducted (Given, 2008). There were two phases of data collection in this study. The first phase of data collection answers the main research question, which includes sub-research one, two, three, and four, the second phase of data collection validates those answers.

Survey research was used in the first phase of this study to gather data from the target audience characterized by the invitation of the respondents and the completion of the online questionnaire over the World Wide Web (abbreviated WWW or the Web). Data for the second phase of this study were collected at a private higher learning institution in Malaysia.

3.4 Research Population and Sample

The definition of the term population is known as a group of individuals, objects or events that possess common characteristics to which or to whom the findings of the study are to be generalized (Boslaugh, 2008; Fink, 2003). Meanwhile, sample refers to the small subgroup or subset of a population (Fink, 2003).

3.4.1 Population

The aim of this study is to explore the effects of personal and psychological factors such as motivation and communication skills on the intention of stakeholders to share tacit knowledge. This study has two stages to answer and validate research questions three and four accordingly.

In the earlier stage, the population consists of software practitioners from diverse software development companies with at least one year of experience in software requirements. The reason for this population being chosen is because software practitioners work closely with stakeholders during the software system development.

Hence, they are able to perceive the actual problems alongside stakeholders clearer than if stakeholders were to perceive the problems alone. The population was also chosen in hopes to obtain the unbiased perceptions of software practitioners on the intention of stakeholders to share their tacit knowledge in requirements elicitation.

To contrast, a private higher learning institution was chosen as the population at the later stage of this study. The private higher learning institution was chosen because of its software applications which are currently in use and in need of improvements in terms of functions and features.

The end users of the above-mentioned software applications are students, an appropriate population for the second stage of this study. The students were chosen over software practitioners in order to validate the findings of the first stage of the study. This study also hopes to obtain comprehensive results by employing two types of population.

3.4.2 Sample

Sample is a small subgroup or subset of a population (Fink, 2003), as mentioned in the previous section. Sample size refers to the number of subjects which are selected in a population to be studied (Salkind, 2010). Consequently, sample size is one of the most important elements when designing a research study because it can affect the interpretation of a population.

There are several factors to be considered when determining a sample size, such as objectives of the study, ethical and legal considerations, nature of the population, and research design and availability of resources (Daniel, 2012). According to Daniel (2012), non-experimental designs have a propensity to require larger sample sizes than experimental research designs. Similarly, quantitative research designs also require larger sample sizes if compared with qualitative research designs.

The first stage of this study employed a non-experimental research design which used survey research as its method (web-based), one that requires a large sample size. Furthermore, a quantitative research design was employed to analyze data to examine the relationship between the variables as illustrated in Figure 2.2 (refer to Section 2.8).

Sampling is necessary as it is difficult, on occasions, to collect a sample from the entire population due to reasons of a large or inaccessible population or the lack of resource. Sampling is defined as a process of selecting individuals, objects or events from a target population so that the study of the sample may yield results

that can be objectively generalized to the population from which they were chosen (Daniel, 2012). In addition, Daniel (2012) classified the types of sampling into non-probability, probability, and mixed-method sample design.

The choice of sampling always begins with choosing a sampling frame, of which one was not available for the population at the first stage of this study. The samples were difficult to identify or to be recruited from the population. It is stated that the population is hidden when there is no sampling frame within the group concerned (Salganik & Heckathorn, 2004).

The reasons that cause a population to be without a sampling frame includes a small-sized population, the difficulty in locating samples which could be caused by the sensitive nature of the population's behaviour, and the difficulty in differentiating between the samples of the population (Salganik & Heckathorn, 2004).

The hidden population (Miller & Brewer, 2003) of stage one, a difficult-to-reach population, is influential in the decision making of the sample design. Under this circumstance, mixed-method sample design (Daniel, 2012) was chosen over a single sample design type for data collection in an attempt to answer research question one which comprises cluster sampling method and snowball sampling method.

The snowball sampling method is appropriate to be applied in the survey that involves surveying samples of a hidden population (Lavrakas, 2008). The basic idea behind the snowball sampling method involves identifying samples and

asking them to give the names of other samples of the same population to participate in the study (Lavrakas, 2008).

The process of identifying and recruiting samples continues until the desired sample size is reached. However, snowball sampling is a nonprobability sampling technique, thus random selection was conducted in each round of sample recruitment to make sure that every sample in the population has an equal chance of being chosen.

On the other hand, cluster sampling was chosen because it is one out of three most often-used techniques that does not require a sampling frame (Henry, 1990). It is also the most practical large survey (Daniel, 2012). It is one of few probability sampling methods that statisticians and researchers use to extract samples from a larger population.

Hence, cluster sampling was used at the first stage of this study, where it requires a larger sample size to answer sub-research question one. The population of the first stage in this study is software practitioners from software companies.

The software companies were divided into clusters from where the samples were then randomly selected to assure that all samples in the population have equal probabilities of being chosen. The random sampling method is used in practice oftentimes for the infinite population because random sampling is considered unbiased (Schumacker, 2015).

Generally, a research study requires a sufficiently large sample size to ensure its generalizability and accuracy of results. However, the population at the first stage of this study is an infinite population where the true population is not known. Nonetheless, the sample size could still be calculated with the following formula, according to Cochran (1977):

$$S = z^2 * p * (1 - p) / M^2$$ (Cochran, 1977)

***Note**: S is sample size for infinite population; z is z-score; p is population proportion (assumed to be 50% = 0.5) and M is margin of error.*

z-score is determined based on confidence level, and confidence level is the probability that the value of a parameter falls within a specified range of values. If 95% confidence level is considered, then z-score is 1.960. On the other hand, margin of error is a small amount allowed in cases of miscalculation or change of circumstances. Generally, margin of error is valued at 5%, which M= 0.05.

Hence, the working steps to calculate the sample size of the infinite population are as below:

$$S = (\text{z-score})^2 * p * (1 - p) / (\text{margin of error})^2$$

$$S = (1.96)^2 * 0.5 (1 - 0.5) / (0.05)^2$$

$$S = 3.8416 * 0.25 / 0.025$$

$$S = 384.16$$

The sample size for the infinite population is 385 after rounding up to the nearest number. The number was used as a target sample size for data collection at the first stage of this study, however, only 320 samples volunteered to participate.

A summary of the samples' demographic of main research question is presented in Table 3.3.

Table 3.3: Samples' Demographic Profile of sub-Research Questions One to Four

Item	Description	Count (N)	Percentage (%)
Gender	Female	73	22.80
	Male	247	77.20
Age	20 to 29 years old	123	38.44
	30 to 39 years old	131	40.94
	40 to 49 years old	53	16.56
	50 to 59 years old	12	3.75
	60 years old and above	1	0.31
Role in Requirements Elicitation	Business Analyst	52	16.25
	Application Analyst	35	10.94
	Application/Technical Consultant	64	20.00
	Project Manager	59	18.44
	Program/Technical/Delivery Manager	46	14.37
	Others	64	20.00
Years of Experience in Requirements Elicitation	1 to 2 years	41	12.82
	2 to 3 years	60	18.75
	4 to 5 years	59	18.43
	More than 5 years	160	50.00

Table 3.3 shows 247 male samples (77.20%) and 73 female samples (22.80%). Their ages range from 21 to 62 years old with an average mean age of 33.15. Approximately 40.94% of them are between 30 to 39 years old. The requirements elicitation process is part of the job routine of the samples in this study, despite diversity in job titles. Among the samples were 52 business analysts (16.25%), 35 application analysts (10.94%), 64 application or technical consultants (20%), 59 project managers (18.44%), 46 program or technical or delivery managers (14.37%), and 64 who have other jobs (20%) such as chief executive officer (CEO) of the company, software engineer, and so forth. Half of

the samples (50%) have more than 5 years of experience in requirements elicitation.

The sampling methods of sub-research questions five and six are different and will be further discussed in this section. In the second stage of this study, students of a private higher learning institution were chosen as samples to answer sub-research questions five and six in order to further validate the outcomes of sub-research questions three and four. In preparation to answer sub-research questions five and six, cluster sampling was used to extract samples. According to Daniel (2012), experimental research usually consists of 15 to 30 participants per group.

Therefore, a total of 34 undergraduate students from the Department of Computing were invited to participate in order to answer sub-research question five in this study. However, two undergraduate students opted not to respond. Hence, only 32 samples who responded pre-test and post-test were included in the study.

All 32 samples were enrolled in computing courses and have similar educational history and background. The selected samples were 7 females (21.90%) and 25 males (78.10%). The samples were age 20 to 25 years old. The inclusion criterion of this study was the sample must be a user of the teaching and learning survey web application.

The selected samples were asked to share their knowledge, opinion, and views during requirements elicitation to enhance the existing teaching and learning survey web application which is currently under-utilized. There was no specific withdrawal or exclusion criterion. Furthermore, samples have the right to leave if they feel uncomfortable with the study. A summary of the samples' demographic of sub-research question five is presented in Table 3.4.

Table 3.4: Samples' Demographic Profile of sub-Research Question Five

Item	Description	Count (N)	Percentage (%)
Gender	Female	7	21.90
	Male	25	78.10
Age	20 to 24 years old	31	96.90
	25 years old and above	1	3.10

On the other hand, undergraduate students from the Department of Computing in the same private higher learning institution were recruited to participate in a pre-test-post-test study in order to answer sub-research question six. Participation in this study was voluntary. A total of 50 students from computing courses who have similar educational history and background were involved. The selected samples were 10 females (20.00%) and 40 males (80.00%). The samples were age 15 to 25 years old. Table 3.5 displays a summary of the samples' demographic of research question seven.

Table 3.5: Samples' Demographic Profile of sub-Research Question Six

Item	Description	Count (N)	Percentage (%)
Gender	Female	10	20.00
	Male	40	80.00
Age	15 to 19 years old	38	76.00
	20 to 24 years old	11	22.00
	25 years old and above	1	2.00

3.5 Data Collection

Data collection is a process of collecting information from all relevant sources to address the research questions. There are many data collection approaches, however, in considering the cost and time constraint, survey research was chosen to collect data to fit the proposed conceptual framework underlying the study. Survey research is the most widely spread method to collect individuals' opinions. Various survey instruments are available, which include pen-and-paper questionnaires, online questionnaires, telephone interviews, and face-to-face interviews.

In this study, an online questionnaire was chosen for the early stage whereas paper questionnaire was chosen for the later stage due to the smaller sample size when compared to the former, which had collected approximately 300 samples.

3.5.1 Data Collection Instruments

Data collection instruments are tools used to collect the data to answer research questions under investigation. There are different types of instruments, however, the most commonly used research instrument is the questionnaire. Besides questionnaire, a web application and WhatsApp were also chosen as tools to collect data in this study. The instruments and tools used in this study will be further discussed in the following sections.

3.5.1.1 Questionnaire for sub-Research Questions One to Four

The questionnaire of this study was developed based on relevant theories and literature with some alterations to fit the knowledge sharing context in requirements elicitation. It is evident from previous studies that no suitable instrument was available to quantitatively measure factors, especially the personal factors in the proposed conceptual framework of this study.

Thus, a decision was subsequently made to construct a new survey instrument that could specifically address the issues being investigated – one that would measure the relative importance of identified tacit knowledge sharing factors in requirements elicitation.

The instrument contains information on the background of participants and the proposed conceptual model, which applied the Structural Equation Modelling (SEM) statistical technique that allow complex relationships between one or more independent variables and one or more dependent variables. In this study, there are three independent variables (personal factors i.e. personal ability, personal relevance and personal attitude) and one dependent variable (intention to share tacit knowledge). In addition, two mediating variables (motivation and communication skills) are contained within the survey instrument due to the variants in psychological adjustment and combined effect that are not accounted for by each individual variable.

Both can be found in Part I and Part II respectively. Part I of the instrument measures the demographic data including gender, age, job title, years of experience in gathering information on software requirements, skills level of

gathering information on software requirements of a participant, company type of a participant, the number of employees in participant's company, the company's major domain area, and the type of solution participant's company provides to businesses and consumers.

Part II of the instrument comprises 6 variables including personal ability (7 items are "share knowledge that is set in his or her daily routines", "share knowledge that is set in standard operating processes", "share knowledge that is set in organizational rules and policies", "share knowledge that is set in organizational cultures", "share knowledge that is set in organizational documents", "mobilize the amount of resources that he or she has within his or her organization or control area", "use resources within his or her organization capacity"), personal relevance (6 items which are "willingness of stakeholder to allocate time in the process of sharing tacit knowledge on software requirements", "stakeholder's efficiency in putting resources within his or her organization or control area together into readiness", "willingness of stakeholder in seeking new software application upgrades", "stakeholder's level of interest in the new features in software application", "willingness of stakeholders to provide information of his or her requirements in a new software application", "proactive action of stakeholder during the process of sharing tacit knowledge on software requirements"), personal attitude (7 items which are "stakeholder's optimism", "stakeholder's confidence", "stakeholder's self-initiative", "stakeholder's trustworthy", "stakeholder's support", "stakeholder's flexibility in accepting new ideas", "stakeholder's creativity in deriving "thinking out of the box" ideas), motivation (4 items which are "involvement", "appointment", "hard work contribution", "knowledge of expertise contribution"),

communication skills (4 items which are "how knowledgeable is the stakeholder", "how well does the stakeholder understand the information at hand", "how well does the stakeholder communicate the information", "how much can the stakeholder reveal the level of information acquired"), and intention to share tacit knowledge (4 items which are "the degree of efficiency of producing an agreeable set of software requirements", "the degree of efficiency of approving the use of such hidden knowledge to produce an agreeable set of software requirements", "the availability of well-defined roles and responsibilities", "the accomplishments and results within specified date") (refer to Appendix B on page 258 for the complete version of this instrument).

Table 3.6: Factors and Measures used in the Research Model

Latent Variables and Their Indicators	**Source**
Personal Ability	(Hunter & Schmidt, 1996; Mcclelland, 1973; Nicholls et al., 1986; Oliveira-Castro & Oliveira-Castro, 2003; Steel & Van Scotter, 2003)
PAb1	Customer's behaviour that is set in his or her daily routines
PAb2	Customer's attitude towards following the set of standard operating processes
PAb3	Customer's knowledge that is set in organizational rules and policies
PAb4	Customer's knowledge that is set in organizational cultures
PAb5	Customer's knowledge that is set in organizational documents
PAb6	The number of resources that a customer has within his or her organization or control area
PAb7	The ability of a customer to use resources within his or her organization capacity

Table 3.6, continued: Factors and Measures used in the Research Model

Latent Variables and Their Indicators	Source
Personal Relevance	(Barki & Hartwick, 1989, 1994; Bloch & Richins, 1983; Celsi & Olson, 1988; Greenwald & Leavitt, 1984; Judith, 1986; Richins & Bloch, 1986; Schiller, 1912; Zaichkowsky, 1985)
PR1	The willingness of the customer to allocate time in the process of gathering information on software requirements
PR2	Customer's efficiency in putting resources within their organization or control area together into readiness
PR3	The willingness of the customer in seeking new software application upgrades
PR4	Customer's level of interest in the new features in the software application
PR5	The willingness of the customer to provide information of their requirements in a new software application
PR6	The proactive action of the customer during the process of gathering information on software requirements
Personal attitude	(Ajzen, 2005; DeFleur & Westie, 1963; Sandell, 1968; Schmidt & Krebs, 1993; Weinstein, 1972)
PAt1	Customer's optimism
PAt2	Customer's confidence
PAt3	Customer's self-initiative
PAt4	Customer's trustworthiness
PAt5	Customer's support
PAt6	Customer's flexibility in accepting new ideas
PAt7	Customer's creativity in deriving "thinking out of the box" ideas

Table 3.6, continued: Factors and Measures used in the Research Model

Latent Variables and Their Indicators	Source
Motivation	(Bandura & Cervone, 1983; Bandura & Schunk, 1981; Deci & Ryan, 1987; Dweck, 1986; Elliot, 1999; Gagné & Deci, 2005; Lin, 2007; Locke & Latham, 2006; Miller & Brickman, 2004; Ryan & Deci, 2000; Zimmerman et al., 1992)
Mot1	Involvement
Mot2	Appointment
Mot3	Hard work contribution
Mot4	Knowledge of expertise contribution
Communication Skills	(Coughlan & Macredie, 2002; Hendriks, 1999; Iksan et al., 2012; Saiedian & Dale, 2000)
Comm1	How knowledgeable is the stakeholder
Comm2	How well does the stakeholder understand the information at hand
Comm3	How well does the stakeholder communicate the information
Comm4	How much can the stakeholder reveal the level of information acquired
Intention to share tacit knowledge	(Ajzen,1991; Bock et al., 2005)
Intention1	The degree of efficiency of producing an agreeable set of software requirements
Intention2	The degree of efficiency of approving the use of such hidden knowledge to produce an agreeable set of software requirements
Intention3	The availability of well-defined roles and responsibilities
Intention4	The accomplishments and results within a specified date

All of the measures used in the present study were originally designed and developed in English. Each item assesses the perception of participants on the stakeholders' personal factors, communication skills, motivation, and intention to share tacit knowledge in requirements elicitation.

All the items are rated between 1 and 11 scale-points, with 1 as strongly disagree and 11 as strongly agree. For the data analysis of Structural Equation Modeling (SEM), the measurement scale for items should be an interval scale, based on the suggestion of (Kline, 2011). All items in the instrument are based on a 1 to 11 scale-point, with 1 as strongly disagree and 11 as strongly agree. The 11-point Likert scale was used as the estimation of relationships among the variables in Structural Equation Modeling (SEM) model are based on the Pearson product-moment coefficient and linear regression, of which both require a wider scale of measurement. Kline (2011) and Byrne (2001) suggested using an 11 point Likert scale to meet the requirement of the Structural Equation Modeling (SEM) analysis. A complete set of the questionnaire is documented in Appendix B (refer to page 258).

3.5.1.2 Web Application

The web application, GameIt is a requirements elicitation tool that elicits requirements from stakeholders. The study aims to use GameIt to elicit as many requirements as possible from stakeholders. Although this study placed great emphasis on eliciting requirements, filtering and prioritizing requirements are not the focus of this study.

The current version of GameIt consists of two core functions, in which stakeholders can propose one or more requirements that they wish to include in the new software application, as well as vote for requirements from a list contributed by stakeholders. Game mechanics were employed to develop the web application framework to include points and a leaderboard to make tacit knowledge sharing session more fun and engaging.

Simultaneously, a game dynamic (reward) was introduced in GameIt to motivate stakeholders to engage and to induce their contribution in requirements elicitation (Kwok & Gao, 2004). *"The more users can gain from the virtual and tangible rewards of using our application, the more we can be rewarded from our users"* (Law, Kasirun, Gan, 2011).

In view of that, participants were awarded virtual and tangible rewards after sharing their knowledge by proposing or voting for requirements in GameIt. The participants earn points as a form of virtual reward and The Coffee Bean & Tea Leaf gift vouchers as a form tangible reward. At every moment they propose a requirement, they will be awarded twenty points. Likewise, voting for a requirement from the list of requirements will earn them five points. The participants would automatically move up in rank on the leaderboard based on the accumulated points. However, only the top three scorers will be awarded The Coffee Bean & Tea Leaf gift vouchers.

This study presumed that gamified features embedded in GameIt would evoke motivational effects if participants were not ignorant of their existence. GameIt concentrated on how gamification efforts can create pleasing experiences to

solve issues e.g. lack of engagement of stakeholders in requirements elicitation. This is a key issue that has led to building the wrong product and is the main cause of project failure (Kujala, 2003; Lim, Quercia, & Finkelstein, 2010; Snijders et al., 2015; Yozgyur, 2014) as stakeholders are motivated easily yet fail to engage actively in a task or activity in requirements elicitation. Screenshots of GameIt is illustrated in Appendix C (refer to page 264).

3.5.1.3 Questionnaire for sub-Research Question Five

A pen-and-paper questionnaire was employed to collect data to answer sub-research question five. It contained two parts: demographic and motivation of stakeholders to share tacit knowledge. The questionnaire was prefaced with a section that explained the objectives of the study and assured respondents of the anonymity and confidentially of their response.

Demographic in this questionnaire included age and gender. On the other hand, the motivation construct of the questionnaire in section 3.5.1.1 was adopted and used in developing the questionnaire for sub-research question five (sub-RQ5). Modifications were made to items of motivation constructed from the questionnaire in section 3.5.1.1, according to the perspective of stakeholders instead of software practitioners to evaluate their motivation in the context of sharing tacit knowledge. A complete set of this questionnaire is shown in Appendix D (refer to page 267).

3.5.1.4 WhatsApp

The mobile instant messaging (MIM), social networking chats have become the prime communicative use of smartphones owing to the upsurge of smartphone penetration in recent years. The general public, including students, is more inclined to communicate with family and friends using such various communication tools such as WhatsApp, Line, and WeChat.

Hence, this study decided likewise to use WhatsApp as a communication tool in conducting an experimental study to validate sub-research question six. In addition to text messaging, users of WhatsApp can send each other images, video, and audio media messages. It allows students to share ideas, opinions, and expectations of the new application in the group discussion, of which has opened up new opportunities for interaction between the facilitator of the group and the students. Screenshots of both experimental and control group discussion are shown in Appendix E (refer to page 269).

3.5.1.5 Questionnaire for sub-Research Question Six

The questionnaire consisted of two parts, which were demographics and survey items. The survey items included the intention of stakeholders to share their tacit knowledge and communication skills. This questionnaire was administered to both the experimental and control groups at the end of the study to establish a better perception of the use of communication skills to influence the intention of stakeholders to share tacit knowledge.

The first part of this questionnaire included questions about the demographic profile (e.g. age and gender) of the respondents whereas the second part of this questionnaire involved measurement items of intention to share tacit knowledge and communication skills construct.

Both constructs were adapted from the questionnaire in section 3.5.1.1 then used in this questionnaire. The measurement items of the intention to share tacit knowledge and communication skills were slightly modified from those employed in section 3.5.1.1 in order to evaluate the intention to share tacit knowledge using appropriate communication skills applied from the perspective of stakeholders. Two different sets of the questionnaire, one of the control group Appendix F (refer to page 271) and another of the intervention group Appendix G (refer to page 273). The questionnaires were prefaced accordingly with a section that explained the objectives of the study.

3.5.2 Data Collection Procedures

In this study, there are three different kinds of data collection procedures. Each procedure will be discussed separately in the following sections.

3.5.2.1 Questionnaire for sub-Research Question One to Four

Three experienced professionals in the software development industry were invited to examine the appropriateness of the research questionnaire especially regarding problems with the clarity of items. Additionally, the three experienced professionals were asked to comment on the overall appearance and organization

of the instrument. The responses, however, suggested only some minor changes in the instructions and wording of some items for each research construct. Some minor changes were made according to the feedback from the three experts.

The preliminary instrument reliability test was conducted in a pilot study with a sample of thirty practitioners from the software industry with experience in requirements elicitation. According to Chua (2012), a research instrument is reliable when its internal consistency reliability, the Cronbach's alpha value achieves .70.

The result of the pilot test showed that the instrument has a high level of reliability with internal consistency Cronbach's alpha for personal ability (α = .904), personal relevance (α = .938), personal attitude (α = .938), intention to share tacit knowledge (α = .914), motivation (α = .926), and communication skills (α = .943).

Reliability estimations are presented in Table 3.7. The score of all factors exhibits acceptable inter-item reliability Cronbach's alpha ranging from .904 to .943. The instrument was deemed ready to be sent to a large sample and thus gather the data for evaluation of the proposed research model.

Table 3.7: Reliability Estimations of Factors in Proposed Conceptual Framework

Latent Variables	Cronbach's alpha
Personal Ability	.904
Personal Relevance	.938
Personal Attitude	.938
Intention to Share Tacit Knowledge	.914
Motivation	.926
Communication Skills	.943

An online survey was used as a data collection method at the early stage of this study. The population consists of software practitioners from different software companies with at least one year of experience in software requirements.

A total of 400 invitations, through the URL of the online survey, were sent out through email to potential participants in software companies, supplemented by an email reminder to assure the validity of response data, to reconfirm the willingness of the participants to participate, and to make sure that they would answer it carefully. Participants were assured that their participation in this study was completely voluntary and that they could choose to discontinue at any time.

The online survey took approximately six months (start date: 22 January 2014, end date: 4 July 2014) to complete. Nevertheless, there were only 320 participants who replied and agreed to take part in this study. The yield was 320 usable questionnaires for analysis from 51 small-sized and 269 medium-sized software companies. Out of a total of 400 invitations sent out via email, only 320 replied were completed, representing an approximate of 80% response rate.

3.5.2.2 Questionnaire for sub-Research Question Five

Data collection procedure for sub-research question five involved two phases of data collection and two data collection tools namely pen-and-paper questionnaire and the web application, GameIt. The participants were asked to answer a questionnaire that was related to motivation before the first phase of data collection.

The purpose of conducting the aforesaid questionnaire was to categorize the participants' motivation level towards the tacit knowledge sharing session in requirements elicitation. Subsequently, the participants were classified into low motivation level and high motivation level groups based on the scores gained in the questionnaire.

As mentioned in the earlier section, motivation construct consists of four items assigned with 1 to 11 scale-points. In order to categorise the continuous variable of motivation construct, the median split method was employed. The median split method divides the motivation construct, which is an independent variable (IV) in this study, into two groups of low motivation level and high motivation level groups with SPSS version 21.

The pre-test and post-test were completed within one day with fifteen minutes of interval time. The duration of the experimental task for this study was a thirty-minute session in pre-test and post-test. The experimental task in the pre-test and post-test session was the same. Participants were required to propose or vote for as many requirements as possible within the allocated thirty minutes for the teaching and learning survey application, GameIt.

Motivation is the intervention of the pre-test and post-test, whereby participants were asked to check their achievement in the last thirty-minute session on GameIt at the section labelled, "View Achievement Board" after completion of the pre-test. At the same time, they were also informed that the top 3 achievers will be awarded gift vouchers.

3.5.2.3 Questionnaire for sub-Research Question Six

Data collection for sub-research question six was conducted in the two phases of pre-test and post-test to measure the effectiveness of communication skills to improve the intention of stakeholders to share tacit knowledge.

The samples of this study were divided into two groups: control group and intervention group. Random selection and random assignment are best equipped to reduce threats to validity. However, these procedures are frequently impractical and are not always applicable to the population of this study – students. Therefore, the cluster sampling technique was used to select subgroups randomly from the population of this study and then randomly assign those subgroups (sample) to the intervention or control group.

In this study, subgroups refer to classes in a department. All classes in a department were assigned a number, then two classes were randomly selected based on the numbers picked. Next, a coin toss method was used to perform a random assignment. A "tail" assigns the subgroup to the intervention group and a "head", the control group (Lewis-Beck, Bryman, & Futing Liao, 2004).

Both groups were to have the same entry before an intervention was introduced to the intervention group. The intervention of this study is communication skills. In the experiment, the control group did not apply any communication skills, and the intervention group applied the communication skills. In other words, the control group is the group that without communication skills, and the intervention group is the group with communication skills. The effect of intervention manipulation on the intention of samples to share tacit knowledge in the intervention group was observed for a month's duration.

Participants of both groups were asked to share their ideas, opinions, thoughts or expectations on how to improve the current software application at their respective WhatsApp group. Both groups completed the questionnaires at the end of the experimental study of the pre-test and post-test design, which lasted for 4 weeks.

3.6 Data Analysis

In this study, data collected was analysed using a number of statistical techniques processed through SPSS version 21 and AMOS version 21. Both descriptive and inferential analysis methods were used to analyse the collected data to answer the main research question and six sub-research questions of this study.

Descriptive analysis is used to describe the basic features of the data in a study. It provides simple summaries of the samples and the measures. On the other hand, inferential analysis, unlike descriptive analysis, is the attempt to apply the conclusions that have been obtained from one experimental study to more general populations (Blaikie, 2003; Fitzgerald & Fitzgerald, 2014). Hence, descriptive

analysis is used to summarize sample data whereas inferential analysis is used to make generalizations about a population from sample data.

3.6.1 Descriptive Analysis

Descriptive statistics such as frequency count was performed to describe and summarize the demographic characteristics where appropriate in this study such as in section 3.4, section 4.6, and section 4.7. Frequency count is the most common kind of statistical analysis to indicate the number of times the data value occurs (Fitzgerald & Fitzgerald, 2014).

3.6.2 Inferential Analysis

Several types of inferential analysis were employed in this study including confirmatory factor analysis, multiple regression analysis, mediation analysis, paired samples t-test, and one-way repeated measures Analysis of Variance (ANOVA). A brief description of each type of inferential analysis is provided as below:

1. Confirmatory Factor Analysis (CFA) is a statistical technique used to test the hypotheses (or confirm theories) simultaneously that collectively constitute a measurement model (Lewis-Beck et al., 2004).

2. Multiple regression analysis predicts the value of a dependent variable based on the value of two or more other variables (Allen, 2017).

3. Mediation analysis is typically applied to assess the extent to which an effect of the intervening process to the relationship between an

independent variable and a dependent variable via the presence of a mediator variable (Iacobucci, 2008).

4. Paired samples t-test compares the means between two related groups on the same dependent variable. Sometimes, it is also known as dependent t-test (Salkind, 2007). Means typically represent two different times (e.g. pre-test and post-test with an intervention between both time points) or two related conditions.

5. One-way Analysis of Variance (ANOVA) is typically used to compare the mean scores collected from different conditions or groups in an experiment in which one independent variable has been manipulated. A one-way repeated measures ANOVA or a within-subjects ANOVA is used to determine whether there is a difference on a dependent variable over multiple time points in response to an intervention (Salkind, 2007).

3.6.2.1 Structural Equation Modeling (SEM)

Structural Equation Modelling (SEM) has become one of the techniques of choice for researchers across disciplines. In this study, SEM technique was used to validate the research model. SEM was also chosen because of its ability to assess latent variables at the observation level and to test causal relationships between latent variables at the theoretical level (Hair, Sarstedt, Ringle & Mena, 2012).

SEM is a combination of factor analysis and multiple regression. It consists of two parts, the measurement model and the structural model (Lewis-Beck et al., 2004). The measurement model is the part that relates indicators (observed or

measured variables) to latent variables (factors or constructs) whereas the structural model is the part that relates latent variables to one another (Hoyle, 2008; Lewis-Beck et al., 2004).

Both models serve different purposes. The measurement model assesses goodness of fit, construct validity, and others. Furthermore, it determines how well a theoretical model, based on past studies, fits the factor structure of a set of indicators. On the other hand, the structural model estimates the relationships among latent variables and tests the overall model, in addition to individual paths.

Confirmatory Factor Analysis (CFA) was conducted at the start of the data analysis of this study. CFA was used to assess the reliability and validity of the measurement model. Section 4.2 shows partial results of the CFA, which excluded motivation and communication skills. Section 4.5 illustrates the complete results of the CFA of this study.

Analysis of Moment Structures (AMOS) is an added SPSS module used to convert CFA to Structural Equation Modeling (SEM). SEM was used to investigate the causal relationships among the latent variables, also to verify the hypotheses developed in this study. Multiple regression analysis was chosen to examine the theoretical model of this study because it allows the development of a more complex model to investigate and explain a particular phenomenon that involves several independent variables in combination or in isolation (Allen, 2017). The results of multiple regression are shown in Section 4.2.4, Section 4.3.1, and Section 4.5.2.

Mediating analysis was then conducted in order to assess the significance of the indirect effects of motivation and communication skills factors on the intention of stakeholders to share tacit knowledge. In mediating analysis, paired samples t-test and one-way repeated measures ANOVA were used to identify whether there is statistical evidence of a mean difference between paired observations with an intervention between two time points.

To summarize the above discussion: a Confirmatory Factor Analysis (CFA) was performed to provide quantitative measures that assess validity and reliability of the proposed theoretical model. On the other hand, Structural Equation Modelling (SEM) was employed to examine the causal relationships among the constructs and to verify the hypotheses developed in this study.

AMOS was chosen as a data analysis tool to analyse the proposed Structural Equation Modelling (SEM) model of this study (refer to Figure 4.4 on page 136 of Chapter 4) which examined whether the model fits the data of the study. A model fit test was performed with four main fit indices (as indicated at the left top corner in Figure 4.4 in Chapter 4), i.e. the Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Chi-Square / Degree of Freedom Ratio (CMIN/df). For the Goodness-of-Fit Index, the model fits the data at a value of $p \geq .05$. AMOS is one of the most user-friendly data analysis tools for determining the relationship between variables in a complex research model (Byne, 2001).

The GFI was created as an alternative to the Chi-Square test because the Chi-Square statistic is sensitive to sample size (Hooper, Coughlan, & Mullen, 2008;

Jöreskog & Sörbom, 1982). Jöreskog and Sörbom (1982) claimed that the GFI is independent of the sample size unlike Chi-Square (χ^2). GFI values ranged from zero to one. Values close to 1.0 is indicative of a good fit (Kline, 2011).

The RMSEA is a "badness of fit" index in which a value of zero indicates the best fit and higher values indicate worse fit. That would mean that the model derived from this study perfectly fits the data of the study with RMSEA = .000. RMSEA value of .05 is considered an indication of good fit, values in the range of .05 to .08 are an adequate fit, and values between .08 to .10 are a mediocre fit (Hooper et al., 2008; Schermelleh-Engel, Moosbrugger, & Müller, 2003). However, more recently, a cut-off value of RMSEA is close to .06 (Hu & Bentler, 1999).

The CFI is known as an incremental or comparative fit index, which is among the most widely used in SEM that *measures the degree to which the data fit the hypothesized model better than the baseline (independence) model* (Hazen, Overstreet, & Boone, 2015). The model fits the data if the CFI is larger than .90, and the model fits the data perfectly if CFI = 1.00 (Kline, 2011). In addition, the CFI is one of the fit indices less affected by sample size (Bollen, 1990; Hu & Bentler, 1999).

The CMIN/df value in the range of 0 to 2 is an indication of good fit, and values between 2 to 3 are indicative of an acceptable fit (Schermelleh-Engel et al., 2003).

3.7 Summary

This chapter describes in detail the methodology of the study. It includes research design, research setting, population and sample, data collection instruments and procedure, and data analysis.

The data analysis was carried out using Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) version 21.0. Both descriptive and inferential statistical methods were used to analyze the data to answer the research questions proposed. Table 3.8 illustrates statistical analysis based on the research questions of this study.

Table 3.8: Statistical Analysis Based on Research Questions

Research Question	Type of Analysis
1. What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?	Inferential analysis: Correlation analysis
2. What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?	Inferential analysis: Multiple regression analysis
3. What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?	Inferential analysis: Multiple regression analysis and mediation analysis
4. What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?	Inferential analysis: Multiple regression analysis and mediation analysis
5. Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?	Inferential analysis: Confirmatory Factor Analysis, multiple regression analysis, and mediation analysis
6. What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?	Descriptive analysis Inferential analysis: General linear model analysis, paired samples t-test analysis, and profile pilots analysis
7. What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?	Descriptive analysis Inferential analysis: General linear model analysis, paired samples t-test analysis, and profile pilots analysis

CHAPTER 4: RESULTS

4.1 Overview

This chapter presents the statistical analysis of data and the results of this study with the relevant data in the text, figures, and tables. The sections are organized according to the research questions of this study. This study consists of one main research question and six sub-research questions. The main research question of this study is formulated as below:

Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?

On the other hand, the main research question has broken into six sub-questions (sub-RQ1, sub-RQ2, sub-RQ3, sub-RQ4, sub-RQ5 and sub-RQ6) differently in order to explain the main research question comprehensively.

sub-RQ 1: *What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?*

sub-RQ 2: *What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?*

sub-RQ 3: *What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?*

sub-RQ 4: *What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?*

sub-RQ 5: *What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?*

sub-RQ 6: *What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?*

In this study, the data collection procedures included survey research which investigated the opinions of practitioners in the software industry about the intention of stakeholders to share their tacit knowledge in requirements elicitation, thus answered sub-RQ1, sub-RQ2, sub-RQ3, and sub-RQ4. The main research question comprises factors mentioned in sub-RQ1, sub-RQ2, sub-RQ3, and sub-RQ4 that could heighten the intention of stakeholders to share their tacit knowledge in requirements elicitation.

On the other hand, the pre-test and post-test design of quasi-experimental and true-experimental research design were chosen to answer sub-research question five and sub-research question six in order to further validate the outcomes of sub-research question three and sub-research question four derived from the survey research.

4.2 sub-Research Questions One and Two

Two models have been introduced in this section: the measurement model and the structural model. The measurement model examines the relationship between the latent variables and their measures whereas the structural model represents the relationship between the latent variables. Results of both measurement and structural models are presented in the subsequent sections.

4.2.1 Measurement Model

The Confirmatory Factor Analysis (CFA) was conducted using maximum likelihood estimation to assess reliability and validity of the measurement model. Validity and reliability are essential elements in the evaluation of a measurement model (Tavakol & Dennick, 2011). Table 4.1 presents all the measurement items together with the corresponding constructs measured. A total of 24 items were used to evaluate the stakeholders' intention of knowledge sharing in requirements elicitation to answer research questions one and two.

The initial results revealed that the measurement model did not fit the data satisfactorily. In order to improve the model fit, a refinement procedure was employed repeatedly until all goodness-of-fit measures of the model achieved the recommended values. The SEM analysis results indicated that the model fits the data well (χ^2 =521.626, df = 239, CMIN/df = 2.183, GFI = .882, CFI= .959, RMSEA = .061). The model fit results are presented in Figure 4.1 (refer to page 117). Table 4.1 presents the validity and reliability of items of the instruments.

Table 4.1: Results of CFA of Measurement Model

Latent variables and their indicators	Factor Loading	Average Variance Extracted (AVE)	Cronbach's alpha	Composite Reliability
Personal ability		.56	.904	.90
PAb1	.63			
PAb2	.79			
PAb3	.86			
PAb4	.74			
PAb5	.84			
PAb6	.66			
PAb7	.70			
Personal relevance		.71	.938	.93
PR1	.83			
PR2	.84			
PR3	.76			
PR4	.83			
PR5	.90			
PR6	.87			
Personal attitude		.68	.938	.94
PAt1	.79			
PAt2	.87			
PAt3	.85			
PAt4	.87			
PAt5	.88			
PAt6	.81			
PAt7	.68			
Intention		.73	.914	.92
Intention1	.89			
Intention2	.78			
Intention3	.87			
Intention4	.88			

Note: PAb: personal ability; PR: personal relevance; PAt: personal attitude; Intention: intention to share tacit knowledge

4.2.1.1 Validity

Validity is the credibility of the research. It is described as the degree to which an instrument measures what it intends to measure (Hair et al, 2009; Tavakol & Dennick, 2011). In order to assess the validity of the measurement model, two types of validity were assessed: content validity and construct validity.

Content validity was assessed to ensure consistency between the measurement items and the existing literature. All measurement items of the survey instrument in this study were developed from existing literature. The expressions of these items were appropriately adjusted to the context of software development, as shown in Table 3.6. Content validity was done by inviting three experienced professionals to comment on the dimension of all measurement items of the survey instrument and by conducting a pilot test to validate the instrument.

Then, the study tested on construct validity which comprises convergent and discriminant validity (Campbell & Fiske, 1959). Generally, construct validity tests how well a concept or behaviour is being translated into an operational reality (Drost, 2011). Convergent validity measures that constructs are anticipated to be correlated, where in reality, they are (Shuttleworth, 2009; Untaru et al., 2016).

In contrast, discriminant validity tests that constructs are expected to not be correlated, where in fact, they are not (Shuttleworth, 2009; Untaru et al., 2016). In order to examine convergent validity, two measures were used: item loadings and average variance extracted (AVE) (Chen et al., 2012).

Convergent validity is adequate if item loadings are .60 (Hau et al., 2013) and average variance extracted (AVE) is greater than .50 (Fornell & Larcker, 1981). All the item loadings and average variance extracted (AVE) values of this study as presented in Table 4.1 were above the acceptable value.

The results of the analysis showed that the inter-correlations among latent variables with the correlation coefficient values are less than .90 as presented in Table 4.2 which indicates that the measure has adequate discriminant validity (Chua & Chua, 2017). The measurement model of this study demonstrated that all measures have satisfactory reliability and validity. Accordingly, the convergent and discriminant validities were supported.

4.2.1.2 Reliability

Reliability in research concerns the ability of an instrument to obtain identical values consistently (Hair et al, 2009; Tavakol & Dennick, 2011). Cronbach's alpha and composite reliability are two measures regularly used to provide evidence of the reliability of a research instrument (Hazen et al., 2015). Cronbach's alpha is a measure of internal consistency with the acceptable value of alpha ranged between .65 to .95 (Chua, 2012).

Table 4.1 illustrates the Cronbach's alpha for each construct of this study. Similarly, composite reliability is another measure of internal consistency that assesses construct reliability (Hazen et al., 2015). The composite reliability is acceptable if its value is .70 or greater (Lin, 2007). It was also calculated using factor loadings, which were all significant at the 0.01 level.

4.2.2 Structural Model

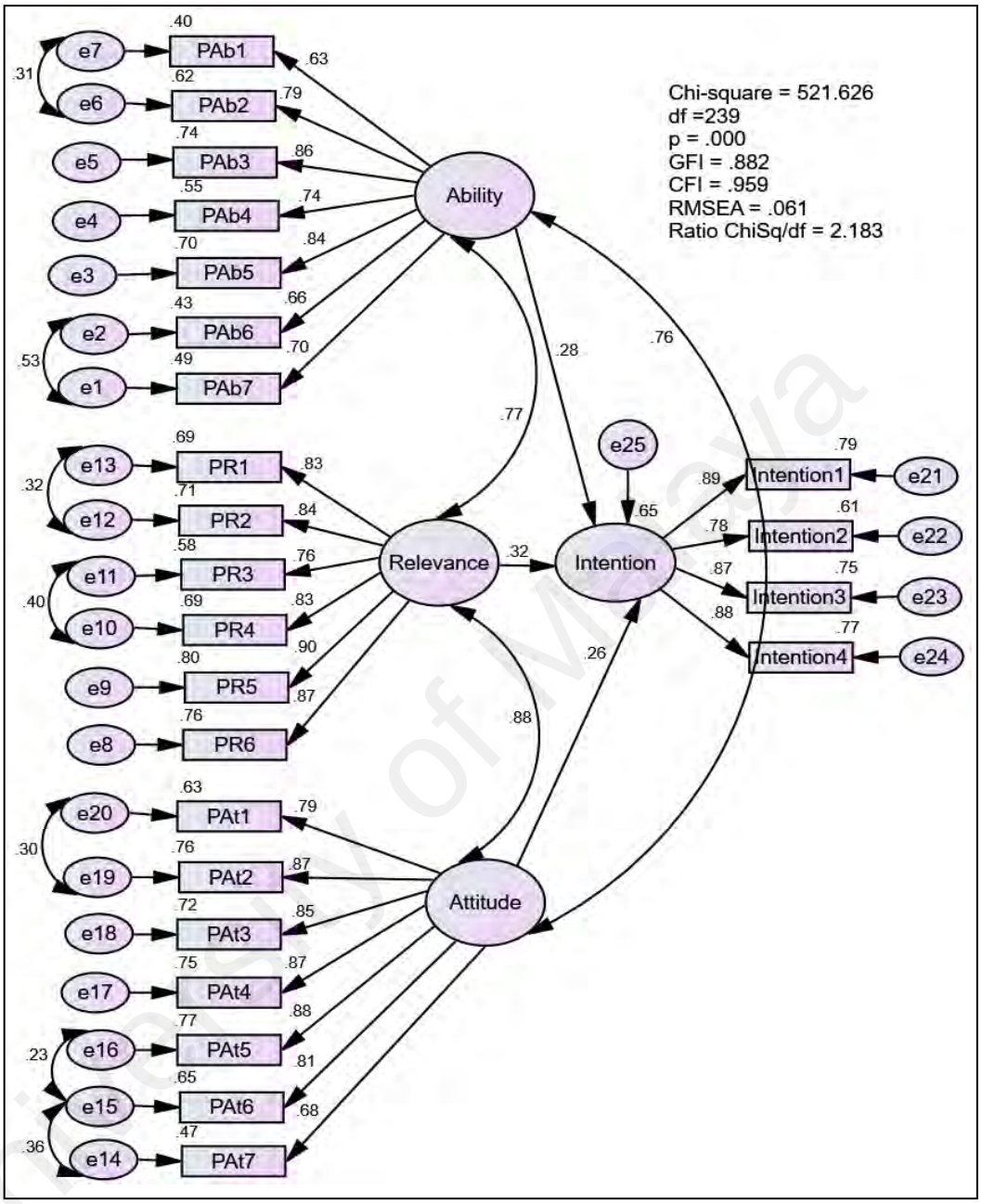

Figure 4.1: Structural model of the relationship between personal factors and the intention of stakeholders to share tacit knowledge

The results of the structural model analysis are shown in Figure 4.1. In order to assess the structural model fit, the CMIN/df value of 2.183 ranged between 2 to 3 was indicative of an acceptable fit according to (Schermelleh-Engel et al., 2003). The model best fits the data when the fit index Ratio is less than 3.0.

In this study, the small value of the ratio (CMIN/df = 2.183) shows that the model fits the data. It indicates that the model can be applied to the population of the study to enhance the intention of stakeholders to share tacit knowledge during the process of requirements elicitation.

Other fit indices also show a good fit for the structural model. The value of Goodness-of-Fit Index (GFI) is .882. Comparative Fit Index (CFI) is .959; thus, according to Kline (2011) and Schermelleh-Engel et al. (2003), the model fits the data if CFI is larger than .90. In addition, the value of RMSEA .061 ranged between .06 and .08 is considered an acceptable fit (Schermelleh-Engel et al., 2003).

Hence, the structural model of this study showed a fairly good fit with the collected data. Furthermore, the structural model accounted for the total variance on stakeholders' intention to share tacit knowledge in requirements elicitation (R^2 = .65).

4.2.3 Results of sub-Research Question One

sub-Research Question One: What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?

Correlation coefficient is a measure of the strength of the relationship between two variables (Salkind, 2007). The correlation coefficient is sometimes referred to as the r-value, and it ranges between -1 and 1 (Salkind, 2007). If the sign of r-

value is positive, then the value of one variable increases when the other variable increases.

On the other hand, if the sign of r-value is negative, then the value of one variable decreases when the other variable decreases. Sign (positive or negative) tells the direction of the relationship while the absolute value of the coefficient (its size, ignoring the sign) tells how strong the relationship is between two variables.

It is worth mentioning that the direction of the relationship does not affect the strength of the relationship. If the size is 1, then the data is perfectly linear. The closer the value is to zero, the weaker the linear relationship between two variables. In contrast, the closer the value is to 1, the stronger the linear relationship between two variables.

Table 4.2 depicts the results of the Structural Equation Modeling (SEM) analysis on the inter-correlations among the latent variables, i.e. personal ability, personal relevance, personal attitude, and the intention of stakeholders to share their tacit knowledge in requirements elicitation. The strength of the correlation is strong between personal attitude and the intention of stakeholders to share tacit knowledge ($r = 0.76$, $p < .01$), thus indicates that there is a significantly strong relationship between personal attitude and the intention of stakeholders to share tacit knowledge.

Likewise, there is a strong relationship between personal relevance and the intention of stakeholders to share tacit knowledge ($r = 0.77$, $p < .01$), and

between personal ability and the intention of stakeholders to share tacit knowledge ($r = 0.73$, $p < .01$). All three personal factors possess a positive value of correlation coefficient towards the intention of stakeholders to share their tacit knowledge, thus indicate that the intention to share tacit knowledge increases when personal attitude, relevance, or ability increases.

On the other hand, the correlation coefficient value between personal relevance and personal attitude ($r = 0.88$, $p < .01$) is a positive value, which means personal relevance and personal attitude are positively related. Furthermore, the relationship between personal relevance and personal attitude is significantly strong as the value of correlation between these two variables is closer to 1.

Besides personal attitude, personal relevance also has a positive relationship with personal ability. However, its relationship is not as strong as the relationship between personal relevance and personal attitude because the correlation coefficient value between personal relevance and personal ability is $r = 0.77$, $p < .01$.

Last but not least, the strength of the correlation between personal ability and personal attitude is also strong and positively correlated because the correlation coefficient value is $r = 0.76$, $p < .01$. It means that the ability of a person would improve instantaneously when his or her personal attitudes have changed positively.

Table 4.2: Inter-correlations among Latent Variables

Latent Variables			Correlation Coefficient Values
Personal Attitude	<--->	Intention to share tacit knowledge	.76
Personal Relevance	<--->	Personal Attitude	.88
Personal Relevance	<--->	Intention to share tacit knowledge	.77
Personal Ability	<--->	Personal Attitude	.76
Personal Ability	<--->	Intention to share tacit knowledge	.73
Personal Ability	<--->	Personal Relevance	.77

*Note: *correlation is significant at p < .01*

4.2.4 Results of sub-Research Question Two

sub-Research Question Two: What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?

The structural model shown in Figure 4.1 was analyzed to examine the associations hypothesized in the conceptual framework of this study. Table 4.3 depicts the results of the structural model analysis.

In this study, the intention of stakeholders to share tacit knowledge is the dependent variable, while the three personal factors of personal ability, relevance, and attitude are the independent variables. Standardized regression weights (beta values, β) compare the strength of the effect of each independent variable to the dependent variable.

In other words, a standardized regression weight is a measure of how strongly each independent variable influences the dependent variable. Standardized regression weights are measured in units of standard deviation. For example, the

intention of stakeholders to share tacit knowledge increases 0.28 standard deviation with an increase of one standard deviation in personal ability. Therefore, the higher the standardized regression weight value, the stronger the effect of the independent variable on the dependent variable.

Table 4.3: Multiple Regression Results of the Study

DV		IV	Estimate	S.E.	C.R.	β
Intention	<---	PAB	.31	.08	3.80	.28***
Intention	<---	PAT	.27	.11	2.50	.26*
Intention	<---	PR	.28	.09	3.00	.32**

*Note: *significant at p < 0.05; **significant at p < 0.01; ***significant at p < 0.001; DV = dependent variable; IV = independent variable; PAB = personal ability; PR = personal relevance; PAT = personal attitude; Intention = intention to share tacit knowledge.*

The results in Table 4.3 indicates that there is a significant positive effect of personal ability (β = .28, C.R. = 3.80, p < .001), personal attitude (β = .26, C.R. = 2.50, p < .05), and personal relevance (β = .32, C.R. = 3.00, p < .01) on the intention of stakeholders to share tacit knowledge. It means that the personal factors of personal ability, attitude, and relevance have had significant positive impacts on the intention of stakeholders to share tacit knowledge.

4.3 sub-Research Question Three

sub-Research Question Three: What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

A mediation model is introduced in this section. It involves motivation as a mediator variable. The results of the mediation model are presented in the subsequent sections.

4.3.1 Mediation Model

Before testing the mediation between variables to answer sub-research question three, a Confirmatory Factor Analysis (CFA) was conducted. The initial results showed that the measurement model did not fit the data well before repeated modification. Finally, the CFA results indicated that the model fits the data satisfactorily (χ^2 =795.134, df = 333, CMIN/df = 2.388, GFI = .848, CFI= .945, RMSEA = .066). Figure 4.2 shows the mediation model in the Structural Equation Modelling (SEM) analysis.

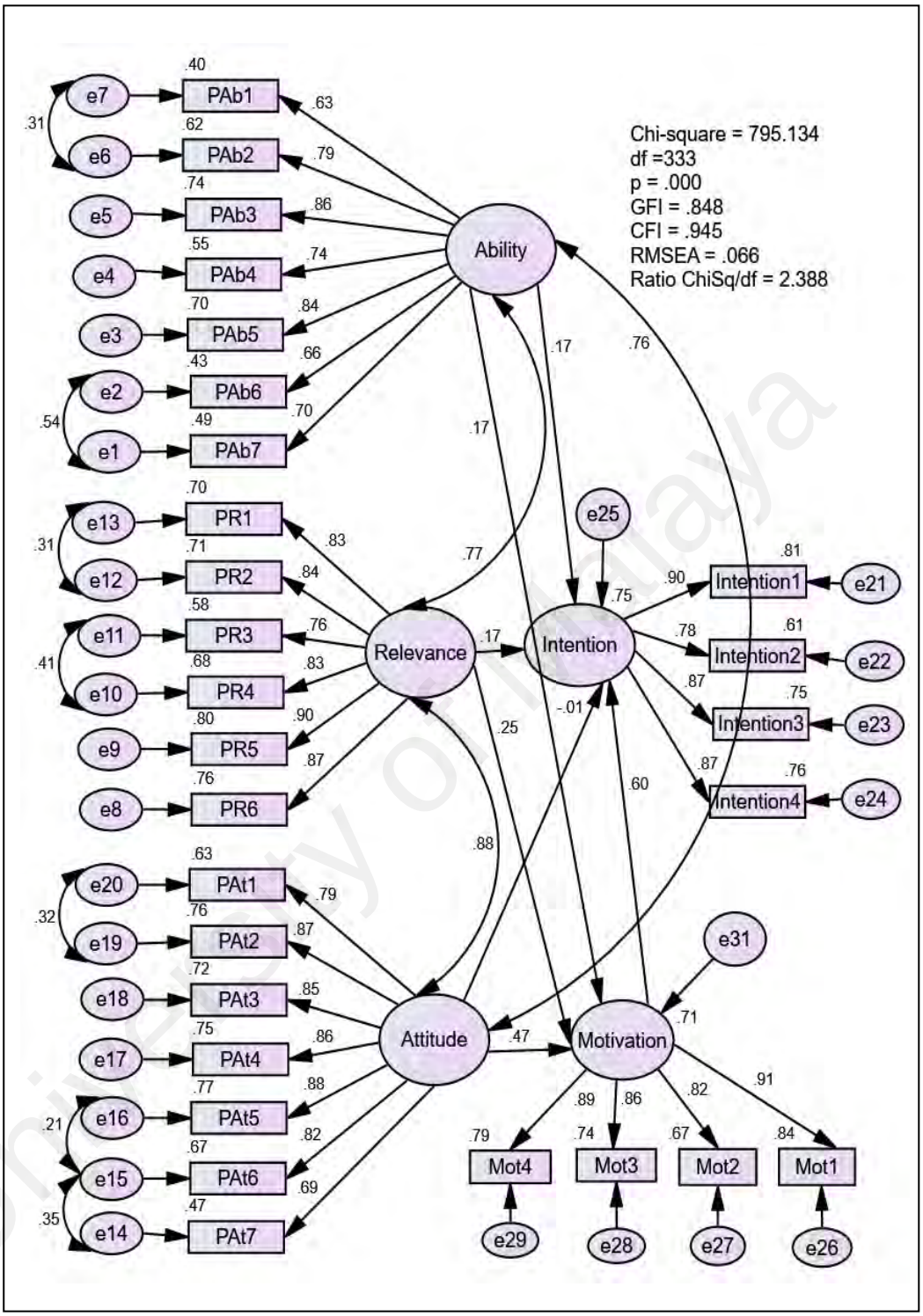

Figure 4.2: Mediation model of the relationship between personal factors, motivation, and the intention of stakeholders to share tacit knowledge

Mediation helps explain a mechanism through which an independent variable might affect a dependent variable through an intervening process, captured by the mediator variable ("Mediation Analysis," 2008). The test for mediation is to examine the relationship between the independent variable and the dependent variable, the relationship between the independent variable and the mediator variable, and the relationship between the mediator and the dependent variable.

Hence, mediation analysis in this section involves three independent variables which are personal ability, personal relevance, and personal attitude; a dependent variable which is the intention of stakeholders to share tacit knowledge; and a mediator variable which is motivation. The results of the mediation analysis are presented in Table 4.4, Table 4.5, and Figure 4.2.

Table 4.4: Results of Multiple Regression for Relationship between Personal Factors, Motivation, and Intention of Stakeholders to Share Tacit Knowledge

DV		IV	Estimate	S.E.	C.R.	β
Intention	<---	PAB	.19	.07	2.63	.17**
Motivation	<---	PAB	.20	.08	2.61	.18**
Motivation	<---	PR	.23	.09	2.51	.25*
Motivation	<---	PAT	.51	.11	4.69	.47***
Intention	<---	Motivation	.58	.07	7.96	.60***

*Note: *significant at $p < 0.05$; **significant at $p < 0.01$; ***significant at $p < 0.001$; DV = dependent variable; IV = independent variable; PAB = personal ability; PR = personal relevance; PAT = personal attitude; Motivation = motivation; Intention = intention to share tacit knowledge.*

The results in Table 4.4 indicates that there is a significant and positive effect of personal ability ($\beta = .17$, C.R. = 2.63, $p < .01$) on the intention of stakeholders to share tacit knowledge. On the other hand, another two personal factors which are personal relevance and personal attitude had not significant influence effect of tacit knowledge sharing intention when motivation was included in the model.

Table 4.4 also indicates that there are significant and positive direct effects of personal ability (β = .20, C.R. = 2.61, p < .01), personal relevance (β = .23, C.R. = 2.51, p < .05), and personal attitude (β = .51, C.R. = 4.69, p < .001) on motivation. That means that one unit standard deviation change in personal ability, personal relevance, and personal attitude will positively enhance .20, .23 and .51 unit standard deviation change respectively in the motivation of stakeholders to share their tacit knowledge. The results in Table 4.4 also show that there is a significant and positive direct effect of motivation on the intention of stakeholders to share tacit knowledge (β = .60, C.R. = 7.96, p < .001).

Table 4.5: Standardized effects of three personal factors on the intention of stakeholders to share tacit knowledge with motivation as a mediator

Standardized Effect		**Personal Ability**	**Personal Relevance**	**Personal Attitude**
Motivation as Mediator				
Direct Effect	Intention to Share Tacit Knowledge	.17	.17	-.01
Indirect Effect	Intention to Share Tacit Knowledge	.11	.15	.28
Total Effect	Intention to Share Tacit Knowledge	.28	.32	.27

Note: Indirect effect is the mediating effect

There are also significant indirect effects (mediating effect) of motivation on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge. The results in Table 4.5 indicates that motivation has increased the effects of the three personal factors on the intention of stakeholders to share tacit knowledge, i.e. increases the effect of personal ability from .17 to .28 (direct effect = .17, indirect effect = .11, total effect = .28), increases the effect of personal relevance from .17 to .32 (direct effect = .17, indirect effect =

.15, total effect = .32), and increases the effect of personal attitude from -0.1 to .27 (direct effect = -.01, indirect effect = .28, total effect = .27). The results provide evidence that motivation is a significant and positive mediator for the effect of personal factors on the intention of stakeholders to share tacit knowledge.

4.4 sub-Research Question Four

sub-Research Question Four: What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

A mediation model is introduced in this section. It involves communication skills as a mediating variable. The results of the mediation model are presented in the subsequent sections.

4.4.1 Mediation Model

Mediation analysis involves three independent variables, namely personal ability, personal relevance, and personal attitude; a dependent variable which is the intention of stakeholders to share tacit knowledge; and a mediator variable which is communication skills. The results of the mediation analysis are presented in Table 4.6, Table 4.7, and Figure 4.3.

A mediation analysis was conducted to answer sub-research question four. The Confirmatory Factor Analysis (CFA) results exhibited a fairly satisfactory fit

with the data collected after repeated modification was performed (χ^2 =803.432, df = 333, CMIN/df = 2.413, GFI = .850, CFI= .946, RMSEA = .067). Therefore, the relationships in the model are valid to the population of the study.

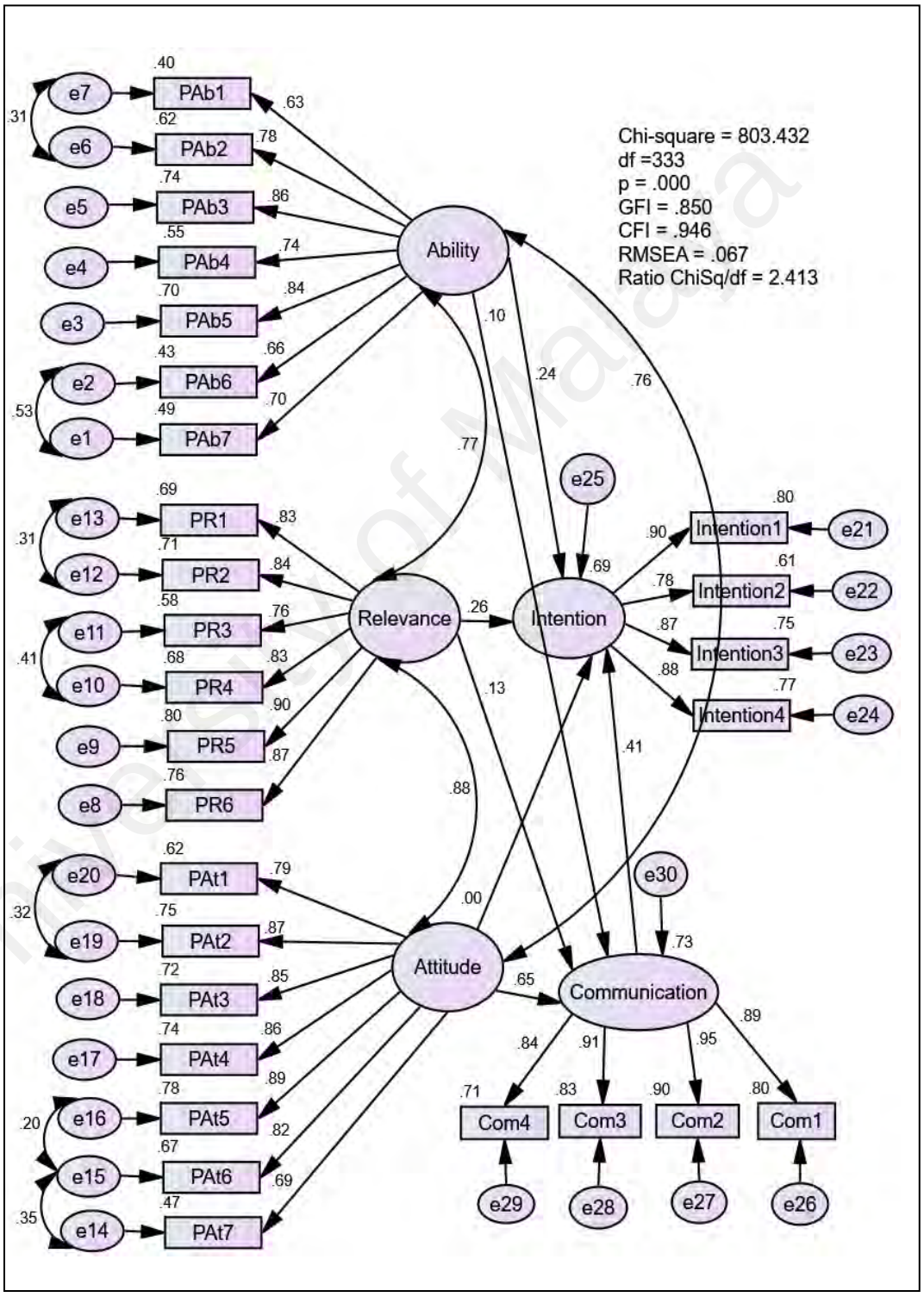

Figure 4.3: Mediation model of the relationship between personal factors, communication skills, and intention of stakeholders to share tacit knowledge

The results in Table 4.6 indicates that there is a significant and positive effect of personal ability (β = .24, C.R. = 3.40, p < .001) and personal relevance (β = .26, C.R. = 2.58, p < .05) on the intention of stakeholders to share tacit knowledge. On the contrary, personal attitude has had no significant effect on the intention to share tacit knowledge when communication skills were included in the model.

Table 4.6: Results of Multiple Regression of Relationship between Personal Factors, Communication Skills, and Intention of Stakeholders to Share Tacit Knowledge

DV		IV	Estimate	S.E.	C.R.	β
Intention	<---	PAB	.26	.08	3.40	.24***
Intention	<---	PR	.23	.09	2.58	.26*
Comm	<---	PAT	.78	.12	6.48	.65***
Intention	<---	Comm	.35	.07	5.11	.41***

*Note: *significant at p < 0.05; **significant at p < 0.01; ***significant at p < 0.001; DV = dependent variable; IV = independent variable; PAB = personal ability; PR = personal relevance; PAT = personal attitude; Comm = communication skills; Intention = intention to share tacit knowledge.*

Table 4.6 also indicates that there are significant and positive direct effects of personal attitude (β = .65, C.R. = 6.48, p < .001) on communication skills but not by personal relevance and personal ability. Table 4.6 also shows that there is a significant and positive direct effect of communication skills on the intention of stakeholders to share tacit knowledge (β = .41, C.R. = 5.11, p < .001).

Table 4.7: Standardized effects of three personal factors on the intention of stakeholders to share tacit knowledge with communication skills as a mediator

Standardized Effect		**Personal Ability**	**Personal Relevance**	**Personal Attitude**
Communication skills as Mediator				
Direct Effect	Intention to Share Tacit Knowledge	.24	.06	.00
Indirect Effect	Intention to Share Tacit Knowledge	.04	.26	.27
Total Effect	Intention to Share Tacit Knowledge	.28	.32	.27

Note: Indirect effect is the mediating effect

There are also significant and indirect effects of communication skills on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge. The results in Table 4.7 indicates that communication skills has increased the effects of the three personal factors on the intention of stakeholders to share their tacit knowledge, i.e. increases the effect of personal ability from .24 to .28 (direct effect = .24, indirect effect = .04, total effect = .28); increases the effect of personal relevance from .06 to .32 (direct effect = .06, indirect effect = .26, total effect = .32); and increases the effect of personal attitude from 0 to .27 (direct effect = .00, indirect effect = .27, total effect = .27). The results provide evidence that communication skills are a significant mediator for the effect of personal factors on the intention of stakeholders to share tacit knowledge.

4.5 main Research Question

main Research Question: Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?

In this section, all variables in the conceptual framework are involved in the data analysis. They are independent variables (i.e., personal ability, personal relevance, and personal attitude), dependent variable (i.e., intention of stakeholders to share tacit knowledge), and mediator variables (i.e., motivation and communication skills). Table 4.9, Table 4.10 and Figure 4.4 present the results of the path and mediation analysis.

4.5.1 Measurement Model

A total of 7 constructs and 32 items were used to evaluate the intention of stakeholders to share their tacit knowledge. Table 4.8 shows all the measurement items together with the corresponding constructs which were measured.

The Confirmatory Factor Analysis (CFA) results exhibited a fairly satisfactory fit with the data collected after repeated modification was performed (χ^2 =1079.555, df = 442, CMIN/df = 2.442, GFI = .825, CFI= .938, RMSEA = .067). The model fit results are presented in Figure 4.4 (refer to page 136).

4.5.1.1 Validity

Four measures were used to examine the convergent validity, of which are Cronbach's alpha, item loadings, average variance extracted (AVE), and composite reliability (CR) (Chen et al., 2012). Convergent validity is adequate if item loadings are .60 (Hau et al., 2013) and average variance extracted (AVE) is greater than .50 (Fornell & Larcker, 1981).

All values of item loadings and average variance extracted (AVE) were above the acceptable value. This indicates that the measurement model of main research question meets the convergent validity criteria. All values aforementioned are clearly presented in Table 4.8.

Table 4.8: Results of CFA of Measurement Model of Main Research Question

Latent variables and their indicators	Factor Loading	Average Variance Extracted (AVE)	Cronbach's alpha	Composite Reliability (CR)
Personal Ability		.56	.904	.90
PAb1	.63			
PAb2	.79			
PAb3	.86			
PAb4	.75			
PAb5	.84			
PAb6	.66			
PAb7	.70			
Personal Relevance		.71	.938	.93
PR1	.84			
PR2	.84			
PR3	.76			
PR4	.83			
PR5	.90			
PR6	.87			
Personal Attitude		.68	.938	.94
PAt1	.79			
PAt2	.87			
PAt3	.85			
PAt4	.86			
PAt5	.89			
PAt6	.82			
PAt7	.69			

Table 4.8, continued: Results of CFA of Measurement Model of Main Research Question

Latent variables and their indicators	Factor Loading	Average Variance Extracted (AVE)	Cronbach's alpha	Composite Reliability (CR)
Intention		.73	.914	.92
Intention1	.90			
Intention2	.78			
Intention3	.87			
Intention4	.87			
Motivation		.76	.926	.92
Mot1	.92			
Mot2	.82			
Mot3	.85			
Mot4	.89			
Communication Skills		.81	.943	.94
Comm1	.90			
Comm2	.95			
Comm3	.91			
Comm4	.85			

Note:PAb: personal ability; PR: personal relevance; PAt: personal attitude; Mot = motivation ; Comm = communication skills; Intention: intention to share tacit knowledge

4.5.1.2 Reliability

Table 4.8 illustrates Cronbach's alpha, the composite reliability for each construct in order to answer main research question. Cronbach's alpha is a measure of internal consistency; the acceptable value of alpha ranges between .65 to .95 (Chua, 2012).

Similarly, composite reliability is another measure of internal consistency that assesses construct reliability (Hazen et al., 2015). The composite reliability is acceptable if its value is .70 or greater (Lin, 2007).

The value of Cronbach's alpha and composite reliability for each construct proposed in the conceptual framework were above the acceptable value. Thus, all constructs in this conceptual framework are reliable.

4.5.2 Structural Model

Model fit index of the model (χ^2 =1079.555, df = 442, CMIN/df = 2.442, GFI = .825, CFI= .938, RMSEA = .067) indicates that it fits the data collected from the respondents of the study. Figure 4.4 presents the whole model of the study.

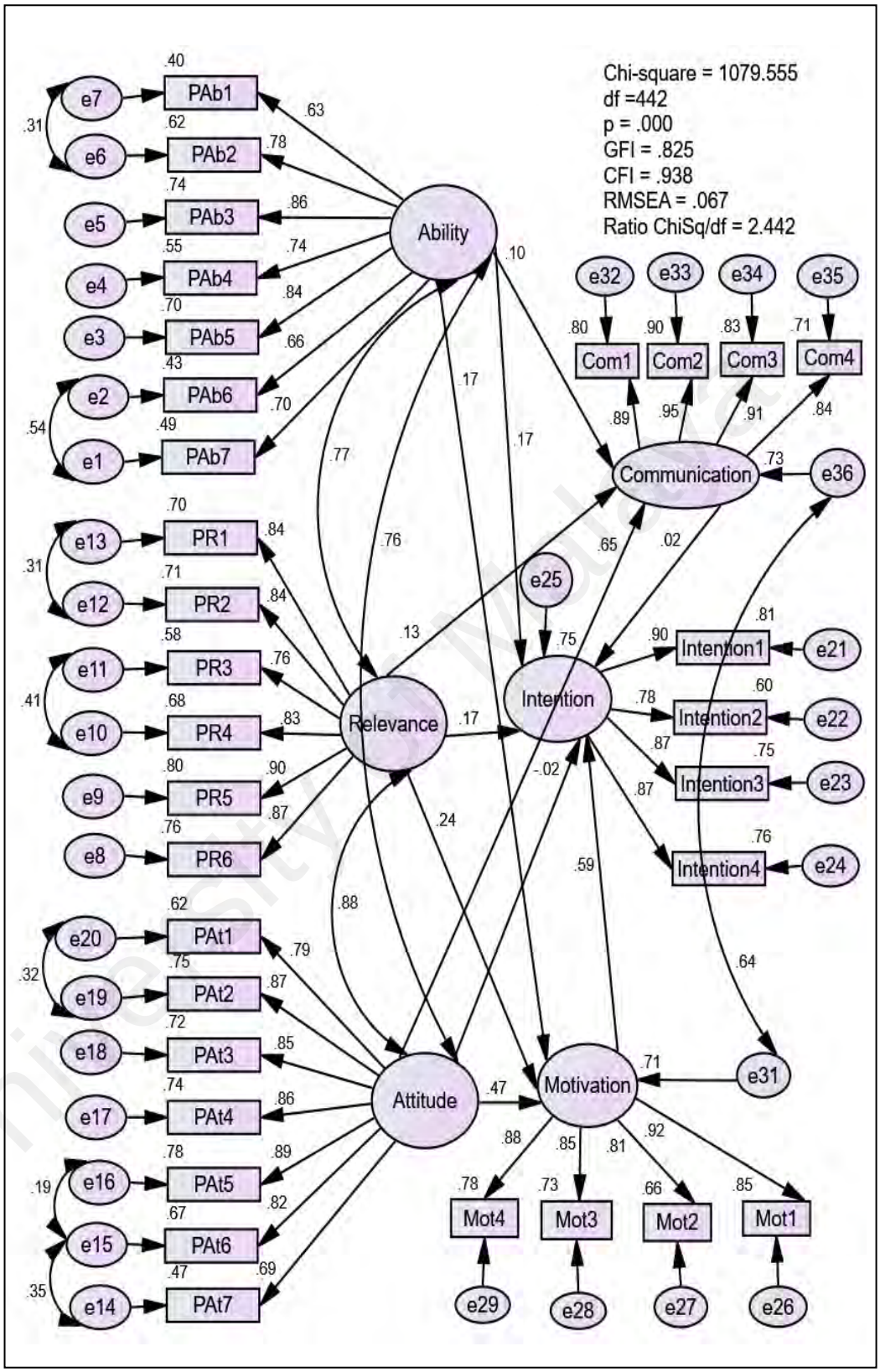

Figure 4.4: Final structural model of the relationship between personal factors, motivation, communication skills, and the intention of stakeholders to share tacit knowledge

The results indicate that there is a significant and positive direct effect of personal ability ($\beta = .17$, C.R. = 2.63, $p < .05$) on the intention of stakeholders to share tacit knowledge. Among the three personal factors, personal ability was the only significant influence on the intention of stakeholders to share tacit knowledge. On the contrary, no significant and direct effects were found of personal relevance and personal attitude on the intention of stakeholders to share tacit knowledge.

Table 4.9 indicates that there are significant and positive direct effects of personal ability ($\beta = .17$, C.R. = 2.60, $p < .01$), personal relevance ($\beta = .25$, C.R. = 2.42, $p < .05$), and personal attitude ($\beta = .47$, C.R. = 2.60, $p < .001$) on motivation. That means that one unit standard deviation change in personal ability, personal relevance, and personal attitude will positively heighten .17, .25, and .47 unit standard deviation change respectively in the motivation of stakeholders to share their tacit knowledge.

Table 4.9 also indicates that there is a significant and positive direct effect of motivation on the intention of stakeholders to share tacit knowledge ($\beta = .59$, C.R. = 5.65, $p < .001$). Apart from that, Table 4.9 also shows that there is a significant and positive direct effect of personal attitude ($\beta = .65$, C.R. = 6.50, $p < .001$) on the communication skills of stakeholders to share tacit knowledge.

Table 4.9: Results of Multiple Regression of Relationship between Personal Factors, Motivation, Communication Skills, and Intention of Stakeholders to Share Tacit Knowledge

DV		IV	Estimate	S.E.	C.R.	β
Intention	<---	PAB	.19	.07	2.63	.17*
Motivation	<---	PR	.22	.09	2.42	.25*
Motivation	<---	PAT	.51	.11	4.77	.47***
Motivation	<---	PAB	.20	.08	2.60	.17**
Comm	<---	PAT	.78	.12	6.50	.65***
Intention	<---	Motivation	.56	.10	5.65	.59***

*Note: *significant at p < 0.05; **significant at p < 0.01; ***significant at p < 0.001; DV = dependent variable; IV = independent variable; PAB = personal ability; PR = personal relevance; PAT = personal attitude; Motivation = motivation; Comm = communication skills; Intention = intention to share tacit knowledge.*

Table 4.10: Standardized effects of three personal factors on the intention of stakeholders to share tacit knowledge with motivation and communication skills as a mediator

Standardized Effect		Personal Ability	Personal Relevance	Personal Attitude
Dwi-mediators (Motivation and Communication skills)				
Direct Effect	Intention to Share Tacit Knowledge	.17	.17	-.02
Indirect Effect	Intention to Share Tacit Knowledge	.10	.15	.29
Total Effect	Intention to Share Tacit Knowledge	.27	.32	.27

Note: Indirect effect is the mediating effect

There are also significant and indirect effects of motivation on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge. The results in Table 4.10 indicate that motivation has increased the effects of the three personal factors on the stakeholder's intention to share tacit knowledge, i.e. increased the effect of personal ability from .17 to .27 (direct effect = .17, indirect effect = .10, total effect = .27); increased the effect of personal relevance from .17 to .32 (direct effect = .17, indirect effect = .15, total

effect = .32); and increased the effect of personal attitude from -.02 to .27 (direct effect = -.02, indirect effect = .29, total effect = .27). The results provide evidence that motivation is a significant mediator of the effect of personal factors on the intention of stakeholders to share tacit knowledge.

In addition, a significant and indirect effect of communication skills on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge was found. Communication skills increased the effect of the three personal factors on the stakeholder's intention to share tacit knowledge, i.e. increased the effect of personal ability from .17 to .27 (direct effect = .17, indirect effect = .10, total effect = .27); increased the effect of personal relevance from .17 to .32 (direct effect = .17, indirect effect = .15, total effect = .32); and increased the effect of personal attitude from -.02 to .27 (direct effect = -.02, indirect effect = .29, total effect = .27). The results provide evidence that communication skills are a significant mediator of the effect of personal factors on the intention of stakeholders to share tacit knowledge.

As a whole, when considering the effects of the two mediators of motivation and communication skills together (dwi-mediating effect), the effect of personal ability significantly increases from .17 to .27; the effect of personal relevance significantly increases from .17 to .32, and the effect of personal attitude significantly increases from -.02 to .27.

4.6 sub-Research Question Five

sub-Research Question Five: What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?

Two different types of analysis (i.e. general linear model analysis and paired samples t-test analysis) were conducted to answer sub-research question five. The details of each analysis are discussed in the following subsections.

4.6.1 General Linear Model Analysis – Repeated Measures ANOVA Analysis

A one-way repeated measures analysis of variance (ANOVA) was conducted in order to compare scores of contribution among participants with a statistic test at pre-test (prior to intervention) and post-test (after intervention). The results of the repeated measures ANOVA analysis are presented in Table 4.11 and Table 4.12. The means and standard deviations are shown in Table 4.11 while the results of the Pillai's trace multivariate test in repeated measures ANOVA analysis are depicted in Table 4.12.

The results in Table 4.12 illustrate a significant increase to the mean score of engagement of stakeholders in knowledge sharing ($F (1, 30) = 220.498$, $p < .001$, partial eta squared effect size = .880; large effect size) from pre-test (mean = 16.0938) to post-test (mean = 42.6562), after the intervention (gamification approach applied in requirements elicitation whereby the participants were asked to check their achievement immediately after the pre-test). The intervention motivation is effective in improving the engagement of the participants to share their knowledge as a whole in requirements elicitation.

Table 4.11: Descriptive Statistics

Measurement	N	Motivation	Mean	Std. Deviation
Pre-test	32	Total score	16.0938	13.24304
Post-test	32	Total score	42.6563	14.36755

Table 4.12: Multivariate Tests

Multivariate Tests	Value	F	Df1	Df2	Sig.	Partial Eta Squared
Pillai's trace	.880	220.498	1.000	30.000	.000	.880

Note: Each F tests the multivariate effect of the intervention. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

4.6.2 Paired Samples t-test Analysis

The results of paired samples t-test for the effect of the intervention on the low motivation and high motivation group are depicted in Table 4.13 to Table 4.16. The intervention of this study was the gamification approach applied in requirements elicitation whereby the participants were asked to check their achievement immediately after the pre-test.

4.6.2.1 Low Motivation Group's Involvement in Knowledge Sharing Session in Requirements Elicitation

The results of paired sample t-test in Table 4.13 and Table 4.14 indicate that the mean score of engagement of participants in knowledge sharing has increased significantly ($t = -13.543$, $df = 15$, $p < .001$) from pre-test (mean = 11.2083) to post-test (mean = 34.3750), after the intervention. That means that the intervention has enhanced the engagement of the low motivation group's

participants effectively in knowledge sharing session in requirements elicitation.

Table 4.13: Paired Samples Statistics

Intervention: Gamified Requirements Elicitation		**Mean**	**Std. Deviation**
Measurement	Pre-test score	11.2083	7.97647
	Post-test score	34.3750	9.10586

Table 4.14: Paired Samples Test Results

Intervention: Gamified Requirements Elicitation		**Paired Differences**		**t**	**df**	**Sig. (2-tailed)**
		Mean	**Std. Deviation**			
Comparison	Pre-test-Post-test	-23.16667	6.84241	-13.543	15	.000

4.6.2.2 High Motivation Group's Involvement in Knowledge Sharing Session in Requirements Elicitation

The results of paired sample t-test for the high motivation group in Table 4.15 and Table 4.16 reveal that the mean score of engagement of participants in knowledge sharing has increased significantly ($t = -9.520$, $df = 15$, $p < .001$) from pre-test (mean = 23.1250) to post-test (mean = 50.9375), after the intervention.

The results show that there is a statistically significant mean score difference between pre-test and post-test when gamification was applied in requirements elicitation. The findings suggest a positive indication of the engagement of

participants in the high motivation group, who acted to further engage after exposure to the intervention.

Table 4.15: Paired Samples Statistics

Intervention: Gamified Requirements Elicitation		Mean	Std. Deviation
Measurement	Pre-test score	23.1250	13.64734
	Post-test score	50.9375	14.04976

Table 4.16: Paired Samples Test Results

Intervention: Gamified Requirements Elicitation		Paired Differences		t	df	Sig. (2-tailed)
		Mean	Std. Deviation			
Comparison	Pre-test-Post-test	-27.81250	11.68600	-9.520	15	.000

4.6.3 Profile Plots Analysis

The profile plots illustrated in Figure 4.5 indicate that for each of the two motivation groups, the post-test out-performed the pre-test in knowledge sharing session after exposure to the intervention. The results of the profile analysis show that gamification increased the engagement of participants for both levels of motivation group, which steered to higher degrees of efficiency in knowledge sharing session in requirements elicitation.

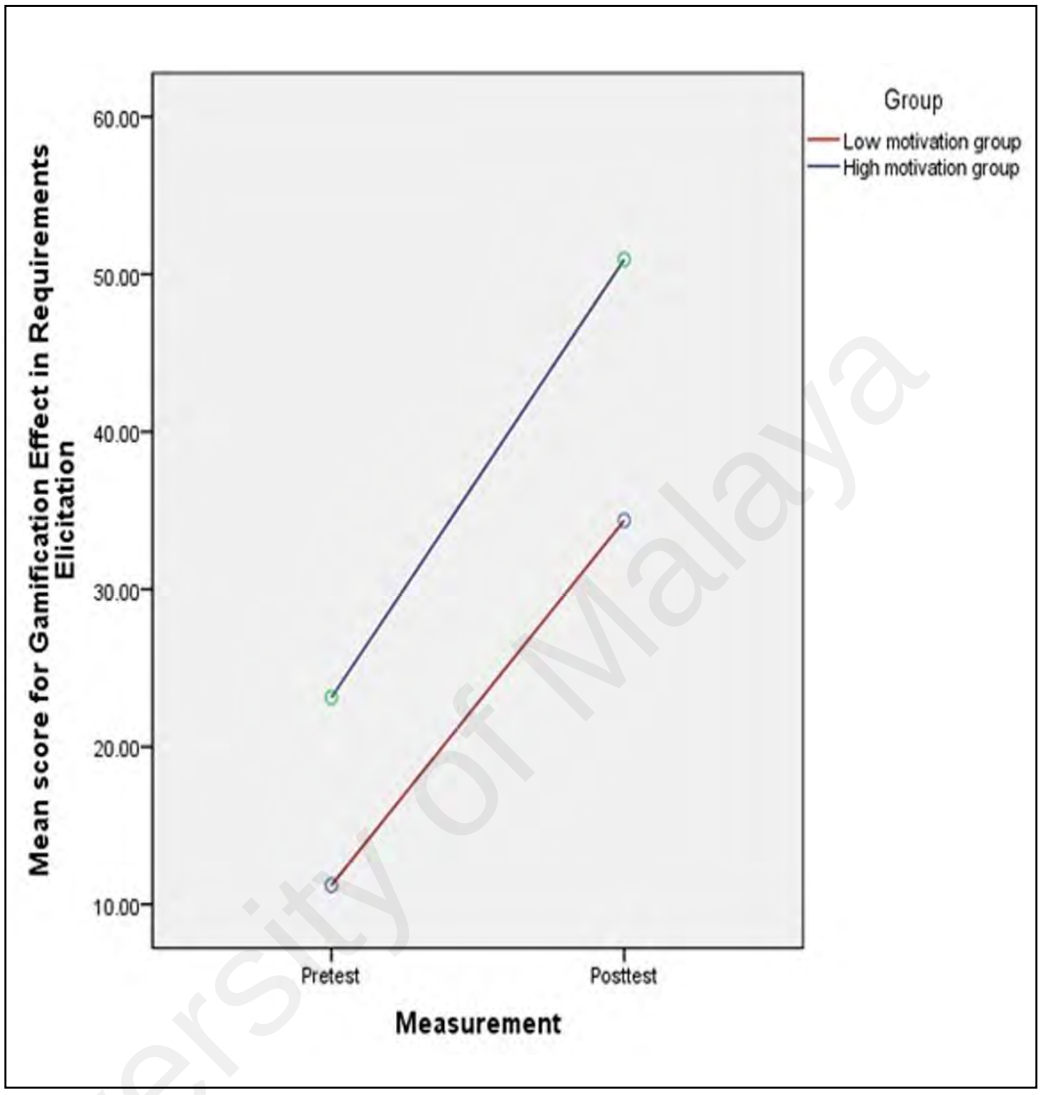

Figure 4.5: Profile Plots for the effect of the intervention

4.7 sub-Research Question Six

sub-Research Question Six: What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?

General linear model analysis and paired samples t-test analysis were conducted to answer sub-research question six. The details of each analysis are discussed in the following subsections.

4.7.1 General Linear Model Analysis – Repeated Measures ANOVA Analysis

A one-way repeated measures analysis of variance (ANOVA) was conducted to evaluate the effectiveness of the intervention in improving the engagement of stakeholders to share tacit knowledge compared to the control group. In this experiment, the study involved two different groups, of which the control group did not apply any communication skills and the intervention group that did. A control group contains 26 participants whereas an intervention group contains 24 participants.

The results of the repeated measures ANOVA analysis are presented in Table 4.17 and Table 4.18. Table 4.17 illustrates the results of means and standard deviations whereas Table 4.18 depicts the results of Pillai's trace multivariate test in the repeated measures ANOVA analysis.

Table 4.17: Descriptive Statistics

	Group	N	Mean	Std. Deviation
Pre-test	Without communication skills	26	10.0000	3.58887
	With communication skills	24	11.5833	3.45048
	Total		10.7600	3.57748
Post-test	Without communication skills	26	10.6538	3.29778
	With communication skills	24	14.8750	2.75543
	Total		12.6800	3.69467

The results in Table 4.18 illustrate that the mean score of engagement of stakeholders in knowledge sharing has increased significantly ($F(1, 48) = 6.464$, $p < .05$) from pre-test (mean = 11.5833) to post-test (mean = 14.8750), after the intervention (communication skills applied to stakeholders in requirements

elicitation, for example, participants were encouraged to share ideas, express thoughts and feelings. Also, demonstrated empathy by trying to understand the situation from the other person's perspective). That means the intervention was effective in improving the engagement of the participants to share their knowledge as a whole in requirements elicitation.

Table 4.18: Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Measurement	Pillai's Trace	.232	14.461	1.000	48.000	.000
Measurement * Group	Pillai's Trace	.119	6.464	1.000	48.000	.014

4.7.2 Paired Samples t-test Analysis

The results of paired samples t-test for the effect of the intervention for the group with communication skills and without communication skills are depicted in Table 4.19. The intervention of this study was communication skills applied in requirements elicitation, whereby participants were encouraged to share ideas, express thoughts and feelings to improve the existing software application. Also, subjects were encouraged to apply other appropriate communication skills. For example, the facilitator of the experimental group demonstrated empathy by trying to understand the situation from the other participant's perspective.

Besides that, other communication skills such as listening to the participant speaking by making indications of agreement or validating the thoughts and feelings of the participant speaking by reflecting back what the participant has

communicated. This could be accomplished by summarizing the main idea of the participant's message.

Table 4.19 indicated that the mean score of engagement of participants in knowledge sharing increased significantly ($t = 2.902$, $p < .05$) after the intervention. Thus, participants of the intervention group who received communication skills intervention showed a significantly higher level of engagement in sharing their tacit knowledge than participants of the control group who do not.

Table 4.19: Paired Samples Test Results

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
With Communication Skills	Without Communication Skills	2.902	.775	.000

Note: Based on estimated marginal means

4.7.3 Profile Plots Analysis

The profile plots illustrated in Figure 4.6 indicate that for each of the two different groups, the post-test out-performed the pre-test in the knowledge sharing session, after exposure to the intervention. The results of the profile analysis show that communication skills have increased the engagement of participants for the intervention group, which steered to higher degrees of efficiency in the knowledge sharing session in requirements elicitation. Therefore, the effectiveness of the intervention on participants reported an

overall significant improvement to share their tacit knowledge better than those in the control group.

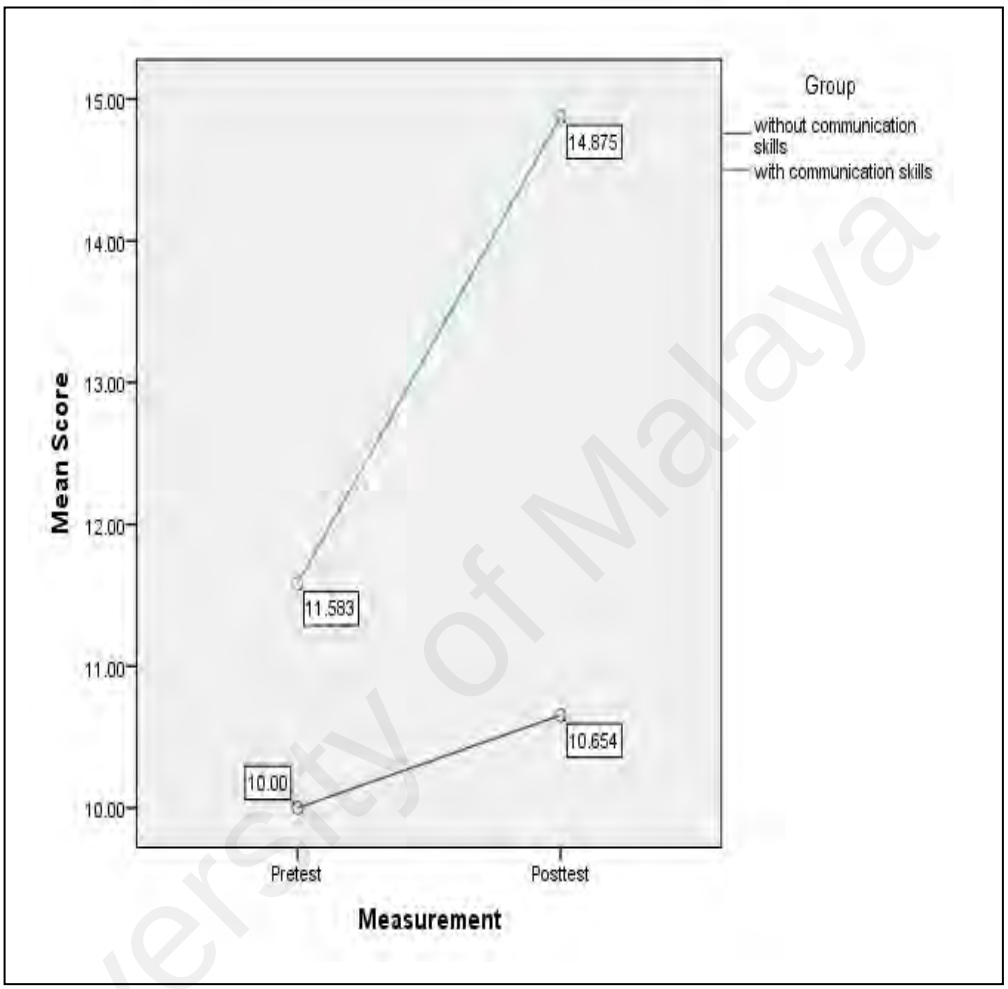

Figure 4.6: Profile Plots for the effect of the intervention

4.8 Summary

This chapter presents the findings of the data collected from two phases. The first phase of data collection was to answer main research question, which includes sub-research questions one, two, three, and four, whereas the second phase of data collection was to validate the results of sub-research questions three and four.

Both descriptive and inferential statistics were used to analyze the data collected in order to answer the main research question and six sub-research questions proposed for this study. The next chapter presents the discussion on the findings of this study.

CHAPTER 5: PROPOSED MODEL (TaKS MODEL)

5.1 Overview

This chapter explains how the proposed model (TaKS model) would be applied in requirements elicitation model process after a thorough study has been conducted to examine how individual attributes (i.e. ability, relevance, and attitude) and psychological factors such as motivation and communication skills may render the intention of stakeholders to share their tacit knowledge during requirements elicitation in the requirements engineering field.

The proposed model (TaKS model) aims to enhance the engagement of stakeholders in requirements elicitation. Many research works, although have been steered on improving the requirements elicitation process such as propose a specific technique to perform during elicitation, have yet to define a model of elicitation process that emphasizes the enhancing of the engagement of stakeholders to share tacit knowledge in requirements elicitation.

The following section explains how the TaKS model could be used as a guideline for the existing requirements elicitation models to identify ideal stakeholders for the involvement in requirements elicitation process. The chapter concludes with a summary of the chapter.

5.2 Integration of TaKS Model into the Existing Requirements Elicitation Process

According to Zowghi and Coulin (2005), requirements elicitation process can be divided into five fundamental stages as described below:

a. Understanding the application domain
b. Identifying the sources of requirements
c. Analyzing the stakeholders
d. Selecting the techniques, approaches, and tools to use
e. Eliciting the requirements from stakeholders and other sources

Requirements elicitation involves a wide range of stakeholders. These stakeholders include customers who pay for the software system, users who interact with the software system to get their work done, developers of the software system, and policymakers who impose rules on the development and operation of the software system. They are the source of requirements during requirements elicitation.

In short, stakeholders are any individuals or groups that have an interest in the software project or are affected in the some way by the implementation of software project. Hence, it is crucial to identify the right stakeholders at the stage of analyzing the stakeholders. Over the years, more than a few process models have been proposed for requirements elicitation (Kotonya & Sommerville, 1998; Constantine & Lockwood, 1999; Zowghi & Coulin, 2005).

Regrettably, these models were not able to provide definitive guidelines to identify the right stakeholders to heighten the engagement of stakeholders to share tacit knowledge in the requirements elicitation process. This indicates that some kind of

selection procedure must take place in order to handle the inability of the existing models.

Figure 5.1 illustrates the proposed model (TaKS model) of this study integrated with the requirements elicitation process model, which was introduced by Zowghi & Coulin (2005) at stakeholder analysis stage as a conceptual framework. The conceptual framework can then be applied by practitioners to conduct the selection process.

The reason of choosing the proposed model (TaKS model) to be embedded at stakeholder analysis stage is because an extensive list of potential stakeholders will be generated during the stakeholder analysis that involves analysing and identifying relevant stakeholders (Robertson & Robertson, 1999; Alexander & Stevens, 2002) . Additionally, according to the intensive literature review of this study, there revealed that tacit knowledge is "hidden known" and difficult to articulate because it resides in human brains and it needs an effective method in order to elicit tacit knowledge in a perfect way.

The TaKS model concentrates on the human mind, behaviour and perception throughout the requirements elicitation process to identify the right stakeholders by enhancing the engagement of stakeholders to share tacit knowledge in requirements elicitation process. Therefore, it is good to incorporate the TaKS model at the stakeholder analysis stage to reduce the failure of a software system because the TaKS model functions as guideline to identify ideal stakeholders for the engagement in requirements elicitation, as only the ideal stakeholders would be

more willing to engage in sharing tacit knowledge, which is crucial in the discovery of complete software requirements.

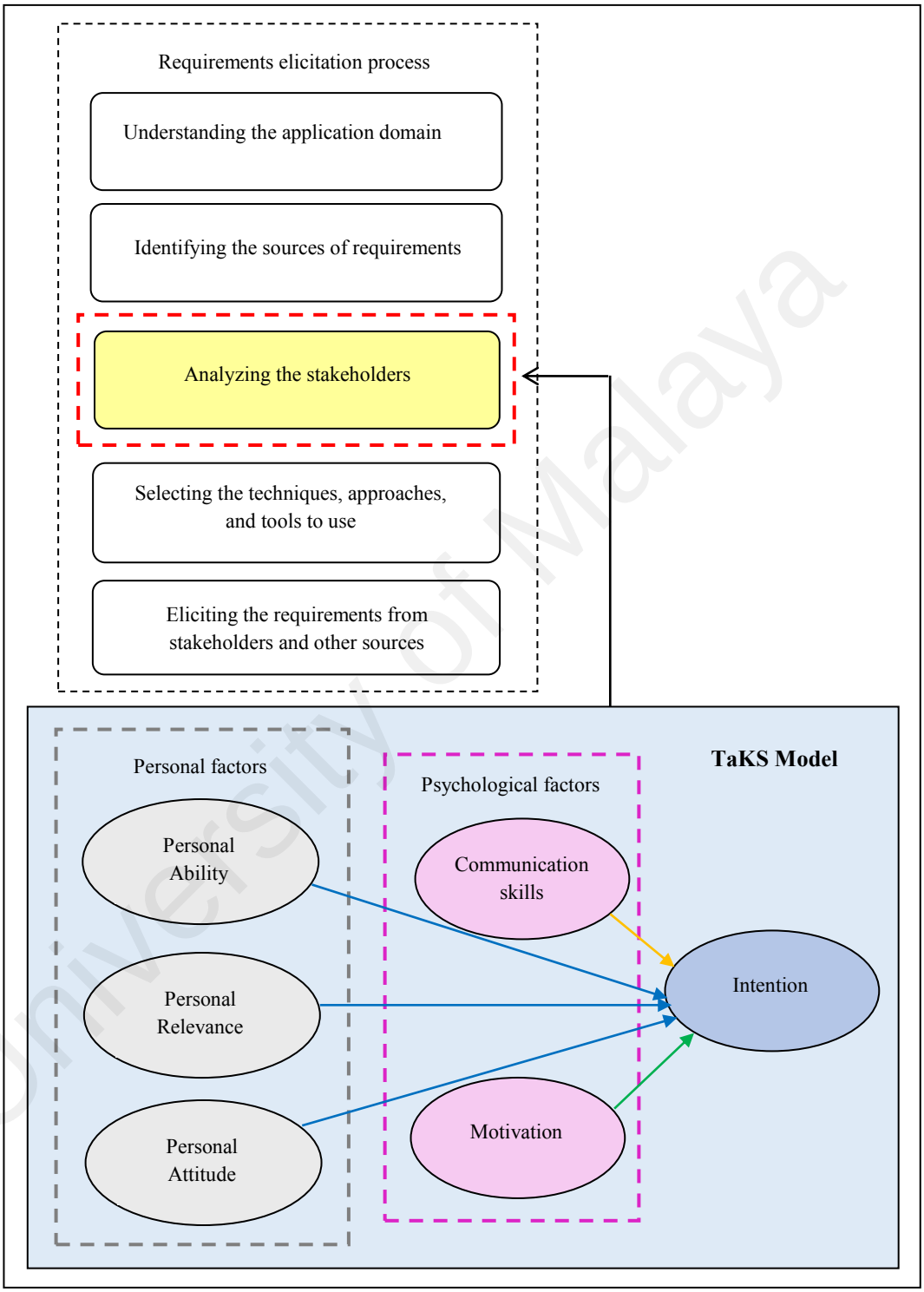

Figure 5.1: The TaKS Model embedded in Stakeholder Analysis Process

5.3 Proposed Model (TaKS Model)

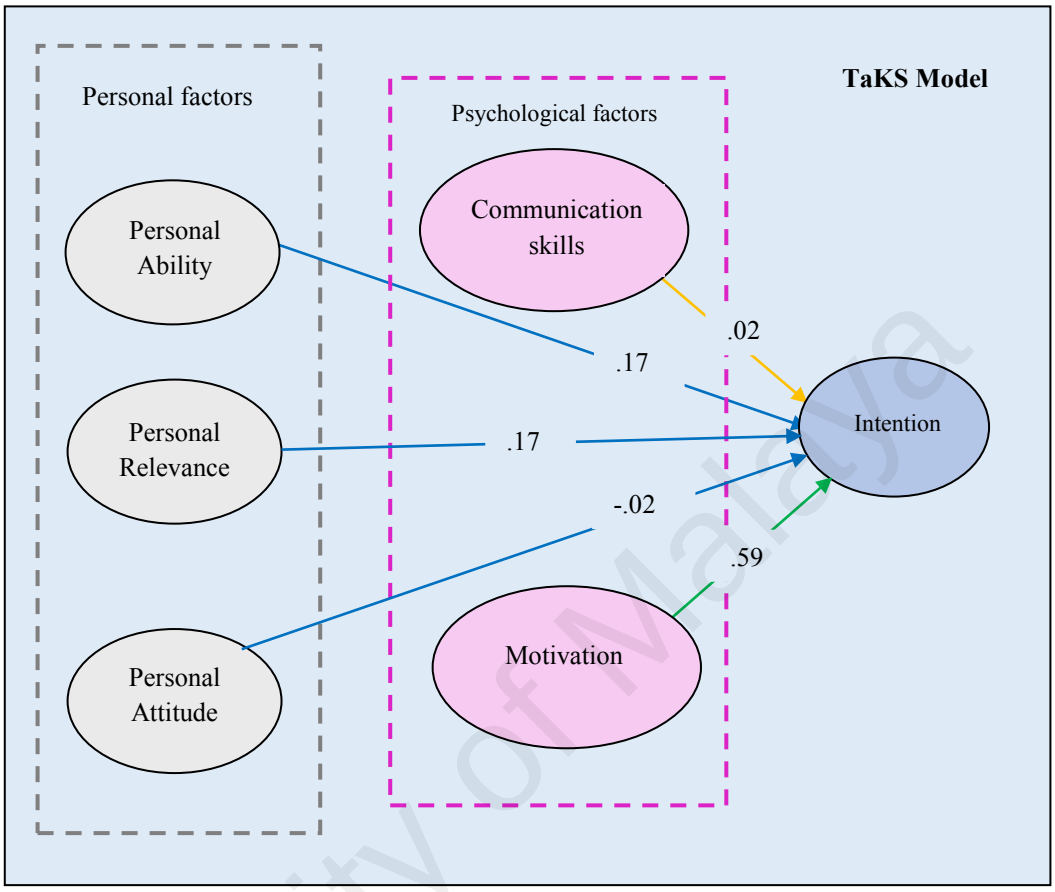

Figure 5.2: The TaKS Model

Figure 5.2 illustrate the TaKS Model to consist of personal factors (i.e., personal ability, personal relevance, and personal attitude) and psychological factors (i.e., communication skills and motivation). All standard regression weights (beta values, β) appear on top of the arrows of each factors that points to the intention, which is in the blue color circle and are the same standard regression weights (beta values, β) that appeared in Figure 4.4. The results of this study showed that personal factors and psychological factors aforementioned have significant influences on the intention of stakeholders to share their tacit knowledge in the requirements elicitation. Figure 4.4 shows that R-squared (R^2) value of the intention of stakeholder to share tacit knowledge

is .75, which means personal factors and psychological factors of this study significantly predict 75% of the variance of intention of stakeholder to share their tacit knowledge.

The mathematical representation of multiple regression for the intention of stakeholder to share their tacit knowledge derived from this study is as below:

Intention = .17 *(personal ability)* + .17 *(personal relevance)* + (-.02) *(personal attitude)* + .02 *(communication skills)* + .59 *(motivation)*

Figure 5.3: Mathematical representation of multiple regression for the intention of stakeholder to share tacit knowledge

The mathematical representation above allows the prediction of the value of the intention of stakeholder to share tacit knowledge by calculating the values of personal factors and psychological factors that were obtained from the questionnaire, which can be found in the Appendix B (refer to page 258), and multiply it with their respective standard regression weights (beta values, β) as shown in Figure 5.3.

The proposed model (TaKS Model) consists of two stages, which are identification and selection stages. The sections below explain the process of identification and selection of stakeholders.

5.3.1 Identification Stage

At the identification stage, a group of potential stakeholders are selected to complete the questionnaire (refer to Appendix B on page 258). The purpose of the questionnaire is to identify the right stakeholders to be involved in the requirements elicitation. The score

value of five constructs in the questionnaire are used in the mathematical representation (refer to Figure 5.3) to obtain the value of the intention of a stakeholder to share tacit knowledge. The five constructs aforementioned are the three personal factors (i.e., personal ability, relevance, and attitude), and two psychological factors (i.e., motivation and communication skills).

Below is one of the constructs in the questionnaire, which is personal ability that is extracted to explain the process of the summing up the items' value of personal ability construct in the questionnaire. For example, presume that one of the stakeholder answered the personal ability construct in the questionnaire as below:

Personal Ability

A stakeholder has high personal ability if he or she is able to …		Rating scale										
		1	2	3	4	5	6	7	8	9	10	11
1.	share knowledge that is set in his or her daily routines					x						
2.	share knowledge that is set in standard operating processes					x						
3.	share knowledge that is set in organizational rules and policies					x						
4.	share knowledge that is set in organizational cultures								x			
5.	share knowledge that is set in organizational documents								x			
6.	mobilize the amount of resources that he or she has within his or her organization or control area								x			
7.	use resources within his or her organization capacity										x	

Sum up all score values of seven items in personal ability construct together, and the working steps are shown as follows:

Total score value of personal ability = Item 1 (5) + Item 2 (5) +
Item 3 (5) + Item 4 (8) +
Item 5 (8) + Item 6 (8) +
Item 7 (10)
= 49

Repeat the same steps as above to get the total score value of the other four constructs (i.e., personal relevance, personal attitude, motivation, and communication skills).

Next, use the summed up score values of the personal factors (i.e., personal ability, relevance, and attitude), and psychological factors (i.e., motivation, and communication skills) in the questionnaire to get the value of the intention of a stakeholder to share tacit knowledge by using the mathematical representation as illustrated in Figure 5.3 to identify the right stakeholders.

Multiply each summed up score value of the personal factors and psychological factors by each of the standard regression weight (beta values, β) as shown in Figure 5.3, then add the products. For example,

Intention = .17 (personal ability) + .17 (personal relevance) + (-.02) (personal attitude) + .02 (communication skills) + .59 (motivation)

Intention = .17(49) + .17(50) + (-.02) (45) + .02(60) + .59(55)

= 8.33 + 8.50 - 0.9 + 1.2 + 32.45

= 49.58

Lastly, the value of the intention of a stakeholder to share tacit knowledge is equal to the sum of the numbers being multiplied, which is 49.58.

Assume that ten stakeholders are selected in the identification stage, and their intention value are shown in Table 5.1 below:

Table 5.1: Sample Intention Values of Ten Stakeholders

Stakeholder	Intention Value
Stakeholder 1	49.58
Stakeholder 2	50.50
Stakeholder 3	51.00
Stakeholder 4	50.00
Stakeholder 5	50.00
Stakeholder 6	46.05
Stakeholder 7	48.33
Stakeholder 8	56.50
Stakeholder 9	50.00
Stakeholder 10	57.66

Now, there left to determine who is selected from the ten stakeholders with different intention values, seeing that some of the stakeholders own equal intention values. Therefore, the next stage, the selection stage, is set to resolve the selection issue.

5.3.2 Selection Stage

The purpose of selection stage is to determine who is being selected from a group of stakeholders, especially who own the same intention value, as illustrated in Table 5.1. A method called median split is

employed to resolve the issue of the equal values of the intention of stakeholders to share tacit knowledge. A median split is one method in statistics for turning a continuous variable into a categorical one. Essentially, the idea is to find the median of the continuous variable. Any value below the median is put it into the category "Low" and every value above it is labelled as "High". Stakeholders who are in the category "High" will be chosen to involve in the requirements elicitation.

Below are the steps to find the median of a group of numbers:

i. Arrange the numbers in order by size, which arranges the number from smallest to largest.

ii. If there is an odd number of terms, the median is the centre term.

iii. If there is an even number of terms, add the two middle terms and divide by two.

Refer to the Table 5.1, the arrangement of the values of the intention of stakeholders to share tacit knowledge as follows:

Table 5.2: Arrangement of Sample Intention Values of Ten Stakeholders Using Median Method

Stakeholder	Intention Value
Stakeholder 6	46.05
Stakeholder 7	48.33
Stakeholder 1	49.58
Stakeholder 4	50.00
Stakeholder 5	50.00
Stakeholder 9	50.00
Stakeholder 2	50.50
Stakeholder 3	51.00
Stakeholder 8	56.50
Stakeholder 10	57.66

There are only ten stakeholders in Table 5.2, therefore it is an odd set of numbers. As mentioned earlier, if there is an even number of terms, add the two middle terms and divide by two. Hence, the steps to get the median is as below:

Median = 50 (intention value of Stakeholder 3) +
50 (intention value of Stakeholder 4) / 2
= 100 / 2
= 50

Based on the calculation, the obtained median of the example is 50. Hence, the median split (with the median being 50 in this example) is

employed to splitting the selected ten stakeholders into "Low" and "High" category as illustrated in Table 5.3.

Table 5.3: Split into "Low" and "High" Category after Applying Median Split

Stakeholder	Intention Value	Category
Stakeholder 6	46.05	Low
Stakeholder 7	48.33	Low
Stakeholder 1	49.58	Low
Stakeholder 4	50.00	
Stakeholder 5	50.00	
Stakeholder 9	50.00	
Stakeholder 2	50.50	High
Stakeholder 3	51.00	High
Stakeholder 8	56.50	High
Stakeholder 10	57.66	High

Hence, Stakeholder 2, Stakeholder 3, Stakeholder 8, and Stakeholder 10 are selected to be involved in the requirements elicitation due to their intention value to share tacit knowledge is higher than the median, which is 50.

5.4 Summary

Tacit knowledge is an important element in the requirements for such software projects (Buitrón, Pino, Flores-Rios, Ibarra-Esquer & Astorga-Vargas, 2017, Ryan & O'Connor, 2013) which eventually fulfils the needs of the stakeholders and

avoids any possibility of failure. Meanwhile, there is no sufficient or an ideal way to improve tacit knowledge sharing in requirements elicitation.

Therefore, it is good to incorporate the TaKS model at the stakeholder analysis stage to reduce the failure of a software system because the TaKS model is aimed to act as guideline to identify ideal stakeholders for the engagement in requirements elicitation, as only the ideal stakeholders would be more willing to engage in sharing tacit knowledge, which is crucial in the discovery of complete software requirements.

CHAPTER 6: DISCUSSION

6.1 Overview

This chapter begins with a summary of this study. Then, it presents a discussion on the findings of this study in light of the relevant literature by interpreting the results derived from the data analysis as illustrated in Chapter Four.

In addition, this chapter also explains new understanding or insights about the problem, taking the findings into consideration. The discussions are based on the objectives of the study as presented in Chapter One.

6.2 Summary of the Study

The aim of this study is to investigate the effects of personal factors and psychological factors that include motivation and communication skills towards the intention of stakeholders to share tacit knowledge.

This study foresaw motivation and communication skills to possess a mediating effect to maximize the stakeholders' engagement and to aid in achieving an ideal behaviour in the tacit knowledge sharing process.

Therefore, a model was formulated to serve as a guide in order to realise the objectives of this study. In this model, the intention to share tacit knowledge is the dependent variable in the relationship between three personal factors (ability, attitude, and relevance) as independent variables, alongside motivation and communication skills as the mediating variables.

In this study, two different types of research designs were employed. They are non-experimental and experimental design. Survey research was employed in this study to answer main research question, which includes sub-research questions one, two, three, and four because it can be conducted easily and with minimal costs, as it is an online questionnaire.

On another note, pre-test and post-test design of quasi-experimental and true-experimental research design were chosen to further validate the outcomes of sub-research questions five and six which were derived from the survey research of this study.

Numerical data gathered were analyzed quantitatively using Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) version 21.0. Both descriptive and inferential analysis methods were used to analyse the collected data to answer the main research question and six sub-research questions of this study. The details of statistical analysis employed in each research question are shown in Figure 3.7 of Chapter Three.

6.3 Summary of the Results

The results of this study are summarized according to the main research question and six sub-research questions as follows:

sub-RQ 1: What is the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge?

The results revealed that the inter-correlation among the three latent variables (i.e. personal ability, relevance and attitude) ranged from .73 to .88 (refer to Table 4.2 for correlation coefficient values of each inter-correlation). The three latent variables are significantly and strongly inter-correlated.

sub-RQ 2: What is the influence of personal ability, attitude and personal relevance on stakeholders' intention to share their tacit knowledge?

The three personal factors of personal ability, personal relevance, and personal attitude do influence the intention of stakeholders to share their tacit knowledge. The findings have shown that there is a significant and direct effect of personal factors on the intention of stakeholders to share their tacit knowledge in requirements elicitation.

Therefore, these personal factors of personal ability, personal attitude, and personal relevance are important to the intention of sharing tacit knowledge.

sub-RQ 3: What are the mediating effects of the expected mediator, motivation, on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

The results provided evidence that there is a significant and positive direct effect of motivation on the intention of stakeholders to share tacit knowledge. Similarly, there is also significant indirect effects of motivation on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge.

However, motivation has had the largest influence on personal attitude among the three personal factors. There was a complete mediating effect of motivation on the relationship between personal attitude and the intention of stakeholders to share tacit knowledge. Similarly, there was a complete mediating effect of motivation on the relationship between personal relevance and the intention of stakeholders to share tacit knowledge.

However, there was only a partial mediating negative effect of motivation on the relationship between personal ability and the intention of stakeholders to share tacit knowledge. To summarise, motivation has a mediating effect on the relationship between personal factors and the intention of stakeholders to share tacit knowledge.

Hence, it can be seen from the results that motivation is a significant mediator for the effect of personal factors on the intention of stakeholders to share their tacit knowledge.

sub-RQ 4: What are the mediating effects of the expected mediator, communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge?

The findings of this study disclosed that there were significant indirect effects of communication skills on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge.

The results indicated that communication skills have increased the effects of the three personal factors on the intention of stakeholders to share their tacit knowledge, especially the effects on personal attitude.

There was a complete mediating effect of communication skills on the relationship between personal attitude and the intention of stakeholders to share their tacit knowledge.

On the contrary, communication skills have no mediating effect at all on the relationship between personal relevance and the intention of stakeholders to share tacit knowledge. Likewise, communication skills have also no mediating effect on the relationship between personal ability and the intention of stakeholders to share tacit knowledge.

Hence, it concludes that communication skills are a significant mediator only on the relationship between personal attitude and the stakeholders' intention to share their tacit knowledge.

main Research Question: Does the proposed conceptual model help to improve the intention of stakeholders to share their tacit knowledge?

The results of this study indicated that there was a significant and positive direct effect of personal ability on the intention of stakeholders to share tacit knowledge.

However, there was no significant direct effect of personal relevance and personal attitude on the intention of stakeholders to share tacit knowledge. The effect of

personal factors on the intention of stakeholders to share tacit knowledge changed when mediating variables (motivation and communication skills) were introduced in the proposed conceptual model.

It was found that the effect of personal factors on the intention of stakeholders to share tacit knowledge in main research question was different compared to the effect of personal factors on the intention of stakeholders to share tacit knowledge in sub-research question two.

Moreover, the results of this study indicated that there were significant and positive direct effects of personal ability, relevance, and attitude on motivation. Similarly, there was a significant and positive direct effect of motivation on the intention of stakeholders to share tacit knowledge.

Besides, the results of this study revealed that there were significant indirect effects of motivation on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge. In other words, there was a complete mediating effect of motivation on the relationship between personal attitude and the intention of stakeholders to share tacit knowledge, likewise on the relationship between personal relevance and the intention of stakeholders to share tacit knowledge.

In contrast, there was only a partial mediating negative effect of motivation on the relationship between personal ability and the intention of stakeholders to share tacit knowledge. To summarise, motivation has a mediating effect on the

relationship between personal factors and the intention of stakeholders to share tacit knowledge.

The results of this study showed that personal attitude was the only personal factor to have significant and positive direct effect on the communication skills of stakeholders in sharing tacit knowledge.

Meanwhile, there was no significant direct effect of communication skills on the intention of stakeholders to share tacit knowledge. Moreover, the results of this study also revealed significant indirect effects of communication skills on the relationship between the three personal factors and the intention of stakeholders to share tacit knowledge.

However, communication skills have no mediating effect on the relationship between all three personal factors (i.e. ability, relevance and attitude) and the intention of stakeholders to share tacit knowledge.

It is important to note, that personal attitude has had a significant and positive direct effect on communication skills of stakeholders when communication skills were the only mediating variable in the proposed conceptual model. The discrepancy of effects occurred when there were more than one mediating variable in the proposed conceptual model.

Despite motivation and communication skills being the mediating variables in the main research question, motivation has had a greater impact on the intention of stakeholders to share tacit knowledge.

Hence, motivation was a significant mediator for the effect of personal factors on the intention of stakeholders to share tacit knowledge. As a whole, the proposed conceptual model does help to improve stakeholders' intention to share their tacit knowledge with motivation present as a mediator.

sub-RQ 5: What is the effectiveness level of motivation on stakeholders' intention to share their tacit knowledge?

Motivation is an effective factor in improving the stakeholders' intention to share their tacit knowledge as described in the results, section 4.6 of this study. The results showed that there was a statistically significant mean score difference between the pre-test and the post-test when gamification was applied in requirements elicitation. It was a positive indication towards the engagement of participants in the high motivation group as they acted to engage further after exposure to the intervention.

sub-RQ 6: What is the effectiveness level of communication skills on stakeholders' intention to share their tacit knowledge?

This study revealed that communication skills are an effective factor in improving the intention of stakeholders to share their tacit knowledge. Communication skills were employed as an intervention in this study. The results showed that the effect of communication skills was significant as the post-test out-performed the pre-test in its respective tacit knowledge sharing session, after the intervention.

6.4 Discussion of Results

This study aims to investigate the effects of personal factors and psychological factors that include motivation and communication skills towards the intention of stakeholders to share tacit knowledge. This study foresaw motivation and communication skills to possess mediating effects to maximize engagement and achievements of stakeholders to share their tacit knowledge. The main objective and six sub-objectives of this study are as follows:

The main objective of this study: To formulate a conceptual model as guidelines to improve stakeholders' intention to share their tacit knowledge.

The sub-objectives of the main objective above are as below:

i. To examine the relationship between the three personal factors of personal ability, personal relevance, and personal attitude and intention of stakeholders to share tacit knowledge.

ii. To investigate whether personal ability, attitude and personal relevance are factors to influence stakeholders' intention to share their tacit knowledge.

iii. To investigate mediating effects of the expected mediator, motivation on the relationship between personal factors and stakeholders' intention to share their tacit knowledge.

iv. To investigate mediating effects of the expected mediator, communication skills on the relationship between personal factors and stakeholders' intention to share their tacit knowledge.

v. To investigate mediating effects of the expected mediator, communication skills on the relationship between personal factors and stakeholders' intention to share their tacit knowledge.

vi. To evaluate the effectiveness of communication skills on stakeholders' intention to share their tacit knowledge.

One main research question and six sub-research questions were proposed for this study according to the objectives aforementioned. Data analysis of this study was conducted based on the proposed research questions and results of data analysis are presented in Chapter Four.

Hence, discussion of the findings in this chapter is intended to provide the answers to the research questions of this study. The discussion of each research question can be found in the following sections.

6.4.1 The Relationship Between Personal Ability, Personal Attitude, and Personal Relevance with The Intention of Stakeholders to Share Tacit Knowledge

The objective of sub-research question one is to examine the relationship between the three personal factors of personal ability, personal relevance, and personal attitude with the intention of stakeholders to share tacit knowledge. The results revealed that the three personal factors were significantly inter-correlated.

In multiple regression analysis, the problem of correlated independent variables is referred to as multicollinearity (Allen, 2017). It occurs when two or more

independent variables are highly correlated, thus making it difficult to establish the effect of each independent variable on the dependent variable.

The effectiveness of the symptoms is interpreted according to the research goals. Multicollinearity can interfere in determining the precise effect of each independent variable, it does not affect the overall fit of the model or produce bad predictions. However, if the model satisfies the residual assumptions and has a satisfactory predicted R-squared, it can produce great predictions even with severe multicollinearity.

As noted above, the three independent variables (i.e. personal ability, relevance and attitude) are significantly inter-correlated. The results indicated that the three independent variables were also significantly correlated with another latent variable, which is the intention of stakeholders to share their tacit knowledge. The higher the intention of stakeholders to share their tacit knowledge, the higher their ability to share tacit knowledge.

This observation is closely associated with their willingness to contribute greater time, energy, and effort in the sharing knowledge process. Stakeholders tend to be more engaged in sharing their tacit knowledge if they believe that the new software system is important and personally relevant to them. Based on this rationale, the more positive the attitude, the stronger the intention of stakeholders to share their tacit knowledge.

6.4.2 The Effects of Personal Ability, Personal Attitude, and Personal Relevance on The Intention of Stakeholders to Share Tacit Knowledge

Research question two sets out to examine whether personal factors (i.e. personal ability, personal relevance, and personal attitude) are the factors that influence the intention of stakeholders' to share tacit knowledge in requirements elicitation. The findings showed that the three personal factors have significant positive effects on the intention of stakeholders' to share their tacit knowledge. The details of the findings are tabulated in Table 4.3 (refer to page 122).

Personal factors (i.e. personal ability, personal relevance, and personal attitude) in this study and their significant relationship were identified to be important drivers of intention, an idea that has not been previously tested.

More importantly, this study has shown that there is a significant direct effect of personal factors on the intention of stakeholders to share tacit knowledge in requirements elicitation. The personal factors of personal ability, personal attitude, and personal relevance are important to heighten the intention of sharing tacit knowledge.

A significantly positive correlation between personal factors and the intention of sharing tacit knowledge is the result of stakeholders who have strong personal factors that will contribute positively to requirements elicitation. This is because they anticipate the benefits of the software system's implementation to be of personal relevance (e.g. personal goals and needs) that aid in accomplishing the day-to-day basic responsibilities of their organization.

Therefore, stakeholders will shift their attitudes in a manner that support their current pursuits, such as they will become more optimistic and open to accept the implementation of a new software system in their organization. They also become more self-initiated and supportive to ensure that requirements elicitation is successfully accomplished by sharing their tacit knowledge.

In other cases, such shifts are not always possible (Carrera, Caballero, Fernández, & Muñoz, 2017) as several research works have contradicted (Ferguson & Bargh, 2004; Trope & Fishbach, 2000). Furthermore, it is worth noting that not all tacit knowledge is personal and can be controlled by the individual's personal factors such as attitudes.

Notwithstanding these limitations, personal attitudes remain in this study as one of the important factors to influence the intention to share tacit knowledge, although it has the lowest significant level of influence amongst the other two factors. That aside, stakeholders who have a high personal ability are relatively more positive in providing crucial information such as business rules, goals, expectation or assumptions, which often remain hidden or unshared within their capacity.

The empirical findings indicate that personal ability is the most significant construct in influencing the intention of stakeholders in sharing tacit knowledge in requirements elicitation ($\beta = .28$, $p < .001$) (as shown in Table 4.3 on page 122) compared to personal relevance ($\beta = .32$, $p < .01$) and personal attitude ($\beta = .26$, $p < .05$). This finding is consistent with those from other studies (Brennan, 2008; Siemsen et al., 2008).

According to the MOA framework, time availability is an indicator of opportunity to share knowledge (Brennan, 2008). This could be the reason why knowledge sharing intention and personal ability are hindered. That is to say, the intention of stakeholders to share tacit knowledge becomes stronger with an increase in the time of participation in requirements elicitation.

Furthermore, evidence in support of this point can be found in Bock et al. (2005) in which they underlined that "*individuals will adopt particular behaviour when the evaluation of their capability is adequate to accomplish the task*". As a result, an organization should pay more attention to how to cultivate the ability of stakeholders and offer appropriate solutions for this purpose.

In view of that, an organization could consider reducing the workload of stakeholders who have been involved in requirements elicitation so that they have sufficient time to participate in the process and successfully improve the quality of requirements.

In addition, the current study also found that personal relevance and intention in regards to tacit knowledge sharing were strongly associated. In this study, personal relevance is defined as the extent to which a judgement has significant consequences for the self.

Stakeholders are more willing to share their knowledge and feel encouraged doing so if they perceive more benefits from the sharing behaviour, a behaviour consistent with the rational action theory (Hau et al., 2013). This rationale could

lead stakeholders to look for approaches that make sharing tacit knowledge in requirements elicitation to produce more fruitful outcomes.

The results suggest that the organization efforts aimed at increasing stakeholders' perception of personal relevance of the technology will contribute to the success of requirements elicitation. For instance, personal relevance is likely high among stakeholders who feel that they are or may be immediately and personally affected by the new software system when they have a direct stake in it.

Furthermore, some researchers (Celsi & Olson, 1988; Zaichkowsky, 1985) perceived personal relevance as an essential characteristic of involvement. It could be said that stakeholders who have been involved in requirements elicitation and believe the software system to have personal significance and relevance are more likely to perceive the software system as being useful with regards to the performance of their jobs.

Also, it is important to note that the results of this study indicate that there was a significant and strong relationship between personal relevance and personal attitude ($r = .88$, $p < .001$), which is consistent with previous studies (Barki & Hartwick, 1994). According to Hartwick and Barki (1994), individuals who perceive the software system as important and personally relevant are likely to hold positive attitudes concerning the software system, thus will choose to involve themselves in the system development process.

Personal attitude is less influential than the other foregoing personal factors. It has nevertheless a significant association with the intention of sharing tacit knowledge in requirements elicitation as presented in Table 4.3 (refer to page 122). This may be due to the lack of communication, rendering stakeholders unaware of the usefulness of a new software system.

However, the results of this study are consistent with the findings of previous studies (Bock et al., 2005; Chang, 1998; Joseph & Jacob, 2011; Ryu et al., 2003; Seba et al., 2012). This is in accord with the conclusion some researchers (such as Bock et al. 2005) have reached, that attitude towards knowledge sharing is directly and positively related to the intention to share knowledge.

Besides, it is also reasonable to look at the proposition by (Davis, 1989) who suggested that there is an association between attitude and perceived usefulness. Accordingly, we emphasise on the functionality aspect of the new software system as necessary to encourage stakeholders to contribute tacit knowledge more enthusiastically in requirements elicitation. It is worthwhile for organizations to focus on enhancing the perceived usefulness of the new software system since it is more likely to lead to an increased intention to share tacit knowledge.

In addition, personal attitude deserves better attention, despite its effect on the intention to share tacit knowledge in this study was weak. This is because attitudes are a major determinant of an individual's intention, as proven in many research (Chen et al., 2012; Govindarajulu, Reithel, & Sethi, 2000; Seba et al., 2012; Untaru et al., 2016; Yun, 2013).

To conclude, the findings of this study imply the importance of including criteria such as personal ability, personal attitude, and personal relevance during the process of stakeholder identification in order to recruit a better quality of stakeholders to be involved in requirements elicitation to contribute their tacit knowledge.

6.4.3 Mediating Effects of Motivation on The Relationship Between Personal Factors and Stakeholders' Intention to Share Tacit Knowledge

The objective of sub-research question three is to investigate mediating effects of the expected mediator, motivation on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge. The results of this study confirm the findings of earlier studies indicating that motivation has an effect on the relationship between personal factors and the stakeholders' intention to drive action (Sardegna, Lee, & Kusey, 2014; Siemsen et al., 2008). Siemsen et al. (2008) revealed that there is complementarity among motivation and personal factors to share tacit knowledge.

Additionally, the results of this study indicated that personal factors and motivation play a complementary role in influencing the sharing of tacit knowledge during requirements elicitation, a result consistent with Siemsen et al.'s findings (2008). It was noted that motivation has a significant direct effect on the relationship between personal factors and the intention of stakeholders to share tacit knowledge.

In addition, Hau et al. (2013) have indicated that motivation significantly influences the intention of stakeholders to share tacit knowledge. The findings of this study also support Hau et al.'s (2008) study, confirming once again that there is a significant direct effect of the motivation of stakeholders on the intention to share tacit knowledge in requirements elicitation.

Besides that, this study also found that motivation is a significant mediator that enhances the effect of the three personal factors on the intention of stakeholders in sharing their tacit knowledge, thus confirms that there is a significant mediating effect of the motivation of stakeholders on the relationship between personal factors and the intention to share tacit knowledge in requirements elicitation.

6.4.4 Mediating Effects of Communication Skills on The Relationship Between Personal Factors and Stakeholders' Intention to Share Tacit Knowledge

Individuals are often encouraged to communicate and share knowledge, yet lack the skills to do so. Thus, a study was conducted to investigate the mediating effects of communication skills on the relationship between personal factors and the stakeholders' intention to share their tacit knowledge in order to answer sub-research question four.

Several prior studies (Chen & Cheng, 2012; Laidlaw et al., 2006; Yang, 2010) have investigated the effects of communication skills on different aspects such as the attitude and ability of individuals. The findings of this study showed that

communication skills have the most significant effects on attitude, followed by personal relevance, then, of the least significant effects, personal ability.

Our findings are consistent with the results of prior studies conducted by Chen & Cheng (2012) and Yang (2010). They have discovered that communication skills mediate the relationship between communication skills, attitude, and the intention to share tacit knowledge. In addition, the findings of Laidlaw et al. (2006) showed that there exists a strong positive relationship between communication skills and the ability to share tacit knowledge.

However, prior studies have not focused much on the relationship of communication skills, personal relevance, and the intention to share tacit knowledge. Hence, there requires a further study as it is found, in this study, that there is a positive relationship amongst communication skills, personal relevance, and the intention to share tacit knowledge.

It is important to note that the results of this study showed that communication skills significantly enhance the mediating effect on the three personal factors and the intention of stakeholders to share tacit knowledge.

Hence, communication skills are necessary for sharing tacit knowledge because it helps to build positive perceptions in the communication process, thereby enhances the intention of stakeholders to share tacit knowledge. The opportunity to share tacit knowledge is increased because communication is more effective as a result of improved communication skills.

6.4.5 Formation of The Conceptual Model of Stakeholders' Intention to Share Tacit Knowledge

The objective of main research question is to formulate a conceptual model as guidelines to improve the stakeholders' intention to share their tacit knowledge. The results of this study showed that the proposed conceptual model does help to improve the intention of stakeholders to share their tacit knowledge.

This study sets out primarily to examine the relationship between three personal factors (i.e. personal ability, personal relevance, and personal attitude) and the intention of stakeholders to share tacit knowledge, as well as to develop a model of the mediating effects of motivation and communication skills on the relationship.

The key findings of this study are as follows. Firstly, there was a significant direct effect of personal ability on the intention of stakeholders to share their tacit knowledge. That is to say, the intention of stakeholders to share tacit knowledge becomes stronger with an increase in the time permitted to participate in the tacit knowledge sharing session.

On the contrary, personal relevance and personal attitude have no direct effect on the intention of stakeholders to share their tacit knowledge. As described, personal attitude is not a factor in the stakeholders' intention to share tacit knowledge, as according to the findings of this study. This is inconsistent with Bock et al. (2005) in which they claimed that attitude towards knowledge sharing is directly and positively related to the intention to share knowledge. Thus, this is an important area that calls for further study, to examine rigorously

the relationship between attitude and the intention of individuals to share tacit knowledge.

In addition, the findings of this study differ from the findings of a previous study (Davis, 1989) which suggested that there is a linkage between attitude and perceived usefulness. Accordingly, individuals should be more willing to expend high effort as they believe that undertaking a particular task will result in a positive gain. Despite so, the perceived usefulness of this study did not in any way influence the stakeholders' attitude to share their tacit knowledge.

However, findings of this study showed that personal attitude recorded a positive effect on the intention of stakeholders to share their tacit knowledge when motivation was as mediating variable. Further discussion is presented in the following section.

Motivation is one of the key factors influencing the intention of individuals to share their knowledge, regardless of the type of knowledge shared (Ning et al., 2005; Osterloh & Frey, 2000). Prior studies have investigated intensively the interaction of motivation and personal factors that drive the intention to share tacit knowledge in various contexts. Siemsen et al. (2008) revealed that there is complementarity among motivation and the ability in driving action to share tacit knowledge.

Similarly, the results from this study showed that personal ability and motivation play a complementary role to influence the intention of stakeholders to share tacit knowledge, of which is consistent with the viewpoint of Siemsen et al.

(2008). In addition, this study revealed that there is a relationship between personal attitude, motivation, and the intention to share tacit knowledge, of which is consistent with the discovery of Lin (2007).

Nonetheless, there is a lack of research studies on the relationship between personal relevance, motivation, and intention to share tacit knowledge. The findings of this study showed that personal relevance has a significant and positive effect on the intention of stakeholders to share tacit knowledge with motivation as mediator. This concludes that motivation is a significant mediator that enhances the effect of personal factors (i.e. ability, relevance, and attitude) on the stakeholders' intention to share their tacit knowledge.

The findings of this study showed that there occurs a significant and directly effective relationship between communication skills and personal attitude. The findings are consistent with the results of the prior study (Harlak, Gemalmaz, Gurel, Dereboy, & Ertekin, 2008) which reported that attitude of participants changed due to the intervention of communication skills.

Simultaneously, the findings of this study clearly revealed that communication skills have no direct effects on personal factors of ability and relevance. Additionally, there were no influences on the intention of stakeholders to share tacit knowledge although communication skills play a role as mediator in this study.

The findings were somewhat surprising because the results of sub-research question four showed that communication skills have a significant and positive

mediating effect on the intention of stakeholders to share tacit knowledge. This implies that motivation has stronger mediating effects than communication skills on the intention of stakeholders to share their tacit knowledge when both appeared as a mediator in the proposed conceptual model.

Generally, there was no strong evidence to show that communication skills are a significant mediator because the indirect effect of personal attitude has only increased .01 from .28 to .29, whereas the indirect effect of personal ability has decreased .01 from .11 to .10. The results are tabulated in Table 4.8 and Table 4.11.

Regardless, motivation and communication skills have parallel mediation effect on the relationship between personal factors (which are attitude and ability) and the intention of stakeholders to share tacit knowledge, as according to the findings of this study.

Nonetheless, this is an important area that calls for further study to improve the understanding about the parallel mediation effect of motivation and communication skills on the relationship between personal factors and the intention of stakeholders to share their tacit knowledge.

6.4.6 Effectiveness of Motivation on The Stakeholders' Intention to Share Tacit Knowledge

User engagement is the key concept in the development of useful and usable systems. It has positive effects system success. The previous studies (Kappelman

& McLean, 1991; Lee & King, 1996) have exposed that user engagement exerts different impacts on user satisfaction, a measure of system success. It appears that user engagement is important in system development to ensure system success.

However, it still lacks considerable efforts given to study user engagement, particularly in requirements elicitation. Indeed, the satisfaction of users with a software system could better be understood when their psychological engagement, presumably in its development, is considered.

Hence, this study aims to evaluate the effectiveness of motivation on the stakeholders' intention to share tacit knowledge by conducting a between-group pre-test and post-test to compare the intervention effect on the engagement of participants in requirements elicitation to share their tacit knowledge (low motivation and high motivation groups).

Gamification was an intervention of this study, of which is an approach to motivate stakeholders to engage in the knowledge sharing session so that they can share more tacit knowledge using game design and game elements in requirements elicitation. There were two game mechanics used in this study, namely points and leaderboard.

The results of the study for the effect of the intervention on the low motivation and high motivation group showed that gamification can substantially be used to improve the engagement of stakeholders in requirements elicitation. Hence, it concludes that motivation is an effective factor in improving the stakeholders'

intention to share their tacit knowledge based on the results obtained in this study.

This study demonstrated that gamification intervention is considered as one of the most powerful motivational interventions, as the empirical findings indicated that the leaderboard increases in the participants' contributions after the pre-test. In this study, leaderboard performs similarly to the typical goal-setting intervention which offers two types of metrics: other participants' scores and leaderboard position for comparisons among participants.

Leaderboard motivated behaviour changes effectively as it allows participants to see the connection between effort and goal achievement. It also provides mechanisms which the achievement of a participant can be immediately and continuously displayed for the self and others in the gamified requirements elicitation, to be seen and acted upon.

Those participants who want to be listed at the top of the leaderboard may contribute aggressively to further strengthen their position. The evidence in support of this point can be found in the goal-setting theory (Locke, 1968). As stated by Locke (1968), an individual's conscious goals regulate his actions. It could also be said that the use of a leaderboard encourages participants to set a higher goal, which further increases their intention to perform well in the gamified requirements elicitation.

From a practical standpoint, this study suggests an emphasis on the use of leaderboard for any gamified activities or tasks in future implementation.

Undoubtedly, the leaderboard is the most basic mechanic of competition (Domínguez et al., 2013) and probably the oldest social feature used in games. Nonetheless, it is considered as one of the powerful game mechanics as indicated in the previous studies (Landers, Bauer, & Callan, 2017) to increase the level of competition amongst players by ranking them in a variety of ways with the aim of generating more fruitful outcomes from the gamified activity or task.

The results then revealed that there appeared to be an acceleration in the growth of stakeholders' engagement after they have viewed their earned points. It was on these grounds on which it was argued that points serve as a feedback mechanism in the current study by enabling participants to maintain their commitment towards a goal, of which the goal of this study was gift vouchers.

Remarkably, the performance of low and high motivation groups has been enhanced after the exposure of intervention. The results of the intervention revealed that combining goals and performance feedback could enhance performance. It can be perceived from the findings that motivational enhancement is closely tied to the intervening self-processes mechanism (i.e., self-efficacy and self-evaluative). (Bandura & Cervone, 1983) revealed that self-processes enhances goal commitment and subsequently strengthens goal attainments.

Hence, from the practical perspective, it is significant to embrace the summary feedback (accumulated points) as a moderator to the goal effects. As identified by Locke and Latham (2002), summary feedback facilitates the goal's

effectiveness. Participants can adjust the level or direction of their efforts or performance strategies to achieve their goal effectively with the facilitation of summary feedback. In this study, the participants of a lower ranking on the leaderboard were trying to increase their efforts to further contribute their knowledge.

It concludes that there is a significant causal relationship between gamification and the engagement of stakeholders to share their tacit knowledge in requirements elicitation, based on the empirical findings of this study. That is to say, motivation is an effective factor in improving the stakeholders' intention to share their tacit knowledge.

6.4.7 Effectiveness of Communication Skills on The Stakeholders' Intention to Share Tacit Knowledge

In this study, experimental pre-test and post-test design was used to evaluate the effectiveness of communication skills towards the intention of stakeholders to share tacit knowledge. The results of this study show that communication skills effectively improve the stakeholders' intention to share their tacit knowledge.

The results support the previous findings of selected studies (Teramachi et al., 2018); (Claramita, Tuah, Riskione, Prabandari & Effendy, 2016). Teramachi et al. (2018) stated that good communication skills help participants in their study to gain the trust of patients and facilitate participants to communicate in a more dialogical manner with their patients.

Trust is an essential factor that helps to promote emotional interaction with individuals which will affect the relationship between satisfaction and continuous knowledge sharing intention (Hashim & Tan, 2015). Similar findings of better social communication skills were found in a study by Claramita et al. (2016) that accentuates the cultural communication proficiency, of which may have an important impact on tacit knowledge sharing.

There were significant mean differences between the intervention group and the control group. Figure 4.6 (refer to page 148) in Section 4.7 evidently illustrates that for each of the different groups, the post-test out-performed the pre-test in the knowledge sharing session after exposure to the intervention.

It seems that communication skills had strongly influenced the intention of stakeholders to share their tacit knowledge. For instance, the use of different skills of communication such as listening to the participants until they have finished delivering their message and practising empathy to understand the perspective of participants would make them feel more comfortable to speak openly, to feel like they matter, and to feel safe to share their tacit knowledge. This can be done by validating the thoughts and feelings of participants when speaking through reflecting back what the participants have communicated and when summarizing the main idea of the participant's message.

Accordingly, the findings of this study confirmed that communication skills are a significant mediator between personal factors and the intention of stakeholders to share tacit knowledge. It also demonstrates the importance of intervention to heighten the intention of stakeholders to share tacit knowledge as it is revealed

that participants who underwent communication skills intervention significantly outperformed those who did not.

6.5 Summary

This chapter presented the summary of findings and the discussion of the findings. The next chapter presents the conclusion, implications, and suggestions for future study.

CHAPTER 7: CONCLUSION

7.1 Overview

This chapter begins with the implications of research, then followed by the suggestions for future research. The chapter closes with a summary as a conclusion to this study.

7.2 Implications of Research

The results of this study have a number of implications for research. Firstly, this study has provided new empirical findings of the impacts of personal factors on tacit knowledge sharing intentions, a literary gap in prior research. The results of this study showed that personal factors (i.e. ability, relevance, and attitude) have significant influences on the intention of stakeholders to share tacit knowledge.

Noting the compelling nature of this new finding, there suggests to add personal factors as assessment criteria aside from those common criteria of power, legitimacy, and urgency in the existing stakeholder identification methods in order to reduce issues of missing or mistaken requirements; these issues remain problematic in requirements elicitation (Vásquez-Bravo et al., 2014).

Hence, more attention should be put on the personal or intrinsic aspect of stakeholders in order to get appropriate stakeholders to be involved in requirements elicitation to share tacit knowledge. The appropriateness of stakeholders indeed influences the quality of requirements in terms of completeness and correctness.

Secondly, the results of this study highlight the crucial role of motivation in mediating the relationship between personal factors and the intention of stakeholders to share their tacit knowledge. Furthermore, this study conducted an experimental study to validate the mediating effects of motivation revealed at the first stage of this study.

The aforementioned experimental study demonstrated that gamification intervention is considered one of the most powerful motivational interventions; the empirical findings indicated that there is an increase in the leaderboard of the participants' contributions after the pretest. Those participants who want to be listed at the top of the leaderboard may contribute aggressively to further strengthen their position.

The evidence in support of this point can be found in the goal-setting theory (Locke, 1968). As stated by Locke (1968), an individual's conscious goals regulate his actions. It could also be said that the use of a leaderboard encourages participants to set a higher goal, which further increases their intention to perform well in the gamified requirements elicitation.

From a practical standpoint, there suggests emphasizing the use of leaderboard for any gamified activities or tasks in future implementations. The results of the experimental study also revealed that there appeared then to be an acceleration in the growth of stakeholders' engagement after they have viewed their earned points.

On these grounds, the points are argued to serve as a feedback mechanism, enabling participants to maintain their commitment toward a goal; and goal of this study was gift vouchers, as noted earlier. The results of the intervention revealed that combining goals and performance feedback could enhance performance. It can be perceived from the above findings that motivational enhancement is closely tied to the intervening self-processes mechanism (i.e., self-efficacy and self-evaluative), of which were indicated in Bandura and Cervone's (1983) studies.

It is, however, important to note that self-processes mechanism will impact goal attainments when goals and feedback information are both present at the same time. In the experimental study, the participants who have self-set goals outperformed and sought to better their prior attainment. In addition, this finding is congruent with the previous studies (Bandura & Cervone, 1983) which revealed that self-processes enhances goal commitment and subsequently strengthens goal attainments.

Hence, from the practical perspective, it is significant to embrace summary feedback (accumulated points) as a moderator to the goal effects. As identified by Locke and Latham (2002), summary feedback facilitates the goal's effectiveness. Participants can adjust the level or direction of their efforts or performance strategies to achieve their goal effectively with the facilitation of a summary feedback. In the experimental study, the participants were trying to increase their efforts in order to contribute further their knowledge when they were found to be of lower ranking on the leaderboard.

In conclusion, the experimental study has demonstrated that there is a significant effect of gamification on the stakeholders' engagement in requirements elicitation. The results revealed that stakeholders have higher engagement levels and higher accomplishment ratio in completing testing tasks after gamification intervention. It provides important insights and suggests useful implications to the researchers and practitioners to determine the practicability of their own project implementation.

Thirdly, the results of this study showed that communication skills are a significant mediator only on the relationship between personal attitude and the intention of stakeholders to share their tacit knowledge. An experimental study was conducted to further validate the mediating effects of communication skills.

The results of the study demonstrated that the effectiveness of the intervention on participants reported an overall improvement in sharing tacit knowledge, better than those in the control group. Several previous studies (Di Maida et al., 2017; Johnston et al., 2015) claimed that WhatsApp plays a crucial role in improving communication.

On the contrary, this experimental study revealed that communication between participants and facilitator has been improved due to communication skills, and not for WhatsApp. That is to say, communication skills are the important driver towards participants' intention to share tacit knowledge. Thus, there lies the importance of effective communication skills in supporting the participants to engage in a constructive exchange and to share tacit knowledge.

From the practical perspective, there suggests conducting a short briefing to share tips on effective communication skills or by sharing a video about tips on effective communication skills with stakeholders who will be participating in the tacit knowledge sharing session in order to educate the stakeholders on the significance of effective communication skills.

To summarize, communication skills are necessary for sharing tacit knowledge because it helps to build positive perceptions on the communication process, thereby enhancing the intention of stakeholders to share tacit knowledge. The opportunity to share tacit knowledge subsequently is increased because communication is more effective as a result of communication skills.

7.3 Limitations of Research

As with all research, there are a number of limitations to this study that must be acknowledged. Firstly, this study examines the intention of stakeholders rather than their actual tacit knowledge sharing behaviour in requirements elicitation.

Secondly, the results of this study were based on the responses obtained from an online survey, reaching and sampling a broader range of individuals. This decision was made to achieve a higher response rate which would then improve the generalizability of the results of this study.

Thirdly, the sample used in this study were, in fact, software practitioners and not stakeholders. This is because software practitioners work closely with stakeholders during the software system development. Additionally, they are able to perceive the actual problems experienced by the stakeholders much clearer than

the stakeholders themselves. This decision was made in hopes to obtain the unbiased perceptions of the software practitioners regarding the stakeholders' intention to share tacit knowledge in the requirements elicitation process. However, the findings of this study cannot be generalized to all software practitioners, as the respondents of this study only involved the software practitioners in Malaysia. This population was chosen because it was the only accessible population within the restrictions of time and financial resources.

Fourthly, the research methods employed in this study cannot be diversified due to time constraints. This study conducted multiple surveys at different stages without involving other methodologies such as observation and interview to further validate the responses gathered from the surveys. Hence, the validity of the research findings is dependent on the sincerity and honesty of the respondents when answering the questionnaire.

Fifthly, tacit knowledge is widely defined as hard to express, convert, communicate and share. Hence, the aim of this study is to heighten the engagement of stakeholders to share more tacit knowledge during requirements elicitation. Furthermore, this study places emphasis on eliciting more tacit requirements from the stakeholders which is difficult to share, regardless of the quality of the requirements. This does not suggest that quality is unimportant but that the attention on controlling the quality of requirements would only be realized after the elicitation process and examined later in the future research plan.

Sixthly, it is unclear defined specific goals within the leaderboard occurred in the experimental study of sub-research question five.

Seventhly, the focus of the experimental study of sub-research question five was on a short-term (i.e., several minutes to a few hours) requirements elicitation due to the cost and associated operational complications of conducting long-term studies.

Eighthly, the experimental study of sub-research questions five and six was performed with a small sample group, that is, a restricted number of stakeholders which were from Department of Computing confine the generalization.

Ninethly, the experimental study of sub-research question five placed emphasis on eliciting requirements regardless the quality of requirements.

7.4 Suggestions for Future Research

There are several limitations to this study that require further examination and additional research. The discussion of suggestions for future research according to the types of study can be found in the following sections.

7.4.1 Non-Experimental Study of Main Research Question

Firstly, this study examined the intention of stakeholders instead of their actual tacit knowledge sharing behaviour in requirements elicitation. Therefore, future studies should examine the behaviour of stakeholders in the requirements elicitation process in order to increase the proposed research model's validity.

Secondly, the sample used in this study was software practitioners and not stakeholders as software practitioners work closely with stakeholders during software development. Furthermore, software practitioners could see the actual problems much clearer than the stakeholders themselves, thus hoping to obtain unbiased perceptions of the intention of stakeholders to share tacit knowledge in requirements elicitation.

Therefore, there is a need for future studies to include stakeholders as the sample of the study to test the same model to see if there are any significant differences between them; and at the same time, to ascertain the validity of results of this study.

Thirdly, future research should expand the understanding of the stakeholders' intention to share tacit knowledge by identifying other possible constructs and integrating them into the proposed research model. Extending the theoretical framework of this study with other significant constructs would enhance its explanatory power of the intention of stakeholders to share tacit knowledge in requirements elicitation.

7.4.2 Experimental Study of sub-Research Question Five

Firstly, there were undefined goals within the leaderboard which occurred in the study. For example, the participants may probably move up in rank on the leaderboard based on the accumulated points when they have proposed or voted more requirements but perhaps only pay attention to it once. On the other hand, participants may have ignored the leaderboard completely.

Therefore, future research should classify tasks according to the difficulty level; and then determine the role of choosing goal based on the difficulty level; subsequently, set the goal revision to continue over the course of a task.

Secondly, the focus of the study was a short-term requirements elicitation (i.e., several minutes to a few hours) due to the cost and associated operational complications of conducting long-term studies.

However, future research should prolong the pretest and posttest session to days, weeks or months instead of minutes or hours. This way, there is a larger possibility for the potential motivational benefits of gamification to be observed over longer periods of time (Jackson & McNamara, 2013).

Thirdly, the study was performed with a small sample group of a restricted number of stakeholders which were from the Department of Computing, thus confining generalization. Hence, future studies should include different departments to achieve strong population validity in order to prove that the findings represent a wider population in real-world situations.

Fourthly, this study did not aim to address all the challenges of requirements elicitation. Instead, heighten active engagement of stakeholders in requirements elicitation was the only emphasis of this study. In addition, the term of stakeholder in this paper refers to the user of the finalised software application.

Hence, future research should involve a crowd of stakeholders such as developers, analysts and others to create a valuable interaction amongst any groups or individuals who can affect or be affected by the implementation of the software application in an organization and to resolve the stakeholders' engagement issue in a holistic manner.

Fifthly, the current study placed emphasis on eliciting requirements regardless of the quality of requirements. However, future research should give attention to filtering and to prioritizing requirements as the success or failure of a software project is mainly affected by the quality of requirements, on which the system is built.

Sixthly, it is recommended that future research explore the existing theories to provide convincing evidence of the effectiveness of other types of game mechanics, also to understand the experimental effects of gamification more broadly.

7.4.3 Experimental Study of sub-Research Question Six

Firstly, the study was performed with a small sample group of a restricted number of stakeholders which were from the Department of Computing, thus confining generalization. Hence, future studies should include different departments to achieve strong population validity in order to prove that the findings represent the wider population in real-world situations.

7.5 Summary

Most studies seek to increase tacit knowledge sharing during requirements elicitation by developing a variety of techniques which are not universally applied. Nonetheless, tacit knowledge continues to affect the quality of the requirements attained. In fact, greater focus should be placed on the stakeholders particularly on the aspects of personal or intrinsic; this will clearly reveal the true reason(s) behind the intention of stakeholders to share tacit knowledge.

Therefore, the aim of this study is to examine the effects of personal factors (i.e., personal ability, personal attitude, and personal relevance) on the stakeholders' tacit knowledge sharing intention in requirements elicitation. Besides, it is necessary to examine psychological factors such as motivation and communication skills that were foreseen to have mediating effects on the relationship between personal factors and the intention to share tacit knowledge.

Non-experimental and experimental design were employed respectively to address research problems and answer research questions in this study. Survey research was used to answer research main research question, which includes sub-research

questions one, two, three and four in the first half of this study. Then, pre-test and post-test design of quasi-experimental and true-experimental research design were employed to further validate the outcomes of sub-research questions five and six respectively which were derived from the earlier survey research.

Descriptive and inferential statistical methods were used to analyze the data to answer the research questions proposed, through the use of Statistical Package for Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) version 21.0.

The results indicated that personal factors are of primary importance and have significant effects on galvanizing stakeholders' intention to share tacit knowledge, of which is crucial in conducting reliable software requirements.

At present, none of the stakeholder identification methods includes personal factors as criteria in stakeholders' evaluation. This added insight can be utilized in practice to better support the stakeholder's elicitation process to achieve more superior requirements (in terms of reliability, quality, and comprehensive requirements).

In addition, the results of this study also revealed that motivation is a significant mediator, but not when dwi-mediators (motivation and communication skills) occur simultaneously in the proposed conceptual model. However, motivation and communication skills have significant mediating effects on the relationship between personal factors and the intention to share tacit knowledge when each of them occurs separately in the proposed conceptual model.

The mediating effects of these two mediators have been further validated through the experimental study conducted separately. The results of the experimental study showed that motivation and communication skills are significant mediators.

It is hoped that the findings of this study would serve to raise awareness of the importance of personal factors as assessment criteria of stakeholders in the stakeholder identification method. In conclusion, this study offers meaningful insights on the stakeholder identification process in RE and would trigger additional theorizing and empirical investigation involving more human factors in future studies.

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