

Understanding Knowledge Sharing Among ICT Professionals: Multiple Models and Empirical Test

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ABSTRACT

This study aims to examine the knowledge-sharing intention (KSI) of information and communications technology (ICT) professionals in Saudi Arabia. A comprehensive theoretical model was constructed for this study that took into consideration individual cognition, personality traits, and social interaction. Data was collected from 240 ICT professionals and engineers from 19 companies. Data analysis and research model assessment were conducted based on structural equation modelling (SEM) in conjunction with SmartPLS software. Results indicate that social influence, attitude toward knowledge sharing, perceived reputation enhancement, and perceived reciprocal benefit have a significant impact on the variations in the knowledge-sharing behavioural intention of ICT professionals. The study results are both theoretically and empirically valuable, and organisations may find the study results useful for the creation of policies that can foster a culture of knowledge sharing.

KEYWORDS

Big-Five Personality Traits, ICT Professionals, Knowledge-Sharing Intentions, Saudi Arabia, Theory of Reasoned Action

INTRODUCTION

Knowledge sharing (KS) has been argued to be positively related to an organisation's innovation capabilities (Liao, 2006). In fact, the sharing of ideas among individuals, teams, and/or business units is a key activity without which an organisation might under-utilize its most valuable resources and assets (Cabrera & Cabrera, 2002). Both researchers and organisations have begun to pay attention to understand how knowledge sharing intention can be increasingly driven by knowledge economy (Liu, 2008). More importantly, organisations are investing strongly in ICT to increase revenue, reduce costs and gain competitive advantage in today's highly dynamic business market (Hewitt et al., 2020; Kossai et al., 2019). On the other hand, with emerging technologies like Blockchain, Big Data, and Cloud computing, the role of KS becomes vital for ICT professionals (Abdelwhab et al., 2019; Gyamfi et al., 2018).

Knowledge has emerged as the most strategically significant resources of an organisation and as a source of sustainable competitive advantage (Iqbal et al., 2019; Shahzad et al., 2016; Ranasinghe & Dharmadasa, 2013; Jennex, 2007; Drucker, 1988). Successful economies continue to make the best use of knowledge and its applications (Mostafiz et al., 2019).

KS is the most essential process for knowledge management (KM) and a building block for firm's success (Al-Alawi et al., 2007; Syed-Ikhsan and Rowland, 2004). KS entails sharing and acquisition

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of thoughts about possible courses of action, information, experience, and best practice between two or more employees for problem-solving and collaboration (Wang & Noe, 2010; Lin, 2007). Tacit knowledge includes skills, insights, perceptions and practical knowledge that are deeply embedded in employees and cannot be communicated and expressed in language (Borges et al., 2019; Hadjimichael & Tsoukas, 2019). KS enables converting tacit knowledge into explicit knowledge (Hoof et al., 2012).

Recent studies have shown increased attention to KS in organisations (Arain et al., 2018; Lotfi et al., 2016; McKay et al., 2015; Ramayah et al., 2013; Ranasinghe et al., 2013; Ganguly et al., 2011; Jeon et al., 2011; Wang & Noe, 2010; Hsu & Lin, 2008; Cabrera et al., 2006; Peltokorpi, 2006; Ipe, 2003). In addition, KS studies have expanded their research focus to include professional groups such as academicians (Fullwood et al., 2019; Ramayah et al., 2013), accountants (Phang & Foong, 2010), civil and mechanical engineers (Matzler et al., 2008), librarians (Noaman & Fouad, 2014) and healthcare practitioners (Razzaque et al., 2013). However, ICT professionals and engineers have been found to be a largely under-researched workforce segment (Tsai et al., 2013; Borges, 2013; Teh & Sun, 2012). Moreover, it is noteworthy that, the phenomenon of KS is largely investigated in the Western world (Mullins et al., 2020; Fullwood et al., 2019; Rodman & Trespalacios, 2018; Wulf & Butel, 2017). In fact, little work on KS has been done in the Arab Middle Eastern context, and specifically in countries that belong to the Gulf Cooperation Council (GCC) (Gharamah et al., 2018; Marouf & Alrikabi, 2015). Therefore, this study aims to identify the antecedents which promote KSI among ICT professionals in Saudi Arabia and identify theories explaining KSI.

Previous research indicated that KS behavior is found to be the basis for a successful and effective teamwork in ICT projects (Koriat & Gelbard, 2019; Carmeli et al., 2011). ICT projects are complex and require open communication among ICT professionals and work teams, in order to share tacit and explicit knowledge (Hewitt et al., 2020; Borges et al., 2019). The main research question of the study addressed in this paper is: What drives an ICT professional's intention to share knowledge?

The research significance stems from its concern with ICT professionals in the context of a developing nation in the Arab Middle Eastern context and validates existing KSI theories using empirical data. Moreover, the study results are both theoretically and empirically valuable for the formulation of approaches to KS. Moreover, this research put forward important empirical contributions that will support the development of strategies to enhance KS behaviors among ICT professionals.

The following section briefly defines knowledge types, knowledge management success and knowledge sharing. Thereafter, the theoretical background and predictors of knowledge sharing intention will be reviewed. Subsequently, the conceptual framework, research design, data collection process will be discussed. Penultimately, the key findings and discussion are presented. Finally, the paper ends with conclusions, key limitations and highlights practical implications for further research.

DEFINING KNOWLEDGE AND KNOWLEDGE TYPES

Knowledge is defined as a set of insights, ideas, expertise, experiences and procedures (Shahzad et al., 2016), whose validity has been established using test of proofs (Lee, 2001). In fact, knowledge is the cornerstone of competitive advantage (Ranasinghe & Dharmadasa, 2013; Ganguly et al., 2011; Majid & Wey, 2009; Jennex & Olfman, 2008). There are two broad classifications of Knowledge namely tacit and explicit. Explicit knowledge refers to concrete concepts that can be expressed verbally (Jennex, 2007; Lee, 2001), typically are transferrable and are disseminated using documents, instruction books, diagrams, material in audio and video format, and computer programs (Ganguly et al., 2019). Tacit knowledge consists of perceptions embedded in a knower's mind overtime, instincts and thoughts for possible courses of action and behaviors (Al-Alawi et al., 2007; Jennex, 2007). Moreover, tacit knowledge implies that individuals' knowledge is greater than what they reveal (Davies, 2015). An important feature of knowledge management relates to how tacit knowledge can be converted to explicit knowledge, so that knowledge can be codified and shared throughout the organisation (Ganguly et al., 2019). In this study, we considered both explicit and tacit knowledge to contribute to organisational knowledge.

Knowledge Management and Knowledge Management Success

Knowledge management (KM) has now become a common priority for companies of all sizes and it is one of the most important aspects in today's competitive business environment (Gunjal, 2005). It is believed that KM has a positive impact on any organisation (Agrawal & Mukti, 2020). KM is defined as the process of extracting value from previous knowledge and experience in order to inform better decisions, modify action and deliver future decision-making actions with the aim of improving the organisation's effectiveness (Huang & Lai, 2012; Jennex, 2005; Horwitch & Armacost, 2002).

KM success can be defined as the reuse of knowledge to enhance organisational and/or individual performance by providing the right knowledge to those that need it when it is needed (Jennex et al., 2011). The successful implementation of KM is dependent on several factors (Huang & Lai, 2012). Researchers have proposed frameworks to examine and predict the factors leading to KM success in organisations (Agrawal & Mukti, 2020; Jennex, 2020; Huang & Lai, 2012; Kulkarni et al., 2006; Jennex & Olfman, 2005; Alavi and Leidner, 2001). **Figure 1** summarizes critical factors discussed in the literature that should be effectively addressed for successful implementation of KM. For example, Jennex et al. (2003) examined the need for having a corporate KM strategy to make sure that knowledge gained from projects are taken into account for use in the organisation. The data was collected from organisations that implemented knowledge management and those that did not. The study concludes that KM strategy had a significant impact on knowledge utilization and knowledge benefit realization of successful KM project or initiative (Jennex et al., 2003). Shahzad et al. (2016) argue that the mere existence of KM in an organization cannot guarantee organisational success and sustained competitive advantage, unless effectively managed by a proper system.

According to Alavi and Leidner (2001), people and the culture in workplace constitute the key drivers that ultimately determine the success or failure of knowledge management. Rubenstein-Montano et al., (2001) also emphasis that information technology (IT) drives change and affects the growth and diffusion of KM in a firm. In fact, IT is an important factor that helps organisations to acquire, maintain, transfer and store knowledge. Moreover, IT can help employees to reduce time of knowledge transfer (Nawab et al., 2015). It is believed that technological and organisational initiatives should be aligned and integrated to provide the optimal infrastructure supporting KM implementation. Huang & Lai (2012) point out that environmental influences (e.g., competition, economic, political, and social climate) play a vital role in the success of KM in organisations.

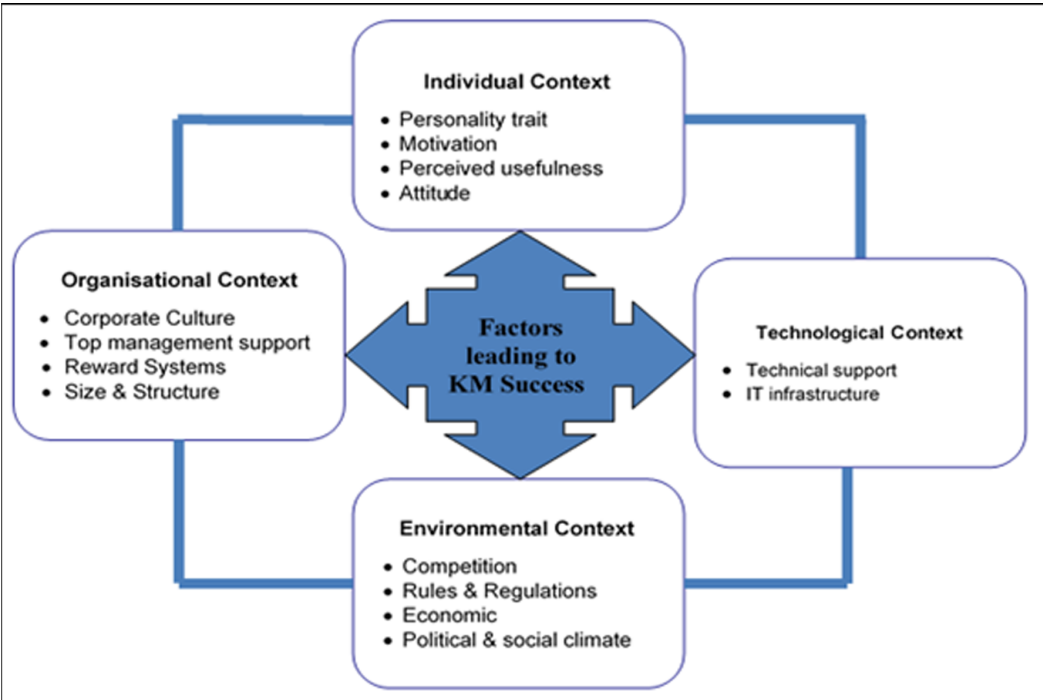
Knowledge Sharing and Intention To Share Knowledge

The purpose of knowledge sharing (KS) is to help the entire organisation to reach its goals (Nawab et al., 2015). Both researchers and organisations have begun to pay increasing attention to understand how knowledge sharing behavioural intention can be stimulated and increasingly driven by knowledge economy (Liu, 2008). Intention is a mental state that possesses a commitment to execute a particular action now, or in the future. Intention involves planning and mental activity to achieve a goal (Lee, 2001). According to Sifa & Von Solms (2016), individual behavior is based on the intentions, needs and beliefs of an individual.

The process of KS, otherwise known as knowledge transfer or knowledge diffusion (Shaari et al., 2015), involves the transmission of knowledge, skills, expertise, experience and information between individuals, between individuals and groups, or between groups. KS's purpose is to address issues and devising novel plans or products through both verbal and non-verbal communication (Wang & Noe, 2010; So & Bolloju, 2005). Based on a survey-based research with ICT professionals in Croatia, it was found that employees showing helping tendency showed KS behaviour (Podrug et al., 2017). However the limitation of this study was that they didn't explicitly model the potential for individual personality traits on KSI behaviour.

Knowledge possessed by one person must be conveyed into a suitable form in order to enable sharing to others. KS is a voluntary action that cannot be forced and hence is dependent on willingness and intent to share with others (Gibbert & Krause, 2002). KS facilitates market access, reinforces

Figure 1. Determinants that lead to KM success in organisations



competitive position, increases market share and improves a company's worth (Clemons & Slotnick, 2016; Li, 2012). As noted by Hendriks (1999), KS is significant as it enables an organisation to acquire an employee's knowledge, thus establishing a connection between the two and translating that knowledge into an asset that can benefit the organisation economically and competitively. Hence, management must comprehend employees' motivation to disclose what they know to be able to successfully encourage KS (Liu, 2008).

Jennex (2006) argues that formulating a corporate KM vision, rewarding employees for KS and establishing a best practices repository are critical success factors for creating and promoting a culture of KS. It is noteworthy that companies such as Lotus Development, an IBM division, rewards their employees for information and knowledge sharing activities (David et al., 2020). In fact, it is found that majority of KS barriers are concerned with individual issues (Nadason et al., 2017), therefore, it is important to understand the factors that create and promote KSI.

Saudi ICT Workforce

The Kingdom of Saudi Arabia, with a population of over 31 million and an area of around 2 million square kilometers is the largest country in the Middle East. Saudi Arabia is a high income country, one of the fastest growing economies in the Middle East and is ranked as the largest exporter of petroleum. Furthermore, Saudi Arabia is progressing towards a digitally-enabled knowledge-based economy (Vision 2030, 2016).

According to Gartner Group (2019), around \$3.7 trillion world-wide was spent on ICT. In Saudi Arabia, the total expenditure on ICT products and services has increased, reaching \$37 billion in 2020 as organisations have started to implement digital transformation initiatives to reduce costs and improve their business process efficiencies (IDC, 2020). In fact, this growth is expected to generate new job opportunities and intensify productivity of workers in local ICT companies as well as in

global subsidiaries based in Saudi Arabia (Amirat & Zaidi, 2019). However, ICT professionals are currently in short supply and this shortage is believed to impact the efficiencies of IT operations in organisations and, more importantly, hinder Saudi innovation and growth (Amirat & Zaidi, 2019; Alsafadi & Abunafesa, 2012). Thus the growth of ICT industries require developing a large pool of ICT professionals locally.

Alsafadi and Abunafesa (2012) conducted a study to understand the state of IT skills in Saudi Arabia by analyzing the supply and demand of ICT skills. The results highlighted a demand for system analysis skills, workflow and work process tools, advanced skills in knowledge management and system integration skills. In June 2011, the Saudi administration introduced the “Nitaqat program” (Nitaqat is-an Arabic term for ‘range’ or ‘limit’), to increase employment opportunities for Saudi nationals in the labor market, and reduce dependency on expatriate workers in many industries, including ICT (Peck, 2017).

In fact, ICT professionals apply their technical knowledge and skills to solve a variety of technological challenges, develop or fix different software or technology programs, develop manuals for use of technology and IT applications. Examining ICT professionals’ knowledge-sharing behaviour is a potential research area for achieving a more comprehensive picture of the reasons compelling ICT practitioners to share their knowledge and subsequently pledge suitable measures to enhance KS behavioural intention.

THEORETICAL BACKGROUND AND FORMULATION OF HYPOTHESES

Knowledge sharing behaviour has been investigated using a wide range of theories such as the Theory of reasoned action (TRA), Theory of planned behavior (TPB), Social exchange theory (SET), Technology Acceptance Model (TAM), Trandis model (TM), resource-based view of the firm, Actor-Network theory (Twum-Darko & Harker, 2017), Hofstede’s cultural model and social and economic exchange theories (Wang & Noe, 2010). Table 1 summarises previous theoretical frameworks applied for studying KS using meta-analyses of key literature with case studies from various organisational settings. For example, Chennamaneni et al. (2012) used the theory of planned behavior (TPB) for studying the main factors affecting KS and they conclude that psychological determinants (reciprocal benefits, perceived reputation, and perceived loss of knowledge), organisational determinants (perceived organisational climate), and technological determinants (facilitating tools and technology), influence attitudes towards KS.

Teh et. al (2011) developed a model based on the Big Five Personality Theory (BFPT) and TRA to understand the online entertainment knowledge-sharing behaviors of a sample of university students in Malaysia. The findings of the study indicated that three aspects of the BFPT, namely, extraversion, neuroticism and openness to experience, were related to individuals’ attitude towards knowledge-sharing behavior. Moreover, Bock and Kim (2002) applied social and economic exchange theories and social cognitive theory in combination with TRA to identify determinants of knowledge-sharing behavior among employees. Knowledge sharing behavior was determined primarily by anticipated affiliations and self-efficiency, but it had a negative correlation with anticipated rewards. Meanwhile, to determine what prompted or prevented individuals from sharing their knowledge, TRA was also applied by Bakker et al. (2006) alongside external motivating factors, socio-psychological factors and organisational environment factors. They reported that expected reciprocity and subjective norm, were the main determinants of how individuals perceived KS, whereas external rewards had no impact. There are considerable difficulties inherent in knowledge sharing and numerous environmental, personal and social factors have been identified as determinants of knowledge-sharing behavior (Chow & Chan, 2008; Hsu et al., 2007; Bock et al., 2005; Kolekofski & Heminger, 2003; Ryu et al., 2003) and this formed the basis for various theoretical frameworks.

Unlike developed countries, the socio-cultural perspectives are different in emerging economies and hence there are limitations of extending the findings to ICT sector in developing countries (Lotfi

Table 1. Theoretical models applied for studying knowledge-sharing literature

Literature	Underpinning theories						Other frameworks	Country
	TRA	TPB	TAM	SET	BFPT	TM		
Bock & Kim (2002)	✓			✓			Self-efficacy	Korea
Bock et al. (2005)	✓							Korea
Cabrera et al. (2006)	✓						Expectancy theory	Spain
Kim & Lee (2006)						✓		Korea
Chow and Chan (2008)	✓						Social capital	Hong Kong
Hsu & Lin (2008)	✓		✓					Taiwan
Jeon et.al (2011)		✓				✓	Motivation theory	Korea
Teh et. al (2011)	✓				✓			Malaysia
Ranasinghe & Dharmadasa (2013).		✓					McClelland's psychological needs approach	Sri Lanka
Lotfi et. al (2016)					✓			Malaysia
Safa & Von Solms (2016).		✓				✓	The Motivation Theory	Malaysia
Chennamaneni et al. (2012).		✓						United States
Shih & Lou (2011).		✓						Taiwan

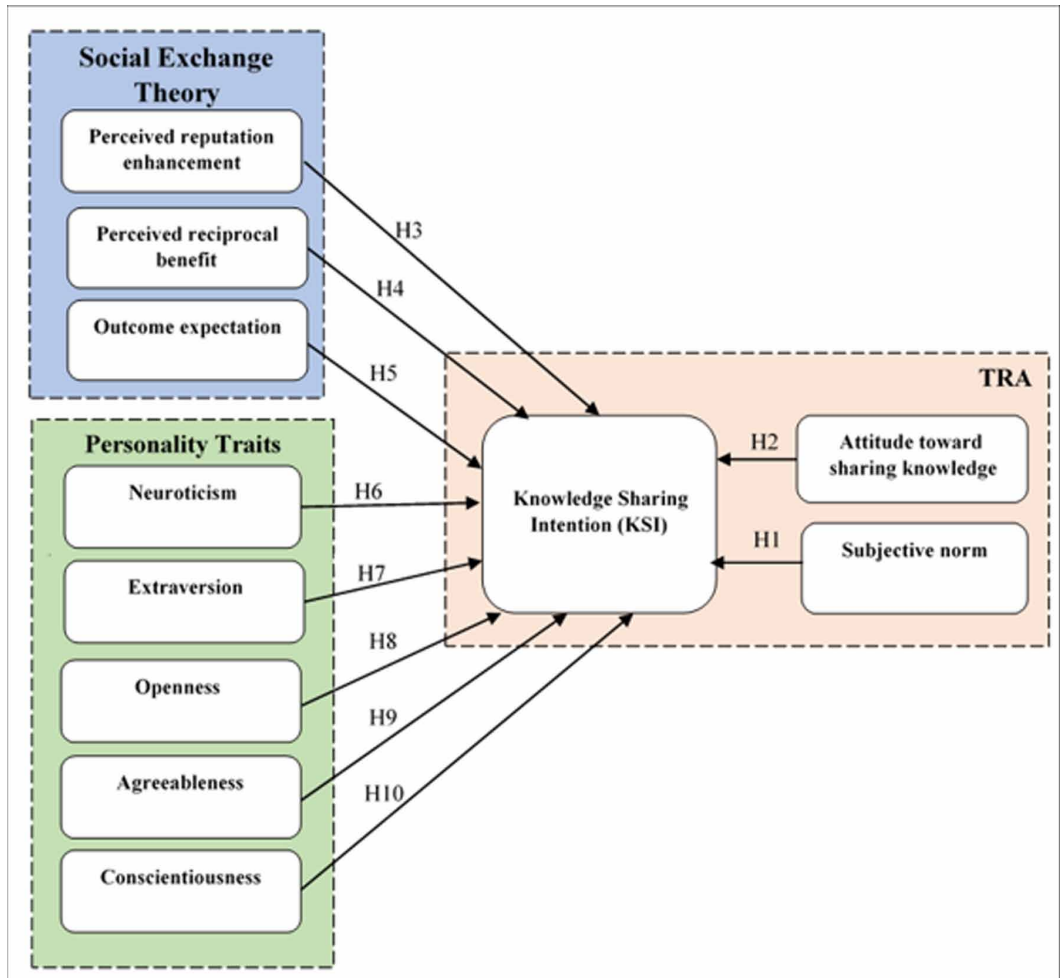
et al.2016). Consequently, for gaining a more comprehensive understanding of knowledge-sharing behavior, research focusing on developing nations as well as on sectors that have not been examined so far needs to be conducted. Hence, this study sought to research how the knowledge-sharing behavior of ICT professionals in Saudi Arabia was influenced by several specific determinants.

The aim of this study was to aid managers and practitioners to successfully stimulate ICT professionals to share their knowledge, and thus spread innovation and effectively exploit novel technologies. To that end, the research framework was underpinned by the Theory of Reasoned Action, Big Five Personality Traits Theory, Social Exchange Theory, and previous relevant studies.

In fact, few studies have explored the relationship between social exchange factors and personality profiles from a behavioral perspective. It is generally acknowledged that individual determinants and attributes such as beliefs, value and personality characteristics have a critical impact on human behaviour, attitude and needs (Borges, 2013). Marouf & Alrikabi (2015) assert that, personality profiles significantly affect individual willingness to share knowledge. Previous research examined the intention to share knowledge in relation to personality profiles and characteristics (Borges et al., 2019; Jadinet al., 2013). However, in comparison with developed economies, relatively little work has been done to investigate the impact of personality traits on ICT professionals' behavioural intention to share knowledge in the context of developing countries.

The social exchange theory is widely used to explain individual knowledge sharing behavioural intention (Jiang & Xu, 2020; Wang et al., 2015). We adopted the SET to describe the decision-making process in KS. In fact, knowledge sharing is seen as an activity of mutual exchange, often accompanied by the expectation of receiving knowledge in return to sharing (Bock et al., 2005; Liu et al., 2012). Moreover, employees are found to display a high level of knowledge sharing behavioural intention based on their perceptions of organisational fairness and justice (Jiang & Xu, 2020). The literature shows contrasting views regarding how specific organisational incentives and rewards may encourage

Figure 2. Research Model



KS behavior among their employees (Wang et al., 2015). Finally, it is believed that knowledge workers play a vital role in organizational innovation and success (Wang et al., 2015). The results of the current study will contribute to developing a theory that will explain KS behavioural intentions of ICT professionals and will identify the antecedents that support or hinder ICT professional's KSI. Figure 2 depicts the proposed conceptual framework.

Theory of Reasoned Action and Knowledge-Sharing Intention

The Theory of Reasoned Action (TRA) is widely used to study human behavioural intentions underpinned by social psychology (Fishbein & Ajzen, 1975). The TRA has been used by researchers for predicting a range of behaviours (Sheppard et al., 1988). This theory has been refined in combination with other theories to better explain behaviors (Wang & Noe, 2010; Lin, 2007). For example, Chow and Chan (2008) developed a model based on TRA and social capital theory to explore organisational knowledge sharing. Meanwhile, Hsu and Lin (2008) integrated TRA and Technology Acceptance Model (TAM) to explore the attitudes and subjective norms influence on KS in the context of blog use.

According to TRA, an individual's attitude toward engaging in a behavior (ATT) and the subjective norm (SN) related to that behavior are the key factors influencing behavioural intention

(BI). In turn, attitude is shaped by an individual's beliefs, while subjective norms refer to how an individual perceives the views of people of significance regarding his/her engagement in a certain behavior (Fishbein & Ajzen, 1975, p. 302).

In this study, subjective norm (also known as normative belief), is related to social pressure on ICT engineers to accept or not to accept the expectations of their superiors and co-workers that they should share knowledge in the workplace (Ajzen, 2002). Earlier studies found that subjective norm positively influenced behavioural intention (Taylor, 2006; Srite & Karahanna, 2006; Bock et al., 2005). Tan et al. (2017) found that subjective norm positively influences an employee's knowledge-sharing intention, which implies that employees take into account the normative expectations of and draw inspiration from their superiors and co-workers to share knowledge. Meanwhile, Jolaei et al. (2014) reported that employees' KSI was positively related to subjective norm, with perceptions of likelihood of praise garnered from superiors and peers determining employees' willingness to KSI.

In this study, attitude toward sharing knowledge refers to ICT engineers' favorable or unfavorable feelings towards engaging in KS. Deutsch and Gerard (1995) maintained that informational and normative factors determined how people perceive norms. Informational factors prevail when information is perceived by individuals as knowledge augmenting, while normative factors prevail when individuals comply with others' expectations to be rewarded or avoid penalties. Behavioural intentions are also subject to attitude, according to Ajzen and Fishbein (1980), an idea that is backed by considerable empirical evidence (Kolekofski & Heminger, 2003; Bock et al., 2005; Kuo & Young, 2008; Jolaei, Md Nor, Khani, & Md Yusoff, 2014). This evidence suggests that how individuals feel towards knowledge sharing is indicative of how willing they are to engage in that process. Therefore, based on the discussion above, the first and second hypotheses are proposed:

Hypothesis 1: Subjective norm has a positive influence on ICT professionals' knowledge-sharing behavioural intention (KSI).

Hypothesis 2: Attitudes towards KS have a positive influence on ICT professionals' KSI.

Social Exchange Theory and KSI

Social exchange theory (Blau, 1968; Blau, 1964) uses reward as a means to describe why individuals or corporate groups are motivated to interact with others (Macneil, 1980; Homans, 1958). Social exchange refers to the exchange of activity either tangible or intangible, and more or fewer rewarding or costly, between at least two parties, whose basic motivation for the interaction either to seek reward or evade punishment (Narasimhan et al., 2009; Emerson, 1976; Homans, 1961). An exchange could be socio-emotional (e.g. trust and dedication) or economic (e.g. money, goods, and services) (Lin, 2007).

The basic assumption is that the continuity of the relationship is based on the general expectation of future returns or rewards from interaction with others (Moghavvemi et al., 2017; Blau, 1968; Blau, 1964). Social exchange theory (SET) has been inspected by Narasimhan et al. (2009), who proposed several key premises in relation to this theory. The first premise is that individuals rely on reason, and assess the optimal approaches to interaction, attempting to achieve the greatest advantages at the lowest expenditure from resource exchange. The second premise is that individuals weigh alternatives that are better than their current circumstances based on information about social, economic and psychological aspects. The third premise is that individuals are focused on achieving their aims.

SET has been widely used for understanding individuals' behavior across different fields, including IT outsourcing (Gottschalk & Solli-Sæther, 2006), online groups' buying intentions and satisfaction (Shiau & Luo, 2012), information sharing and collaborative behaviors (Wu et al., 2014), and self-disclosure in online communities (Posey et al., 2010). Zafirovski (2005) asserted that SET was an interdisciplinary theoretical framework of relevance for social sciences studies, and there is ample empirical support for the usefulness of SET. Generally, it is believed that people share knowledge with an anticipation of return benefits (Liu et al., 2012). Social exchange is influenced by "expected

reciprocity, anticipated gain in reputation and influence on others, altruism, perception of efficacy and direct reward” (Thibaut and Kelley, 1959; Chang et al., 2015; Onu & Adegbola, 2018).

SET has been commonly applied as a theoretical basis for investigating knowledge-sharing behaviours among individuals (Hall, 2001; Kankanhalli et al., 2005; Hsu et al., 2007; Liu, 2008; Liu et al., 2012). However, earlier studies employed a range of different constructs, which have yielded different outcomes. For instance, SET was the basis of the cost/benefit analysis applied by Kankanhalli et al. (2005) to investigate motivational and demotivational determinants of KS. This study reported that employees were most encouraged to add their knowledge to electronic knowledge bases by determinants related to benefits, such as rewards, reputation and mutuality. The positive correlation between reward systems and KS has also been confirmed by Chiu et al. (2006) and Kim and Lee (2006). Conversely, some studies indicated that there was no correlation between organisational rewards and employees’ knowledge-sharing intention (Lin, 2007; Wasko & Faraj, 2005; Bock et al., 2005; Bock & Kim, 2002). This discrepancy in the findings implies that additional factors, like individuals’ personality, may have an influence (Liu, 2008).

In order to explore knowledge-sharing behaviours among ICT engineers, we draw on Social Exchange Theory and hypothesise that perceived reputation enhancement, perceived reciprocal benefits, and outcome expectation, could influence knowledge sharing among ICT engineers.

Perceived Reputation Enhancement

Reputation, which concerns how others perceive one’s action, is one of the extrinsic motivational factors of KSI (Chang and Chuang, 2011; Hung et al., 2011; Lin, 2007; O’Dell et al., 1998). Abzari et al. (2011) argued that the perceived reputation enhancement contributed to employees’ intention to share. According to Chennamaneni et al. (2012), employees were willing to engage in KS if it benefited their standing. Indeed, reputation boost is considered a significant determinant of KSI (He & Wei, 2009; Hsu & Lin, 2008; Chennamaneni et al. 2012; Kankanhalli et al., 2005). Therefore, in this study we hypothesize that:

Hypothesis 3: Perceived reputation enhancement has a positive influence on ICT professionals’ knowledge-sharing behavioural intention.

Perceived Reciprocal Benefits

Reciprocal benefits form the second motivational factor in KSI. In general, individuals show reluctance towards the sharing of limited resources (Moghavvemi et al., 2017). In the context of KS, reciprocal benefit means fulfilment of a benefit expectation of a future request for knowledge because of present contributions (Kankanhalli et al., 2005) and benefit gained by involving social exchange (Zhang et al., 2017; Blau, 1968).

Serenko et al. (2016) reported that a strong perception of mutuality was conducive to KS, while Bock et al. (2005) also asserted that mutual advantages could successfully stimulate KS and therefore promote durable cooperation. Furthermore, there is a greater probability of employees’ perception and intention of knowledge sharing being positive if they consider that sharing knowledge with co-workers is mutually advantageous (Lin, 2007). Based on the previous research, the following hypothesis is proposed:

Hypothesis 4: Perceived reciprocal benefit has a positive influence on ICT professionals’ KSI.

Outcome Expectations

Apart from the two extrinsic motivational factors, outcome expectations defines the consequence of one’s own behavior (Hsu, Ju, Yen, & Chang, 2007; Compeau & Higgins, 1995). Many studies have reported that individuals’ expectations for knowledge sharing (outcome expectation) could be

in the form of career progression, widening friends network, more power and responsibility in the organisation, access to more credit or improved collaboration opportunities (David et al., 2020; He & Wei, 2009; Hsu, Ju, Yen, & Chang, 2007; Jones et al., 2006; Bock and Kim, 2002; Ryan & Deci, 2000). Moreover, it is believed that, since KS is a personal act, people's tendency to participate is influenced strongly by perceived outcomes (Cabrera et al., 2006; Ipe, 2003). Individuals share knowledge when they consider that the costs for sharing are surpassed by its benefits (Thibaut, 2017). Hence, individuals are more likely to embrace knowledge sharing if they believe they will be rewarded adequately (He & Wei, 2009; Bock et al., 2005). Based on the previous studies, the following hypothesis is proposed:

Hypothesis 5: Outcome expectations have a positive influence on ICT professionals' KSI.

Big Five Personality Traits and KSI

The Big Five Personality Traits (BFPT) or the Five Factor Model (FFM) of personality is a comprehensive and widely researched model of personality (Goldberg, 1992; Goldberg, 1990; McCrae & Costa, 1987). The BFPT is also called the five-factor model with dimensions comprised of the acronym OCEAN "Openness to experience, Conscientiousness, Extraversion, Agreeableness, Neuroticism" (Goldberg, 1992).

Openness to experience is the degree to which an individual is open-minded; Conscientiousness refers to the extent to which an individual undertakes tasks correctly and meticulously; Neuroticism refers to an individual's ability to respond well to stress; Agreeableness refers to an individual's tendency to cooperate and get along with other people and achieve interpersonal intimacy; extraversion represents outgoingness and sociability; (Judge et al., 2005; Goldberg, 1992; McCrae & Costa, 1991).

Researchers have demonstrated the validity of the Big Five personality dimensions in predicting knowledge-sharing behavior (Lotfi et al., 2016; Teh et al., 2011; Hsu et al., 2007; Gupta 2008; Matzler et al., 2008). Lotfi et al. (2016) studied 133 university staff on personality traits and knowledge sharing in Malaysia. According to the results obtained, knowledge-sharing behavior was significantly favorably determined by openness to experience, extroversion and conscientiousness, but was significantly unfavorably determined by neuroticism and insignificantly determined by agreeableness. Lotfi et al. (2016) argued that conscientiousness revealed "individuals' dispositions, such as has been reliable, well-behaved, dependable, responsible, productive, hard-working, organised, and goal-oriented". In a study comprised of 255 University students in Malaysia, Teh et al. (2011) reported that extraversion and neuroticism had a positive significant relationship with the students' knowledge sharing behavior.

Investigating how behaviors of knowledge sharing and accumulation were affected by personality, Gupta (2008) reported that the higher the individuals' agreeableness and conscientiousness, the greater the likelihood to engage in knowledge sharing. Likewise, people with high agreeableness were found to exhibit helpfulness, cheerfulness, cooperation and support in the workplace, which is why they were more inclined towards knowledge sharing (Lotfi et al. 2016). The significant impact of agreeableness, conscientiousness and openness on knowledge-sharing behavior was also highlighted by Matzler et al. (2008) based on the investigation of 600 engineers regarding the correlation between personality features and knowledge sharing.

Based on the reviews, it was found that there were limited studies which correlated between knowledge sharing and all five personality traits. Some such studies did not investigate all five personality traits, but limited themselves to two or three such traits. For example, only agreeableness, conscientiousness and openness were addressed by Matzler et al. (2008), whereas other studies, such as the one conducted by Lin and Wang (2012), failed to verify the traits empirically. As such, there is a necessity to elucidate all five personality traits as a whole and explore in detail their impact on knowledge-sharing behavior in the ICT sector. Moreover, such an exploration could shed light on which aspects of individual traits would promote engagement or deter in knowledge sharing. The reason being, despite possessing relevant knowledge, individuals with negative personality traits will

not make that knowledge available to others in the workplace. Given these considerations, additional hypotheses were formulated in relation with BFPT namely:

Hypothesis 6: Neuroticism has a negative influence on ICT professionals' KSI.

Hypothesis 7: Extroversion has a positive influence on ICT professionals' KSI.

Hypothesis 8: Openness to experience has a positive influence on ICT professionals' KSI.

Hypothesis 9: Agreeableness has a positive influence on ICT professionals' KSI.

Hypothesis 10: Conscientiousness has a positive influence on ICT professionals' KSI.

RESEARCH DESIGN

For evaluating the relationships between constructs and testing research hypotheses, an empirical study was conducted in Saudi Arabia within companies from different sectors based on a self-administered questionnaire, on the basis of voluntary and confidential participation. The questionnaires were sent with a cover letter in which the aim and objectives of the research were described, and the anonymity of results was warranted. Data was collected from a convenient sample of 500 employees and questionnaires were mailed to 19 companies from different industries (Education, IT-related & Telecommunications, medical and legal services, Banking & insurance). 130 questionnaires responses were received. This represents a return in the initial mailing of about 26 percent. To increase returns, we used repeated mailings that have been acknowledged by many scholars to increase responses (Goyder, 2019; Fowler, 2013; Black & Champion, 1976;). Later, we selected a sample of 250 from those companies receiving questionnaires but did not respond initially. The same questionnaire was sent again, and 110 responses were received. This increased the overall return to 240, or about 48 percent for the study.

The respondents' profile has been summarised in Table 2. These respondents consisted of software developers, technical support engineers, information security officers, and programmers. The majority of respondents (76%) were male and the remaining were female. About 59% of the respondents were in the age category 26-35 years old. Overall, 40% of the respondents had work experience of between 1 and 5 years and only 10% had work experience of less than one year. As for educational achievement, the surveyed respondents were generally well-educated, with over 30.4% holding a master's and doctorate degree and 56% having a 4-year first degree. About 88.7% were in full-time employment (see Table 2 for further details). Respondents industry profile has been presented in the last row with numbers in the brackets indicate number of companies in each listed sector.

Measures

The aspects assessed in the present study included knowledge-sharing intention, subjective norm, attitudes toward knowledge sharing, perceived boost to reputation, perceived mutual advantages, anticipation of outcomes, and the five dimensions of BFPT. Translation of measurements from English to Arabic was undertaken and the two versions were verified to be consistent through the back-translation method (Finley et al., 2017). The questionnaire constructs were designed similar to existing studies on Knowledge sharing and these are summarised in the Table 3. A pilot study was conducted with 30 employees, which helped in developing the final 40 items.

DATA ANALYSIS AND RESULTS

Reliability and Validity Analysis

The partial least squares (PLS) method was adopted for analysis of the inter-construct causal relations via structural equation modelling (SEM) using SmartPLS software. A PLS model should be performed

Table 2. Profile of the respondents

Respondents' characteristics		Responses (n =240)	Percentage (%)
Gender			
	Male	182	75.8
	Female	58	24.2
Age (year)			
	Under 25	32	13.3
	26-35	142	59.2
	36-45	56	23.3
	46-55	9	3.8
	56 (or above)	1	0.4
Education			
	High School	7	2.9
	Diploma	24	10
	Bachelor	134	55.8
	Master's Degree	61	25.4
	Doctorate Degree	12	5
Work experience			
	<1 year	23	9.6
	1-5 years	96	40
	6-10 years	64	26.7
	> 10 years	57	23.7
Employment Status			
	Full-time	212	88.3
	Part-time	28	11.7
Industry & Number of Participating Enterprise			
Education	4	106	44.2
IT-related & Telecommunications	5	74	30.9
Medical and legal services	6	31	12.9
Banking & Insurance	4	29	12.1

in two stages. First, measurements are tested for its validity and reliability. Second, the structural model is tested for its predictive power and significance (Hair et al., 2012).

Reliability and validity analyses on measurement model were conducted by:

1. Examining the reliabilities of individual item using Cronbach's alpha (α)
2. Computing convergent validity of the measures and respective constructs
3. Discriminant validity.

Table 3. Questionnaire instrument design and literature source

Measure	Scale	Reference
Knowledge-sharing behavioural intention (5 items)	Likert scale: Strongly disagree (1) to Strongly agree (5)	Bock et al.'s (2005)
Subjective Norm (3 items)		Ibragimova et al. (2012)
Attitudes towards knowledge sharing (4 items)		Bock et al.'s (2005)
Perceived reputation enhancement (5 items)		Kankanhalli et al. (2005) and Hsu and Lin (2008)
Perceived reciprocal benefits (5 items)		Kankanhalli et al.'s (2005)
Outcome expectation (3 items)		Bock et al.'s (2005)
Big Five Personality Traits (15 items)	Likert scale: Does not apply to me at all (1) to Strongly applies to me (5)	Costa and McCrae (1992), Lin (2011) and Ali (2019)

First, the value of Cronbach's alpha (α) was calculated, considering that the reference value 0.70 is the cut off value for being acceptable (Nunnally, 1978). It can be observed in Table 4 that all Cronbach's alpha values were higher than 0.70, with the highest for perceived reciprocal benefits (0.91) and the lowest for attitude towards knowledge sharing (0.72).

For convergent validity the factor loadings were assessed for each measure to its corresponding construct, and further composite reliabilities were determined. With a recommended minimum factor loading of 0.5, the loadings for each measurement item on their respective construct were analyzed, and all items had loadings greater than 0.60 (Hair et al., 2014).

The composite reliability (CR) was also calculated based on standardized factor loadings and error variances (Hair et al., 1998). The CR for all constructs was above the 0.70 recommended level (Nunnally, 1978) and in the range from 0.77 to 0.96. These results showed the convergent validity of the instrument. Finally, determination of the average variance extracted (AVE) for every construct was undertaken by using standardized factor loadings and measurement errors of indicators. AVE for each construct was above the recommended level of 0.5 (Fornell & Larcker, 1981) and in the range from 0.53 to 0.76. In summary, the measurement model demonstrated adequate reliability and convergent validity.

Table 5 indicates that the correlations between indicators were below the AVE of each construct, which allowed us to conclude that, overall, there was discriminant validity between the different constructs in this study. Moreover, Table 5 shows the means, standard deviations, and inter-correlations of the study variables. The highest mean value was scored by Neuroticism personality trait (4.23), whereas the lowest mean (2.24) was associated with the agreeableness personality trait.

Discussion of Findings: Testing The Hypotheses and The Structural Model

Reliability indices showed statistical significance of the measurement model and overall model. Subsequently, the coefficients of the underlying relationships between constructs were tested for validating ten hypotheses. Among the measures in SET (with $p < 0.001$), the highest prediction was for perceived reciprocal benefit ($\beta = 0.507$) to predict knowledge-sharing intention. Similarly among the two measures in TRA (with $p < 0.001$), the highest was for attitude towards KS ($\beta = 0.550$). Using hypothesis testing, six out of ten hypothesis namely H1, H2, H3, H4, H9 and H10 were supported. Subjective norm, attitudes towards KS, perceived reputation enhancement, perceived reciprocal benefit, agreeableness and conscientiousness accounted for 70.7% of the variation in ICT engineers' behavioural intention towards knowledge sharing.

Table 4. Reliability and Convergent validity test results

Constructs	Mean	Std. Deviation	Cronbach alpha (α)	Factor loading	Composite reliability	Average variance extracted (AVE)
Knowledge-sharing behavioural intention (KSI)	3.73	0.810	0.82	0.815	0.92	0.59
	3.85	0.760		0.765		
	3.76	0.848		0.717		
	3.98	0.823		0.757		
	4.11	0.718		0.782		
Subjective norm (SNO)	3.59	0.818	0.85	0.799	0.81	0.6
	3.58	0.829		0.815		
	3.45	0.827		0.684		
Attitudes towards knowledge sharing (ATT)	4.35	0.717	0.72	0.783	0.92	0.7
	4.10	0.800		0.86		
	4.16	0.828		0.849		
	4.06	0.834		0.746		
Perceived reputation enhancement (PRE)	4.23	3.550	0.85	0.864	0.96	0.75
	3.60	1.014		0.879		
	3.95	0.852		0.859		
	3.74	0.959		0.737		
	3.52	0.928		0.864		
Perceived reciprocal benefits (PRB)	4.07	0.725	0.91	0.837	0.96	0.76
	4.1	0.736		0.865		
	4.09	0.785		0.914		
	4.18	0.760		0.888		
	4.07	0.725		0.842		
Outcome expectation (OEX)	2.63	1.113	0.85	0.809	0.83	0.64
	3.1	1.132		0.988		
	2.58	1.225		0.535		
Neuroticism (NEU)	4.32	0.733	0.83	0.839	0.9	0.75
	4.17	0.741		0.893		
	4.21	0.759		0.856		
Extraversion (EXR)	3.56	1.00	0.75	0.799	0.86	0.67
	4.01	0.996		0.846		
	3.89	1.108		0.802		
Openness to experience (OTE)	2.37	0.968	0.76	0.731	0.77	0.53
	2.87	1.132		0.822		
	2.72	1.131		0.623		
Agreeableness (AGR)	2.41	1.179	0.75	0.675	0.82	0.6
	2.28	1.016		0.812		
	2.03	1.239		0.825		
Conscientiousness (CON)	4.38	0.722	0.79	0.781	0.84	0.63
	3.80	1.035		0.756		
	4.23	0.779		0.843		

Table 5. Means, standard deviations, inter-construct correlation, and square root of AVE

	K S I	S N O	A T T	P R E	P R B	O E X	A G R	O T E	C O N	N E U	E X R
KSI	(0.76)										
SNO	0 . 3 7	(0.77)									
ATT	0 . 5 5	0 . 2 5	(0.83)								
PRE	0.34	0.18	0.31	(0.87)							
PRB	0.51	0.33	0.51	0.37	(0.86)						
OEX	0.06	0.09	0.02	0.20	0.08	(0.78)					
AGR	0.02	0.02	0.14	0.01	0.04	0.08	(0.80)				
OTE	0.03	0.03	0.01	0.11	0.06	0.10	0.50	(0.73)			
CON	0.55	0.28	0.47	0.29	0.43	0.01	0.26	0.05	(0.80)		
NEU	0.49	0.23	0.41	0.28	0.47	0.02	0.12	0.05	0.67	(0.86)	
EXR	0.09	0.12	0.07	0.05	0.07	0.01	0.46	0.33	0.26	0.23	(0.82)
Mean	3.89	3.54	4.17	3.80	4.11	2.77	2.24	2.66	4.14	4.23	3.82
Std. Deviation	0.61	0.72	0.64	1.04	0.65	1.02	0.93	0.76	0.72	0.62	0.84
Note: The shaded numbers in bold are the square roots of the average variance extracted (AVE).											

Among the BFPT (with $p > 0.05$), outcome expectation ($\beta = 0.056$), neuroticism ($\beta = -0.024$), extroversion ($\beta = 0.093$), and openness to experience ($\beta = 0.030$) did not affect knowledge-sharing behavioural intention, hence hypotheses H5, H6, H7, and H8 were not supported. Table 6 provides an overview of the outcomes of hypothesis testing. Moreover, the standardized path coefficients and the significance level as recorded by each path are presented in Figure 3.

DISCUSSION

This study developed a model based on the Theory of Reasoned Action, Big Five Personality Traits and Social Exchange Theory. The general belief is that willingness to share knowledge is affected by cultural values held at both individual and national level (Chang et al., 2015). Therefore, this study attempted to investigate knowledge sharing in Saudi Arabia. Our findings strongly support the fact that the proposed model is appropriate to use to understand the intentions of ICT engineers and professionals towards KSI. In fact, sharing knowledge is believed to be important among ICT engineers in addition to technical knowledge, as ICT professionals require cognition, previous experience to solve daily problems, and design and implement new systems (Borges, 2013).

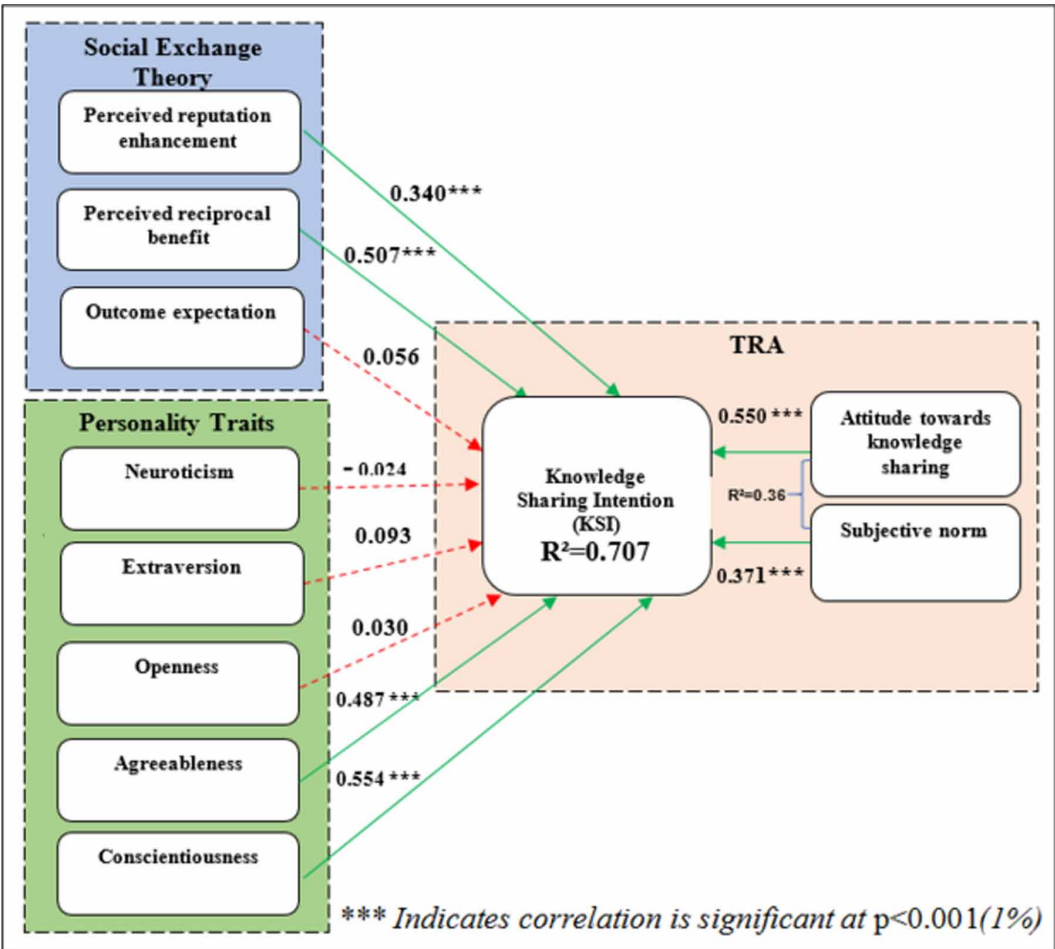
TRA factors (subjective norms and attitudes towards knowledge sharing) had significant impact on KSI and explained 36% of the variance. This corroborated the findings of Huang et al. (2008) and Bock et al. (2005), which found significant role played by an individual's attitude on KSI. Moreover, with perception of top management and colleagues valuing knowledge sharing, knowledge workers engage in knowledge sharing (Chiu et al., 2006). ICT engineers with different levels of exposure to normative influence may have different perceptions towards KS and would like to exchange information with their colleagues and users.

Perceived reputation enhancement and perceived reciprocal benefit were observed to be significant factors. Earlier studies found that knowledge-sharing intention was related to perceived reciprocal benefit and enhanced professional reputations (Huang et al., 2008; Hew & Hara, 2007; Lin, 2007; Kankanhalli et al., 2005; Wasko & Faraj, 2000). According to the Social Exchange Theory, people

Table 6. Hypothesis testing results

H#	Hypothesised path	Standardised beta coefficient (β)	T-Value	R ²	Result
H1	Subjective norm → KSI.	0.371	6.172	0.138	Accepted
H2	Attitudes towards knowledge sharing → KSI	0.550	10.153	0.302	Accepted
H3	Perceived reputation enhancement → KSI	0.340	5.570	0.115	Accepted
H4	Perceived reciprocal benefit → KSI	0.507	9.080	0.257	Accepted
H5	Outcome expectation → KSI	0.056	0.865	0.003	Rejected
H6	Neuroticism → KSI	-0.024	-0.363	0.001	Rejected
H7	Extroversion → KSI	0.093	1.445	0.005	Rejected
H8	Openness to experience → KSI	0.030	0.461	0.001	Rejected
H9	Agreeableness → KSI	0.487	8.613	0.238	Accepted
H10	Conscientiousness → KSI	0.554	10.269	0.307	Accepted

Figure 3. Research model with results



weigh advantages, costs of knowledge sharing and the anticipation of being rewarded (e.g. gaining greater respect or standing) as influencing their decision to engage in such behavior (Emerson, 1981).

Outcome-based expectations and tangible rewards did not have a significant effect on the intention to share knowledge. This was inconsistent with the observation made by numerous practitioners that the management of knowledge depended significantly on rewards (Cho et al., 2007). In addition, earlier studies found no relationship between rewards and knowledge-sharing intention (Chang et al., 2007; Lin, 2007; Kwok & Gao, 2005).

The results of the present study suggest that knowledge sharing is influenced by individuals' deep-seated traits, in particular agreeableness and conscientiousness. Fundamentally speaking, ICT professionals with a high percentage on these two traits were found to be more involved in knowledge-sharing activities than individuals with a low percentage on these two traits. This finding corroborates earlier research on the importance of the selection of individual characteristics, such as agreeableness and conscientiousness, in influencing knowledge sharing and in the recruitment and selection (Podrug et al 2017; Martzler et al., 2008; Lounsbury et al., 2007; Witt & Burke, 2002). In fact, it is widely believed that the nature of ICT job requires employees to be reliable, dependable, responsible, organised, productive, hard-working, goal-oriented, and share their information, experience, and best practices without hesitation. This is likely the reason why they participate in knowledge-sharing activities. On the other hand, extroversion, neuroticism, and openness to experience did not have a bearing on KSI. Similar to Lofti et al 2016, neuroticism did not show influence in KSI and this was corroborated by in the current study. This result is similar with the finding reported by Wang and Yang (2007), who concluded that there was no significant relation between KSI and the three traits neuroticism, extroversion, and openness to experience.

CONCLUSION AND RECOMMENDATIONS

With emerging ICT technologies like cloud services, Big Data, Blockchain, etc., being adopted, knowledge sharing intention and its antecedents require re-examining in a developing country context. To sum up, this study contributed to knowledge by generating empirical data about knowledge sharing in a different research field and context, thus expanding the existing body of evidence, by focusing on ICT professionals' behavior of knowledge sharing, and by creating a more comprehensive picture of knowledge-sharing behavior by taking into account a wider range of factors in an integrated framework.

Studies examining employees' knowledge-sharing intention have originated mostly in developed nations. However, there were limited studies on the impact of a subset of determinants and knowledge-sharing behavior in developing Middle Eastern countries (Wang & Noe, 2010) and this study was needed. This study employed well-established theories, including the Theory of Reasoned Action, the Big Five Personality Traits and the Social Exchange Theory, to explain ICT professionals' intention toward knowledge sharing in organisations in Saudi Arabia. A viable line of inquiry is to explore the determinants of knowledge-sharing behavior among ICT professionals, the elucidation of which is essential for practice and for development of suitable strategies to promote KS. Indeed, study findings could serve as a reference for project-based organisations to promote knowledge sharing in IT projects, and implement KS for sustained business growth and performance.

The present study adopted a cross-sectional design and data of a subjective nature were used. Therefore, causality and correlation between factors of significance for the intention of sharing knowledge should be further investigated in a study underpinned by a longitudinal design. Furthermore, besides the TRA, SET and BFPT theories employed in this study to investigate the knowledge-sharing intention of ICT professionals, future studies could adopt additional theories as well, like the motivation theory and Triandis framework, or else it could combine research parameters in different ways to enhance comprehension of knowledge-sharing behavior among ICT professionals. Additionally, future study can examine how organisational characteristics, such as trust climate and learning orientation,

may moderate the relationship between individual characteristics and knowledge-sharing intention. Another worthwhile line of inquiry is exploring how knowledge-sharing intention and behavior can influence ICT professionals' innovation behavior.

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APPENDIX

Table 7. The abbreviation table

Definition	Abbreviation			
Knowledge-sharing intention	K	S	I	
Information and Communications Technology	I	C	T	
Knowledge sharing	K		S	
Knowledge management	K		M	
Theory of reasoned action	T	R	A	
Theory of planned behavior	T	P	B	
Social exchange theory	S	E	T	
Technology Acceptance Model	T	A	M	
Big Five Personality Traits	B	F	P	T
Five Factor Model	F	F	M	
Structural equation modeling	S	E	M	

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