

Critical factors for knowledge sharing in technology-intensive organizations: evidence from UAE service sector

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Abstract

Purpose – The purpose of this paper is to identify the critical factors that impact knowledge sharing (KS) and their importance in technology-intensive service organizations in the United Arab Emirates (UAE).

Design/methodology/approach – An extensive literature review was conducted to identify the critical factors for KS in technology-intensive organizations. Then, an analytical hierarchical process (AHP) was applied to prioritize the primary criteria and sub-criteria. This study consists of nine primary criteria and 34 sub-criteria that are relevant to KS in technology-intensive organizations.

Findings – The results show that organizational leadership (OL) is the most important factor that impacts KS in technology-intensive organizations, which is followed by organizational culture (OC), organizational strategy (OSY), corporate performance (CP), organizational process (OP), employee engagement (EE) and organizational structure (OST). According to the results, the least impactful factor is human resource management (HRM).

Research limitations/implications – Because the results in this study were only obtained from service organizations, future studies can include manufacturing organizations from different countries and additional success factors. Future studies could also use structural equation modelling methodology for better understanding the relations among these critical factors for KS.

Originality value – This paper is one of the first in the UAE to examine the broad range of critical success factors for KS in technology-intensive organizations.

Keywords AHP, UAE, Knowledge sharing, Critical factors, Technology-intensive organizations

Paper type Research paper

1. Introduction

Knowledge sharing (KS) as an exchange of knowledge between and among individuals, within and among teams or organizational units (Paulin and Suneson, 2015). This exchange may be focused or unfocused, but it usually does not have a clear *a priori* objective. KS is very important for organizational performance in different industries and across levels because it improves people's approach for addressing different issues and activities (Ramachandran *et al.*, 2008). The more an organization facilitates KS, the greater the chance that the organization will experience positive changes in people's performance and productivity (Argote *et al.*, 2000).

Kumar *et al.* (2013) state that in today's dynamic business world, KS has become an increasingly important and complex element, which is also consistent with Al-Azri *et al.* (2010). However, the field continues to lack a sound and holistic understanding of the key factors that influence the success of KS. Competitive and creative organizational environments have made it challenging to ensure that the KS and the know-how transferring process is effective and efficient.

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The KS practices in UAE organizations are important because the UAE has gained the attention of technology providers from all over the world. Numerous projects that are initiated by foreign technology firms in the UAE call on different types of knowledge and skills compared to those held by UAE organizations (Boumarafi and Jabnoun, 2008). In this study, technology-intensive organizations were chosen because they can show how different factors impact the decision-making model of KS better than other organizations (Argote *et al.*, 2000).

This study establishes a multi-criteria decision-making process of KS factors and sub-factors to identify the most important factors that impact KS in technology-intensive organizations and assist in creating a decision-making model for these organizations. Accordingly, the analytical hierarchical process (AHP) method is used in this study because this model is effective for multi-criteria decision-making (Saaty, 1987). This approach is important for gaining the trust of the organization, specifically for technology investment and understanding how these investments can benefit the organization (Al-Yahya and Farah, 2009).

This paper is organized in the following manner. Section 2 provides a review of the related literature. Section 3 explains the research methodology. Section 4 presents the analysis and discussion. Finally, Section 5 presents the conclusion.

2. Literature review

2.1 Knowledge sharing in organizations

Willem and Buelens (2009) define KS as the transferring or sharing of knowledge from one place in an organization to another. This may occur through individuals or groups. KS is an important aspect of the current business world, focuses on project management, organizational performance and the innovation capacity of an organization. KS is influenced by several factors, from leadership, culture, strategy, structure, process, performance and HRM to technology (Omar Sharifuddin Syed-Ikhsan and Rowland, 2004; Al-Khouri, 2014). Effective KS requires improving the decision-making strategies and evaluating business activities (Riege and Lindsay, 2006). Based on previous research, each factor that impacts the KS process is explained in more detail below.

2.1.1 Organizational leadership. Singh (2008) explained that organizational leadership (OL) in KS practices can be understood by exploring the concepts of integrity, decision-making and ability to change in organizations. Argote *et al.* (2000) state that leadership has a major role because KS is about openness, trust and cooperation, which will only be successful with effective leadership. Singh (2008) states that trust and integrity are two qualities of a leader that he should maintain and present to his team members to be successful. Members tend to be inspired and motivated by a leader who they can trust and respect; however, a mismatched or unbalanced knowledge level among project members across different domains makes it difficult to build trust among members (Park and Lee, 2014). The qualities of a leader and leadership style determine the success of the KS process because the leader must win the trust of the members to make KS effective.

Mohd Noor *et al.* (2015) state that a proper KS process requires forming a culture in the organization, which is headed by the leader. Bremer *et al.* (2013) state that KS is a critical and complex process; it is incomplete without the trust and guidance of an effective leader. Kumar *et al.* (2013) highlight that a leader who is entrusted with decision-making powers must have the ability and power to influence the KS process inside an organization and influence the activities that affect the process. Empowering leadership refers to leader behaviours within the organization that also encourages followers' participation in decision-making and reduces frustration by removing the administrative obstacles that interfere with performance. Kumar *et al.* (2013) further discuss that decision-making that includes effective communication and attention helps transform information into knowledge;

therefore, the decision-making abilities of the leader are essential for the KS process. As [Alipour et al. \(2011\)](#) specified, decision-making is essential in KS because every organization has a different culture and structure that influences their KS process. Finally, for the importance of ability to change in an organization, [Rahim \(2014\)](#) claims that leaders are highly associated with the changes that occur in the organization. Organizational change is a dynamic phenomenon that rapidly occurs as businesses are becoming increasingly competitive and global. In addition, [Zhao et al. \(2016\)](#) suggest that transformational leadership can influence employees' reactions to change during the organizational change procedure. [Table I](#) briefly describes each sub-factor of OL.

2.1.2 Organizational culture. Organizational Culture (OC) refers to the values and behaviours that work together to constitute the environment of an organization. [Jung et al. \(2007\)](#) state that KS is highly influenced by OC because the culture shapes the organization and the leaders' and employees' behaviours in the organization. [Al-Adaileh and Al-Atawi \(2011\)](#) studied the impact of OC on KS and illustrated that when organizations promote a culture of teamwork and openness through employee involvement and reward systems, it positively affects KS among organizational members. In organizations where there is a collectivist culture, several factors affect KS, including teamwork, individual characteristics and environmental factors ([Manlio Del Giudice et al., 2014](#)). Therefore, openness and teamwork, as part of an organization's culture, significantly affect KS. In addition, [Al-Khoury \(2014\)](#) found that the overall environment in the Emirates-ID organization encouraged teamwork and collaboration, which improved general KS practices.

Collaboration in OC is being flexible and developing close connections among employees who work together. [Pastor \(2011\)](#) believes that collaboration in OC is an essential factor that unites the organization and reduces conflict; furthermore, [Donate and Guadamillas \(2010\)](#) state that because employees form connections and collaborate with each another, they understand one other better, which helps the KS process. [Ajmal and Koskinen \(2008\)](#) state that effective KS becomes more critical when the management has a more strategic role in the organization. Without management support, no strategic or functional procedures can be conducted in an organization. [Beckett et al. \(2000\)](#) found that when the top management understands the vision and mission of an organization, they tend to develop strategic initiatives to manage knowledge in an organization. Motivation and support from the management through participation should enhance organizational performance and the overall KS process. [Abou-Zeid \(2005\)](#) stated that knowledge that is gained through project implementation is not retained and there is no learning factor. In addition, [Al-Khoury \(2014\)](#) found that the learning culture supported KS practices. Therefore, a learning culture in the organization highly influences the KS process. Sub-factors representing OC can be seen in [Table II](#).

2.1.3 Organizational strategy. [Anghel et al. \(2013\)](#) suggested that successful knowledge strategies depend on organizations if they can link connect their business strategy to their knowledge requirements. Organizational strategy (OSY) has three sub-factors. The first factor is vision and mission, which has a significant value for the strategic initiatives in an

Table I Organizational leadership		
Factor	Description	Reference
Trust and integrity	The leadership is about cooperation, trust, integrity and sharing	Park and Lee (2014) , Mohd Noor et al. (2015) , Analoui et al. (2012) , Ajmal et al. (2010) , Singh (2008)
Decision-making	KS within leadership practices can be understood by exploring the concepts of integrity, decision-making and the ability to change within the organization	Kumar et al. (2013) , Alipour et al. (2011)
Ability to change	Leaders are highly associated with changes that occur in the organization	Zhao et al. (2016) , Rahim (2014) , Taylor (2016)

Table II Organizational culture		
Factor	Description	Reference
Teamwork	Organizations where the collectivist culture prevails, several factors affect KS, including teamwork, individual characteristics and environmental factors	Al-Khouri (2014), Manlio Del Giudice <i>et al.</i> (2014)
Openness	When organizations promote a culture of openness and teamwork through employees' involvement and reward system, it positively affects knowledge exchange among organizational members	Al-Adaileh and Al-Atawi (2011), Manlio Del Giudice <i>et al.</i> (2014)
Collaboration	Because employees connect to and collaborate with one another, they understand each other better, which helps the KS process.	Pastor (2011), Donate and Guadamillas (2010), Ajmal and Koskinen (2008)
Management support	Without management support, no strategic or functional procedure can be conducted in an organization	Ajmal and Koskinen (2008), Beckett, Wainwright and Bance (2000)
Learning culture	Knowledge that is gained throughout project implementation is not retained and there is no learning factor	Al-Khouri (2014), Abou-Zeid (2005)

organization. When management understands the vision and mission of the organization, they tend to develop strategic initiatives to manage knowledge in the organization (Beckett *et al.*, 2000). The leadership and strategy emphasize developing and promoting vision, which supports KS. It focuses on formulating a strategy and emphasizes the vision, while communicating the vision to the entire organization (Bedford and Harrison, 2015).

Organizations that are knowledge-focused develop the ability to effectively manage risk taking. These knowledge-focused organizations can attain high organizational performance by managing and reducing risk (Singh, 1986). Delios and Henisz (2003) revealed that through effective KS, organizations can minimize risk. This is because of their accumulation of knowledge, which is gained through experiential learning and allows them to act and respond accordingly. Therefore, managers in organizations can minimize risks through effectively accumulating and managing knowledge (Coleman *et al.*, 2016). For effective KS, there is dire need for organizations to adopt Strategic planning and reasoned approaches (Snyman and Kruger, 2004). Additionally, Luu (2014) stated that organizational ethical behaviour can only be developed via planning for ethics.

Finally, organizational policy has an effective role in promoting or inhibiting KS. Hall and Goody (2007) revealed that KS activities in an organization are influenced by the organizational and operational structure. The operational structure of an organization includes policies. Another research study that was conducted by Parirokh *et al.* (2008) examined the requirements for KS in academic libraries. Moreover, Coleman *et al.* (2016) stated that the organization can gain knowledge to reduce risk through policy. Therefore, organizational policy, as a part of OSY, can promote KS in an organization. All underlying sub-factors of OSY are listed in Table III.

Table III Organizational strategy		
Factor	Description	Reference
Vision and mission	Vision and mission are significant to the strategic initiatives in an organization	Bedford and Harrison (2015), Beckett <i>et al.</i> (2000)
Risk taking	Managers in organizations can minimize risks through effectively accumulating and managing knowledge	Delios and Henisz (2003), Valio Dominguez Gonzalez and Fernando Martins, 2014, Singh (1986)
Strategic planning	For KM to be effective, there is dire need for organizations to adopt strategic planning and a reasoned approach	Luu (2014), Trong Tuan (2012), Snyman and Kruger (2004)
Organizational policy	The presence of effective policy guidance in an organization clarifies the organizational members that have access to the information and knowledge. This information can clarify the issues of risk taking and trust, which then effectively contributes to KS	Parirokh <i>et al.</i> (2008), Hall and Goody (2007), Rousseau <i>et al.</i> (1998)

2.1.4 *Organizational structure*. Amaral and Uzzi (2007) state that Organizational Structure (OST) should define the path for the flow of instruction and information within the organizations, and thus, the KS process is also affected by the OST that is adopted by the organization. OST is determined by the firm size, formalization, centralization and integration, and these factors influence the KS processes that occur within the organization (Chen *et al.*, 2010). When discussing OST, Firm size is the most important factor that affects the KS process. Zheleva and Viklund (2014) state that large OST indicates more employees and a longer communication network. The longer the network, the greater the chances of misunderstandings. Thus, Coakes (2003) concludes that firm size has a positive relationship with the KS process in an organization. As Savanevičienė and Girdauskienė (2007) stated, formalization in OSTs is becoming more and more relevant in today's business world. Formalization refers to the level of coding rules and procedures that guide the employee's behaviour, because complex OSTs require clearly defined and specialized roles for the employees in an organization. These roles are governed by the organization's rules and procedures (Valio Dominguez Gonzalez and Fernando Martins, 2014). Furthermore, according to Savanevičienė and Girdauskienė (2007), formalization in the OST can encourage specialized knowledge and allow for more effective KS because there is more organization in the groups.

The centralized authority provides direction to the company and is responsible for the organization's strategic planning and decision-making. This type of structure can benefit the KS and the sharing process, as there is centralized knowledge generation. Willem and Buelens (2009) illustrated that the resources, technologies and planning for the KS process will be centralized, and hence, there will be less hindrances. This type of structure is suitable for large organizations in which it is not possible to implement democratic leadership and participatory decision-making. Additionally, Mahmoudsalehi *et al.* (2012) examined the impact of OST on KS. Their research findings reflected that when OST is less formalized and centralized, it facilitates KS. Moreover, an OST that is characterized by integration positively influences the KS in an organization. Several publications on KS show that the network structure is more favourable for KS because it promotes a greater integration of employees while enhancing the flow of knowledge (Valio Dominguez Gonzalez and Fernando Martins, 2014). In addition, as Chen and Huang (2007) stated, OST may moderate the relation between KS and innovation. OST is usually categorized into three elements: formalization, centralization and integration. The above findings show that there is a significant relationship between KS and OST. Key representing sub-factors of OST are shown in Table IV.

2.2.5 *Organizational process*. Several studies have described the relation between Organizational Process (OP) and KS and their influence on each other. Jung *et al.* (2007) stated that OP is an excellent delivery medium for knowledge and an arena for creating knowledge. He also found that the information about the process and the process execution are valuable corporate knowledge. In addition, Hao *et al.* (2015) highlighted that many KS

Table IV Organizational structure

Factor	Description	Reference
Firm size	Firm size is directly related to the innovative knowledge in an organization	Savanevičienė and Girdauskienė (2007), Coakes (2003)
Formalization	Formalization in the OST can encourage specialized knowledge and allow for a more effective KS	Valio Dominguez Gonzalez and Fernando Martins, 2014, Savanevičienė and Girdauskienė (2007)
Centralization	The resources, technologies and planning for the KS process will be centralized, and thus, there will be fewer hindrances	Mahmoudsalehi, Moradkhannejad and Safari (2012), Willem and Buelens (2009)
Integration	An OST that is characterized by integration positively influences KS in an organization	Valio Dominguez Gonzalez and Fernando Martins, 2014, Chen and Huang (2007)

processes within organizations benefit KS performance, such as discussions, meetings, sharing training experiences and presentations.

Nonaka and Takeuchi's knowledge creation theory in OP has four sub-factors: socialization, externalization, combination and internalization. [Raina and Chauhan \(2016\)](#) found that socialization is important when organizational knowledge must be processed into group and individual knowledge. KS requires social interactions between the employees in the organization in a manner that facilitates KS, and managers must promote positive moods and emotions in employees by engaging them in the processes of social exchange, which leads to KS ([Lai and Lee, 2007](#)). Externalization articulates tacit knowledge into explicit knowledge. Transforming tacit knowledge into explicit knowledge assists KS through written documents, images and records. It becomes easy to share knowledge through the process of externalization ([Nonaka and Toyama, 2015](#)).

The notion of combination and its relationship to KS have been discussed by [Nonaka and Toyama \(2015\)](#). They suggest that the knowledge in an organization is stored in the form of documents. Knowledge is also stored in the minds of the individuals as tacit knowledge. In another study, effective KS generated new combinations in the organization ([Chen and Huang, 2007](#)). Internalization is process through which individuals transfer and share knowledge with each other and internalize the information through a collaborative knowledge-building approach. People use internalized information, which aids in creating new knowledge in the organization. Internalization creates new knowledge through expanding existing knowledge, which leads to an increase in individual learning ([Cress and Kimmerle, 2008](#)). [Table V](#) demonstrates signifying sub-factors of OP.

2.1.6 Corporate performance. The relationship between KS and improved Corporate Performance (CP) has been studied by [Lai and Lee \(2007\)](#). They posit that if an organization develops the ability to effectively manage knowledge, then there are improvements in CP ([Tseng et al., 2010](#)). Another research study examined the relationship between KS and Information, Communication and Technology (ICT) practices through HRM and the performance of the organization. The research findings revealed that organizations tend to have better CP results when they significantly emphasize HRM and ICT ([Andreeva and Sergeeva, 2016](#)).

KS can be related to the financial performance of an organization. [Chang and Ahn \(2005\)](#) explain that when organizations emphasize organizational KS activities by engaging employees in knowledge-related activities, creative ideas are generated that enhance organizational innovation. According to [Palacios Marqués and José Garrigós Simón \(2006\)](#), firm performance is positively affected by KS because KS is a competitive advantage in an organization.

In addition, Customer Satisfaction is an important indicator of financial performance. [Ngai et al. \(2009\)](#) suggest that organizations must analyse the needs of the customers and

Table V Organizational process

<i>Factor</i>	<i>Description</i>	<i>Reference</i>
Socialization	Many researchers found that socialization is important when organizational knowledge must be processed into group and individual knowledge	Nonaka and Toyama (2015) , Raina and Chauhan (2016) , Lai and Lee (2007)
Externalization	Transforming tacit knowledge into explicit knowledge assists in sharing knowledge through written documents, images or records	Nonaka and Toyama (2015, 2014) , Al-Khouri (2014)
Combination	Effective KS generates new combinations in an organization	Chen and Huang (2007) , Nonaka and Toyama (2015)
Internalization	Internalization assists in creating new knowledge through expanding existing knowledge, which leads to an increase in individual learning	Nonaka and Toyama (2015) , Cress and Kimmerle (2008)

increase knowledge about their needs, which will increase customer satisfaction and, ultimately, CP. In addition, [Bedarkar et al. \(2016\)](#) stated that KS has an important role in providing relevant information to customer relationship management systems to improve customer satisfaction and loyalty. Therefore, KS is also associated with customer satisfaction. Finally, the Competitiveness of the organization determines the degree to which a firm will better perform. [Palacios Marqués and José Garrigós Simón \(2006\)](#) studied the relationship between KS practices and CP. The purpose of the study was to investigate KS as a competitive advantage and examine its effect on performance. The results of their research study revealed that when firms adopt KS practices, they perform better than their competitors, which increases their competitiveness. [Jasinskas et al. \(2015\)](#) also examined the relationship between KS, its implementation and the competitiveness of the firm. CP can be understood from different perspectives as elaborated in [Table VI](#).

2.1.7 Human resource management. [Majeed \(2009\)](#) explored the relation between KS and human resource management (HRM) in knowledge-intensive firms and found that personnel demands, training and development programmes and worker's knowledge are examined when designing KS strategies in organizations. Additionally, [Hameed et al. \(2016\)](#) found that if an organization wants to enhance the creation, innovation and development of KS in an organization, then they must attend to HRM.

[Zellner and Fornahl \(2002\)](#) state that KS and recruiting/selecting employees is almost the same. KM addresses the resources and information within an organization, which is also the goal of the hiring process. [Zellner and Fornahl \(2002\)](#) further explained that the KS process is highly influenced by the recruitment process and that the two are hand-in-hand. [Manjula et al. \(2016\)](#) stated that developing employee's knowledge, skills and abilities to improve the quality of working life and HRM is a very important subject and is always affected by two important functions of HRM: recruitment and selection. The recruiters design their hiring strategies according to the KS process in the organization because the new recruits must be able to comply with the firm's KS process.

KS and management are essential components of the employee's training that is performed by the HRM team, as stated in [Freyens and Martin \(2007\)](#). They also describe how training uses technological tools, such as multimedia-based training and other techniques, which help the KS process. Moreover, [Al Saifi et al. \(2016\)](#) found that cross-training in the department can enhance KS among the staff in the department in the organization. In addition, [Hau et al. \(2013\)](#) and [Patil and Kant \(2012\)](#) explain that rewards have a key role in motivating and encouraging employees to their work and efficiently perform. The system of contributing knowledge in the organization and enhancing KS behaviours is contingent on rewards. Rewards encourage employees to enhance their collective performance, such as creating a sense of cooperation, ownership and commitment; however, the tangible rewards will not always be effective, as employees seek encouragement to contribute to KS

Table VI Corporate performance

<i>Factor</i>	<i>Description</i>	<i>Reference</i>
Financial performance	Organizations adopt an adhocracy culture, which significantly facilitates knowledge conversion in the organization and ultimately enhances the organization's financial performance	Al-Khouri (2014) , Schiuma et al. (2012) , Tseng et al. (2010) , Chang and Ahn (2005)
Customer satisfaction	Organizations must analyse the needs of the customers and increase their knowledge about the customer's needs and wants, which will increase customer satisfaction and, ultimately, organizational performance	Bedarkar et al. (2016) , Ngai et al. (2009)
Competitiveness	KM, through the effective utilization of HRM and ICT, leads to an increase in organizational competitiveness and economic performance	Jasinskas et al. (2015) , Palacios Marqués and José Garrigós Simón (2006)

in the organization. [Andreeva and Sergeeva \(2016\)](#) found that rewards have a positive impact on KS, while motivating employees and making them feel appreciated and valued. HRM activities are described in [Table VII](#).

2.1.8 Technology infrastructure. The technology acceptance model (TAM) has a vital role in understanding the relation between KS and the organization. [Kowitlawakul et al. \(2015\)](#) and [Davis et al. \(1989\)](#) proposed that TAM demonstrates the different stages through which users accept and can use the technology infrastructure (TI). In this model, there are several factors that affect technology acceptance and the utilization of new technology. KS in an organization also depends on specific factors, and introducing new technology in the organizations also passes through the KS system to penetrate the organization ([Kowitlawakul et al., 2015](#)). [Rodrigues et al.](#) found that the KS process also depends upon the reliability of the technology for the users.

[Rodrigues et al. \(2016\)](#) explained that in the past, the people in the organizations were not aware of what they did not know, thus, their decisions and attitudes were based on a limited set of available information. [Kowitlawakul et al. \(2015\)](#) states that adopting the latest technology can also be relatively advantageous for the organization and its KM strategy. Using the latest technology allows the organization to compete with competitors and gain an advantage over or equal to them for attracting customers and identifying appropriate strategies. Research ([Tsui and Malhotra, 2005](#)) found that technology in KS makes organizations more knowledge intensive and enhances the KS process among employees and the customers. The KS process is enhanced with customers through technological tools, such as effective communication. [Davis et al., 1989](#) believes that TAM is based on the users' perceptions of the usefulness and ease of use of the technology for a specific purpose. This implies that the users or workers must be convinced of the ease of use and usefulness of the technology to ensure a higher level of technology acceptance, which will assist with KS activity ([Davis et al., 1989](#)) ([Kowitlawakul et al., 2015](#)). Key TI sub-factors are provided in [Table VIII](#).

2.1.9 Employee engagement. Employee Engagement (EE) is employee's positive attitudes about their employers and the organization. Employees who are engaged in their

Table VII Human resource management

<i>Factor</i>	<i>Description</i>	<i>Reference</i>
Recruitment and selecting	KM addresses the resources and information in an organization, which is also the goal of the recruitment process	Manjula et al. (2016) , Zellner and Fornahl (2002)
Training	KS and management are an essential part of the <i>training</i> process of employees that are performed by the HRM team	Al Saifi et al. (2016) , Freyens and Martin (2007)
Reward in performance	Rewards have a key role in motivating and encouraging employees to work and efficiently perform	Andreeva and Sergeeva (2016) , Hau et al. (2013) , Patil and Kant (2012)

Table VIII Technology infrastructure

<i>Factor</i>	<i>Description</i>	<i>Reference</i>
Reliability	The KS process, in relation to new technology, also depends on the reliability of the technology among users	Kowitlawakul et al. (2015) , Davis et al. (1989)
Availability	The people in the organizations were not aware of what they did not know, and their decisions and attitudes were based on a limited set of available information	Kowitlawakul et al. (2015) , Rodrigues et al. (2016)
Relatively advantageous	Adopting the latest technology can also be relatively advantageous for the organization and its KM strategy	Kowitlawakul et al. (2015) , Tsui and Malhotra (2005) , Davis et al. (1989)
Ease of use	This implies that the users or workers must be convinced about the ease of use and usefulness of the technology to ensure a higher level of accepting the technology	Kowitlawakul et al. (2015) , Davis et al. (1989)

organizations reflect a positive attitude for the values of the organization. They also understand the business perspectives and their responsibilities (Robinson *et al.*, 2004). In a study by Julia Claxton *et al.* (2014), the antecedents of EE were examined and the findings revealed that there were many factors that affected the EE in an organization, including job design, the environment in the workplace, the organization's HRM and the relationship with the ultimate supervisor and colleagues. EE perform better and have significantly lower turnover intentions. Schaufeli and Salanova (2010) explained that growth opportunities for the employees can increase their level of engagement. They suggested that work engagement among employees can increase if training, career growth and development programmes are introduced to facilitate employee's personal growth and development. Mueller (2015) found that growth opportunities improve EE, which also improves KS in organization.

Additionally, facilitating working environment tends to affect EE and KS significantly. As Julia Claxton *et al.* (2014) explained, a multi-space working environment positively influences and promotes KS in an organization. Joshi and Sodhi (2011) identified the drivers of EE in organizations and found that the relationships of employees with the top management, equal treatment of employees, respect among colleagues and a positive working environment to promote mutual coordination among employees, affects the EE. Trust in the organization is an antecedent of KS as suggested by Hau *et al.* (2013), trust prevails at the individual and at the organizational levels. Their research findings demonstrated that KS was enhanced among employees through social capital, reciprocity, organizational rewards and an element of enjoyment.

Ford and Staples (2010) stated that interpersonal trust and distrust among the individual in an organization may affect EE. Bakker and Demerouti (2008) found that when an individual has abundant personal resources, there is a positive effect on his self-worth or self-regard. High personal regard leads to a high level of goal-congruence. Another study by Xanthopoulou *et al.* (2007) examined the relationship between personal resources and work engagement. The personal resources included self-efficacy, optimism and self-esteem. High self-efficacy in individuals allows them to believe in themselves and they tend to broadly fulfil organizational demands and expectations through high levels of engagement. Table IX shows relevant sub-factors for EE.

Based on previous studies, the factors and sub-factors that impact the success of KS in an organization are illustrated in Figure 1.

Table X below synthesizes the primary factors and sub-factors with references.

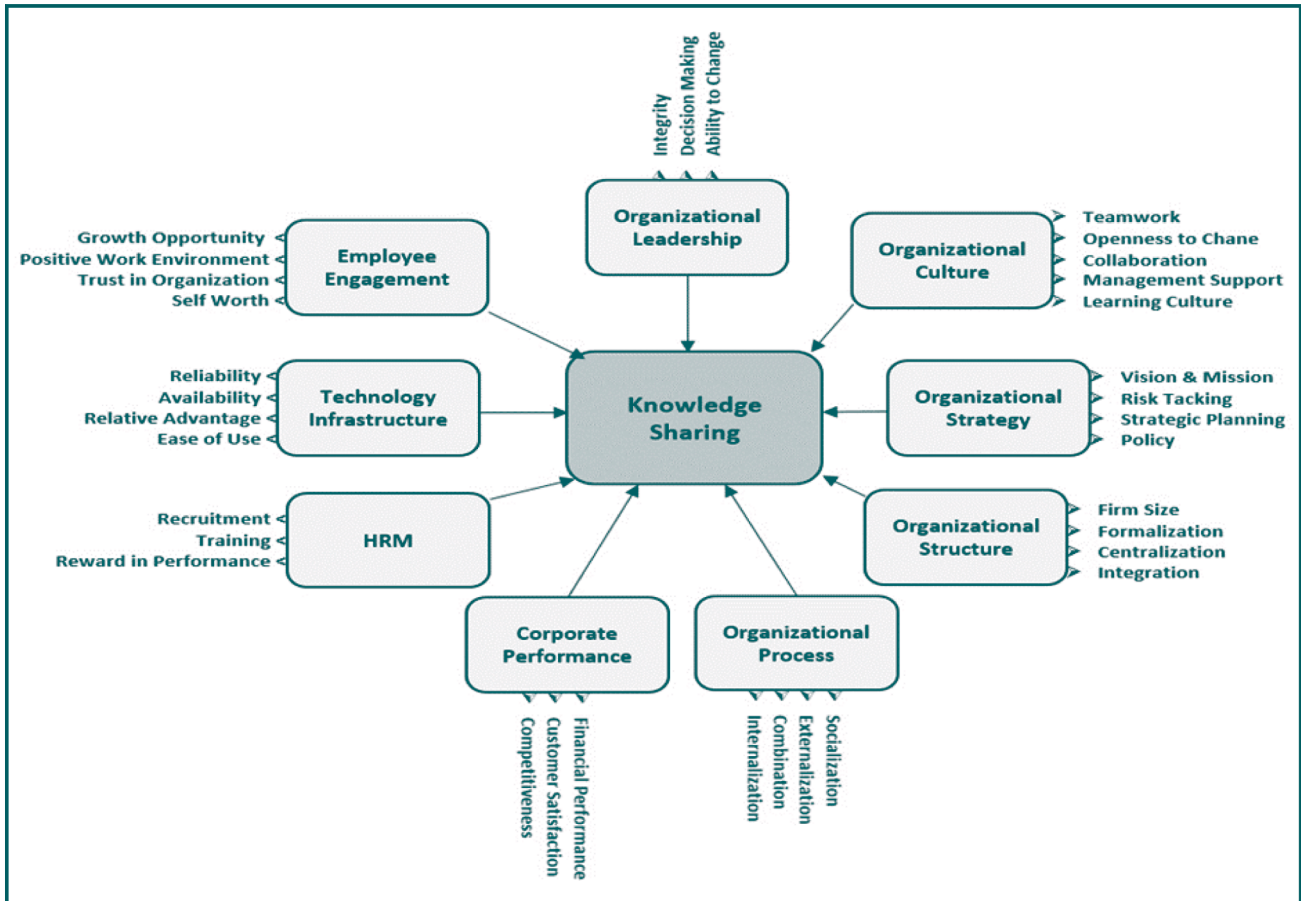
2.2 Synthesis of the knowledge sharing literature

Table XI provides a brief and concise synthesis of KS studies in the past decade. These were identified from Emerald, ScienceDirect and ProQuest databases, with "Critical factors"

Table IX Employee engagement

Factor	Description	Reference
Growth opportunity	Growth opportunities for the employees in an organization can increase their level of engagement	Mueller (2015), Schaufeli and Salanova (2010)
Positive work environment	A multi-space working environment positively influences and promote KS in an organization	Julia Claxton <i>et al.</i> (2014), Joshi and Sodhi (2011)
Trust in organization	Trust prevails at the individual as well as at the organizational level, which will enhance KS in the organization	Hau <i>et al.</i> (2013), Niu (2010), Ford and Staples (2010)
Self-worth	High self-efficacy in individuals allows them to believe in themselves and they tend to broadly fulfil the organizational demands and expectations through high levels of engagement	Bakker and Demerouti (2008), Xanthopoulou <i>et al.</i> (2007)

Figure 1 Factors and sub-factors that impact knowledge sharing



and Knowledge sharing' as the keywords, between 2007 and 2017. Most of these studies included few factors and were not conducted in technology-intensive organization. This study is the first to include nine primary and 34 sub-criteria to identify and prioritize the critical factors for KS.

2.3 Knowledge sharing in the UAE context

The government of the UAE is taking several steps at the national level to create awareness about the strategic significance of KS through national programmes (Muhammad Siddique, 2012). KS has an important role in the social and economic development of a country; therefore, one cannot deny the significance of KS.

Several research studies that have emphasized the importance of KS and its effects on performance and other organizational factors have been conducted in the context of the UAE. For example, Muhammad Siddique (2012) conducted a baseline study to investigate KS initiatives in the UAE. Moreover, Abdallah *et al.* (2012) studied the impact of KS on the innovative capabilities of the firms in the UAE. Al-Khoury studied the fusion of KM in the public sector in the UAE (Al-Khoury, 2012). Similarly, Suliman and Al-Hosani (2014) examined the relationship between KS practices and employee's job satisfaction in the UAE. This research shows that there are many studies on KM in the context of UAE. However, no studies have examined the critical factors that impact KS in UAE technology-intensive service organizations. Therefore, the present study seeks to fill this gap because

Table X Criteria and sub-criteria for KS in technology-intensive organizations

Main criteria	Sub-criteria	Reference
OL	1. Decision-making (OL1)	Zhao <i>et al.</i> (2016), Rahim (2014), Kumar <i>et al.</i> (2013), Alipour <i>et al.</i> (2011), Zhang and Bartol (2010), Singh (2008), Ahearne <i>et al.</i> (2005)
	2. Integrity (OL2)	
	3. Ability to change (OL3)	
OC	1. Teamwork (OC1)	Al-Khouri (2014), Al-Adaileh and Al-Atawi (2011), Pastor (2011), Donate and Guadamillas (2010), Ajmal and Koskinen (2008), AL-Alawi <i>et al.</i> (2007), Abou-Zeid (2005), Ladd and Heminger (2002), Beckett, Wainwright and Bance (2000)
	2. Openness to change (OC2)	
	3. Collaboration (OC3)	
	4. Management support (OC4)	
	5. Learning culture (OC5)	
OSY	1. Vision and mission (OSY1)	Coleman <i>et al.</i> (2016), Bedford and Harrison (2015), Luu (2012, 2014), Anghel <i>et al.</i> (2013), Hall and Goody (2007), Snyman and Kruger (2004), Delios and Henisz (2003), Valio Dominguez Gonzalez and Fernando Martins, 2014, Beckett, Wainwright and Bance (2000)
	2. Risk taking (OSY2)	
	3. Strategic planning (OSY3)	
	4. Policy (OSY4)	
OST	1. Firm Size (OST1)	Valio Dominguez Gonzalez and Fernando Martins, 2014, Zheleva and Viklund (2014), Mahmoudsalehi, Moradkhannejad and Safari (2012), Willem and Buelens (2009), Amaral and Uzzi (2007)
	2. Formalization (OST2)	
	3. Centralization (OST3)	
	4. Integration (OST4)	
OP	1. Socialization (OP1)	Raina and Chauhan (2016), Nonaka and Toyama (2015), Hao <i>et al.</i> (2015), Chen <i>et al.</i> (2010), Cress and Kimmerle (2008), Chen and Huang (2007), Ermine <i>et al.</i> (2006)
	2. Externalization (OP2)	
	3. Combination (OP3)	
	4. Internalization (OP4)	
CP	1. Financial Performance (CP1)	Bedarkar <i>et al.</i> (2016), Jasinskas <i>et al.</i> (2015), Al-Khouri (2014), Schiuma <i>et al.</i> (2012), Ngai <i>et al.</i> (2009), Lai and Lee (2007), Palacios Marqués and José Garrigós Simón (2006), Chang and Ahn (2005)
	2. Customer satisfaction (CP2)	
	3. Competitiveness (CP3)	
HRM	1. Recruitment and selecting (HRM1)	Al Saifi <i>et al.</i> (2016), Andreeva and Sergeeva (2016), Manjula <i>et al.</i> (2016) Hau <i>et al.</i> (2013), Patil and Kant (2012), Majeed (2009), Freyens and Martin (2007), Zellner and Fornahl (2002)
	2. Training (HRM2)	
	3. Reward in performance (HRM3)	
TI	1. Reliability (TI1)	Kowitlawakul <i>et al.</i> (2015), Tsui and Malhotra (2005), Davis <i>et al.</i> (1989)
	2. Availability (TI2)	
	3. Relative advantage (TI3)	
	4. Ease of use (TI4)	
EE	1. Growth Opportunity (EE1)	Mueller (2015), Julia Claxton <i>et al.</i> (2014), Hau <i>et al.</i> (2013), Joshi and Sodhi (2011), Schaufeli and Salanova (2010), Niu (2010), Bakker and Demerouti (2008), Xanthopoulou <i>et al.</i> (2007), Robinson <i>et al.</i> (2004)
	2. Positive work environment (EE2)	
	3. Trust in the organization (EE3)	
	4. Self-Worth (EE4)	

Table XI Synthesis of previous KS studies

<i>Author(S)/Year</i>	<i>Title</i>	<i>Purpose</i>	<i>Methodology</i>	<i>Findings</i>
Fullwood and Rowley (2017)	An investigation of factors affecting knowledge sharing among UK academics	To examine relationships between knowledge-sharing factors, attitudes and intentions to share in UK academics	A structural model was used to test the hypothesized relationships	Individual beliefs among academics were more dominant for knowledge-sharing attitudes than OC. In addition, leadership was the most powerful and autonomy was the weakest factor in the overall OC
Razmerita <i>et al.</i> (2016)	What factors influence knowledge sharing in organizations? A social dilemma perspective on social media communication	To recognize the factors that drive and hinder employees' involvement in enterprise KS through social media	A theoretical unified research model was tested using statistical methods on a sample of 114 respondents in Denmark	The significant drivers for knowledge sharing were: enjoying helping others, monetary rewards, management support, management encouragement and motivating behaviour. The identified barriers were: changing behaviour, a lack of trust and a lack of time
Killingsworth <i>et al.</i> (2016)	Factors that influence knowledge sharing among global virtual teams	To scrutinize interrelations of the team environment for trust and affiliation and the motivating factors for reciprocal benefits and enjoyment to determine their impact on knowledge sharing in loosely connected global virtual teams	An online survey was developed to measure the theoretical constructs. A one-way ANOVA was conducted to compare the variables	Trust, reciprocal benefits and enjoyment are significantly related to positive attitudes towards knowledge sharing. Positive attitudes, enjoyment, age, nationality and computer experience are positively related to knowledge-sharing behaviour. Affiliation does not significantly affect a positive knowledge-sharing attitude. Gender is not related to knowledge sharing-behaviour
Arif <i>et al.</i> (2015)	Understanding knowledge sharing in the Jordanian construction industry	To comprehend and enable more KS in construction companies in Jordan	Factor analysis was used to find possible relationships between cultural variables for grouping purposes and to eliminate the cultural variables that did not affect KS. AHP was used to prioritize these variables	Trust, management and communication were the three most important factors, while communication was the least important factor
Fatemeh and Leila (2014)	Factors of success for inter-organizational knowledge sharing: a proposed framework	To identify the primary determinants that influence inter- and intra-organizational KS	A complete theoretical and conceptual study	Individual factors, such as motivation, tendency, trust, ability and use of IT, communication and cooperation; organizational factors, including structure, culture and organizational environment, motivations, management and leadership, rewards. In addition, for knowledge flow, inflows and outflows of knowledge among individuals are mediated by the channels they use to

(continued)

Table XI

<i>Author(S)/Year</i>	<i>Title</i>	<i>Purpose</i>	<i>Methodology</i>	<i>Findings</i>
Amayah (2013)	Determinants of knowledge sharing in a public-sector organization	To examine the factors that affect KS in a public-sector organization	The data were collected through questionnaires and analysed using multiple regression	communicate as well as the surrounding cultures Social interactions, rewards and organizational support have the highest effect on KS as enablers. Two barriers, degree of courage and empathy, had a substantial influence on KS
Wickramasinghe and Widyaratne (2012)	Effects of interpersonal trust, team leader support, rewards and knowledge-sharing mechanisms on knowledge sharing in project teams	To explore the effect of interpersonal trust, team leader support, rewards and KS mechanisms on voluntary KS in software development project teams in Sri Lanka	Survey methodology was used and 150 software developers responded to the survey. Regression analysis was performed for data analysis	Interpersonal trust and rewards have significant positive effects on KS. Work-group communication and personal interactions had significant positive effects on KS
Fathi <i>et al.</i> (2011)	Key determinants of knowledge sharing in an electronics manufacturing firm in Malaysia	To study the factors that affect KS attitudes in a Malaysian manufacturing firm and how this attitude influences their intent to share knowledge	A survey was conducted in a manufacturing firm and Pearson's correlation analysis and linear regression evaluated the hypotheses	Collectivism, social networks, social trust, shared goals, incentive systems, kiasuism and self-efficacy were significant. Individualism was not significant
Zboralski (2009)	Antecedents of knowledge sharing in communities of practice	To evaluate the role of community members' motivation to share knowledge in communities of practice	Partial least square structural equation modelling was used for data analyses	The results show that a leading facilitator and appropriate managerial support positively impacts interaction processes in communities of practice
Paroutis and Al Saleh (2009)	Determinants of knowledge sharing using Web 2.0 technologies	To explore the key determinants of KS and collaboration using Web 2.0 technologies by discovering the reasons for and barriers to employees' active involvement in several platforms within a large multinational firm	This study is based on a case study design. In total, there were 11 in-depth interviews. In addition, secondary data were collected. The data were analysed using a grounded theory approach	Four vital determinants of KS using Web 2.0 technologies are history, outcome expectations, perceived organizational or management support and trust
Ma <i>et al.</i> (2008)	Knowledge sharing in Chinese construction project teams and its affecting factors: an empirical study	To test the effect of fundamental contextual factors that affect KS in Chinese construction project teams	Data were collected by surveying 222 managerial employees and regression analysis explored the relationship between different factors and the willingness to share knowledge	Explicit knowledge promotes KS, while tacit knowledge creates barriers to KS in project teams. Moreover, trust is positively related to KS, but justice, leadership styles and empowerment do not influence KS among members in project teams
Al-Alawi <i>et al.</i> (2007)	OC and knowledge sharing: critical factors for success	Examining the role of certain factors of the OC in the success of KS	There was a survey and several interviews with staff from various organizations in Bahrain in the public and private sectors and the hypotheses were testing with a one-way ANOVA	Trust, communication, information systems, rewards and OST are positively related to KS

the field lacks a sound and holistic understanding of the key factors that influences KS success, which was stated in [Al-Azri et al. \(2010\)](#). The UAE is a developing country that has come a long way in building an open knowledge-based economy in recent years by taking advantage of the economic benefit of its vast resources of oil, which was stated in [Katsioloudes and Brodtkorb \(2007\)](#). They explained that in the UAE, there is a rapid increase in the significance of strategic KM. The UAE Government is developing human capital and knowledge resources by emphasizing education, training and research initiatives. However, there has been an underutilization of skills and knowledge in the public sectors ([Biygautane and Al-Yahya, 2011](#)). Moreover, the rate of under-used knowledge and skills in the UAE is 42 per cent. In addition, the most significant example is the establishment of the Dubai knowledge village in 2003, which provides a platform for organizations to promote KS ([Muhammad Siddique, 2012](#)).

The UAE has recently been recognized as a region that has significant local and foreign investments. The UAE region has experienced significant local and foreign investments in the domains of information technology, telecommunication and infrastructure and tourism. Despite these investments and infrastructural development, local technology-intensive organizations are reluctant to adopt and implement approaches of KS in their business processes ([Yeo et al., 2010](#)).

Thus, this research addresses tacit knowledge because technology-intensive organizations emphasize the importance of tacit knowledge or know-how ([Arora, 1996](#)). Tacit knowledge differs from explicit knowledge and is challenging to share ([Nonaka and Von Krogh, 2009](#)).

2.4 Research questions and objectives

Based on the rationale built in sections 2.2 and 2.3, we derive the following research questions:

- RQ1. What are the significant factors that affect KS practices in technology-intensive service organizations?
- RQ2. How these are prioritized as most and least important for implementing a KS strategy.

In addition, the answers to these questions will contribute to the following research objectives:

- This research will identify the critical factors that impact KS in technology-intensive service organizations in the UAE.
- The research will assist decision makers in addressing the complexity of these key factors while implementing KS strategies.

3. Methodology

3.1 Overview of the analytical hierarchy process

The analytical hierarchy process (AHP) was introduced by Thomas Saaty in the 1970s. It is a structured technique for organizing and analysing complex decisions in a structured way. [Saaty \(1987\)](#) believes that it is an effective tool for conducting complex decision-making. This tool aids the decision-making process and helps the decision maker set priorities for obtaining the best decision. Through pairwise comparisons, there is a reduction in complex decisions, which achieves both objective and subjective aspects of the decision. [Saaty \(1987\)](#) also suggested that AHP can reduce bias in the decision-making process, as the decision makers' evaluations are checked for consistency through this useful technique. [Saaty \(2008\)](#) further evaluates AHP as a useful tool because it is flexible and powerful for obtaining decisions through pairwise evaluations of the criteria and the provided options. [Armancost et al. \(1990\)](#) write that organizations use the AHP tool to make effective

organizational decisions and identify solutions that suit their needs. AHP has been successfully implemented in several fields. For example, [Hussain et al. \(2015\)](#) implemented AHP in KM processes. [Hsu et al. \(2010\)](#) implemented AHP in logistics management.

A primary objective in this study is to prioritize the critical factors that impact KS practices in technology-intensive organizations in the context of the UAE; therefore, this study applied the AHP. It has been used to develop hierarchical models in other industries, for example, manufacturing companies ([Jin Lin et al., 2014](#)). It is also broadly used in supply chain management ([Tan et al., 2016](#); [Tseng and Hung, 2014](#)).

3.2 Target organizations

[Dankbaar \(1998\)](#) defined technology-intensive organizations as organizations that anticipate an adoption of technology. These organizations better anticipate the need for time to change their technology and adopt new and advanced technology to sustain their dynamic environments. Some studies also identify technology-intensive organizations as globalized firms that have a high cost for research and development (R&D), and to cover the high cost of R&D, they strive for increased global revenue, which is why they operate globally ([Schwens and Kabst, 2011](#)). According to [Nambisan \(2002\)](#) increased globalization has created numerous challenges and opportunities for technology-intensive organizations. In the current dynamic business environment, customers are located all around the world, which has minimized national borders and created challenges for technology-intensive organizations ([Blomqvist et al., 2008](#)). Most respondents were from telecommunication service companies. One of the most important reasons for choosing the telecommunication services sector in this study is the contribution of the GDP to the UAE economy. The ICT infrastructure in the UAE is globally ranked 31st, and the UAE is the 20th wealthiest global nation. The UAE needs to focus on developing a knowledge-based economy to release its full potential ([Hameed et al., 2016](#)).

3.3 Analytical hierarchy process framework of knowledge sharing

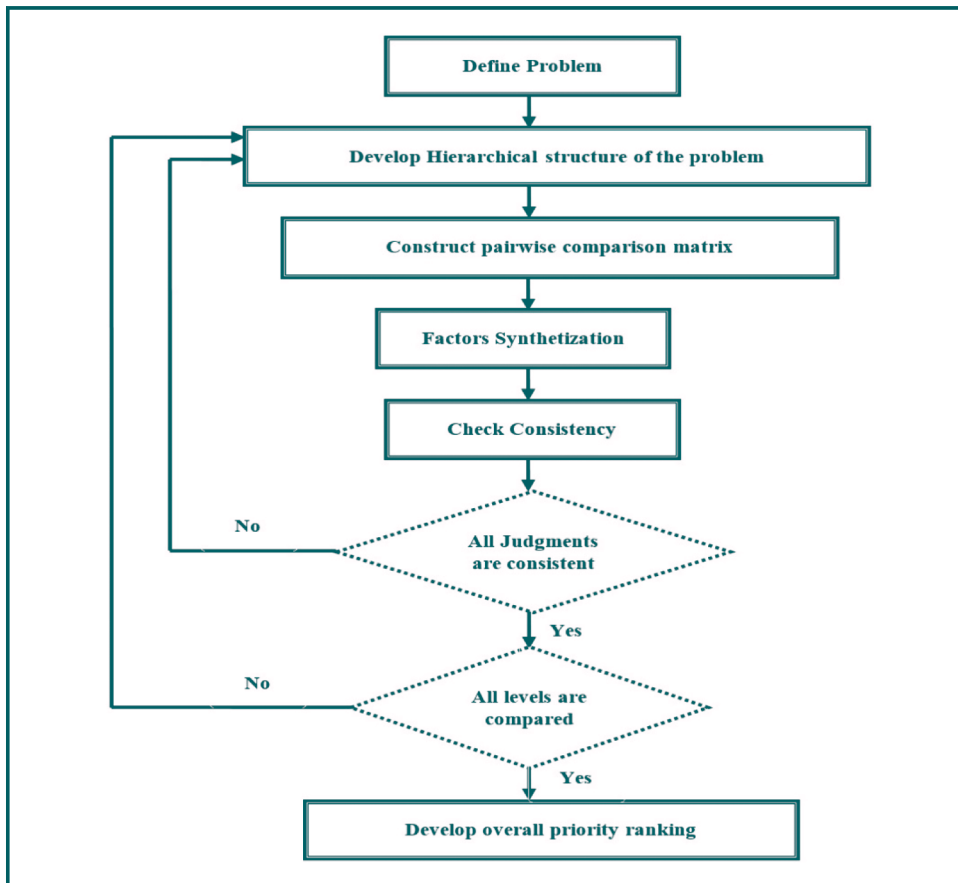
The purpose of this study is to enhance current understanding of the relative importance of the attributes of KS in UAE technology-intensive organizations and propose a process for prioritizing competing criteria/factors. This paper is composed of a multi-criteria decision-making model of KS in technology-intensive organizations. Their contributions are assessed and judged to identify the most important effects of KS on technology-intensive organizations. Furthermore, AHP is analysed to examine the complex multi-criteria decision-making process. The AHP method is comprised of four phases:

1. structuring the decision problem;
2. collecting and measuring data;
3. determining the normalized weights; and
4. synthesizing and determining the solution to the problem ([Sachdeva et al., 2015](#)).

Using this four-phase approach, we formulate an AHP model to analyse the criteria/factors that impact KS in technology-intensive organizations. The hierarchical model in [Figure 2](#) presents the methodology that was used in this study, as summarized by [Sachdeva et al. \(2015\)](#).

The objective of this study is to identify the most important criteria in KS in technology-intensive organizations in the UAE to assist organizational decision-making. This research is based on a hierarchical process from previous research. The AHP has been used to investigate this complex hierarchical system.

Figure 2 Summary of AHP steps



The classification of the goal and the other decision criteria and variables are presented in three major levels. The highest level of the hierarchy is the overall goal, i.e. selecting the competitive criteria that impacts KS in technology-intensive organizations. Level 2 represents the criteria that is used to select the KS factors. This study identified nine criteria: organizational leadership, organizational culture, organizational strategy, organizational structure, organizational process, corporate performance, HRM, technology infrastructure and employee engagement. These are the basic criteria for measuring the factors that impact KS in organizations based on the literature review. Level 3 contains the sub-criteria that affects the critical selection of KS criteria. For each primary criterion, there are three to five different sub-criteria based on the literature review. For OL, the first primary criterion, the three sub-criteria are integrity, decision-making and ability to change. For the second primary criterion, OC, the five sub-criteria are teamwork, openness to change, collaboration, management support and learning culture. For the third primary criterion, OSY, the four sub-criteria are vision and mission, risk taking, strategic planning and policy. For the fourth primary criterion, OST, the four sub-criteria are firm size, formalization, centralization and integration. For the fifth primary criterion, OP, the four sub-criteria are socialization, externalization, combination and internalization. For the sixth primary criterion, CP, the three sub-criteria are financial performance, customer satisfaction and competitiveness. For the seventh primary criterion, HRM, the three sub-criteria are recruiting/selecting, availability and training. For the eighth primary criterion, TI, the four sub-criteria are availability, reliability, relative advantages and ease of use. For the final primary criterion, EE, the four sub-criteria are growth opportunities, a positive work

environment, trust in the organization and self-worth. Based on this AHP hierarchy, a research framework was constructed to evaluate KS factors and sub-factors, which is shown below in [Figure 3](#).

After constructing the AHP hierarchy, the next phase is data collection and evaluating the hierarchy. The data were collected from top-level executives in technology-intensive organizations that pioneered designing and implementing KS practices in the UAE. The targeted organizations were large, with 500 or more employees, which was as defined by [Acs et al. \(1994\)](#).

The questionnaire in this study consisted of two parts: the Part 1 was related to the candidate's experience in the field, and the Part 2 prioritized the factors from the respondents' perspectives. The questionnaire was designed with a nine-point scale, as suggested by [Saaty \(1987\)](#) and was based on the AHP hierarchy. All respondents were seniors (experts) in their field, which is recommended for AHP methodology ([Freeman and Chen, 2015](#)). The questionnaire was randomly distributed to 15 senior level managers with a minimum 10 years of experience in each technology-intensive organization. The factors that impact KS in technology-intensive organizations are shown in Figure-3. The questionnaire was pilot-tested with industry experts and academics, and several items were rephrased to make them clear and easy to understand. The evaluation team consisted of four members: one was a senior manager with more than fifteen years' experience in the technology field and the other three were middle managers with more than ten years of experience in technology-intensive organizations in the UAE.

The next step in AHP is to determine the pair-wise comparisons among the applied criteria. To determine the pair-wise comparison criteria, [Saaty \(1987\)](#) suggested a nine-point scale, which is shown below in [Table XII](#).

We defined a pair-wise comparison. For example, if a company identifies OL as moderately more important than TI, the former is rated "3" and the latter is rated "1/3" in this

Figure 3 AHP for factors impacting KS in technology-intensive organizations

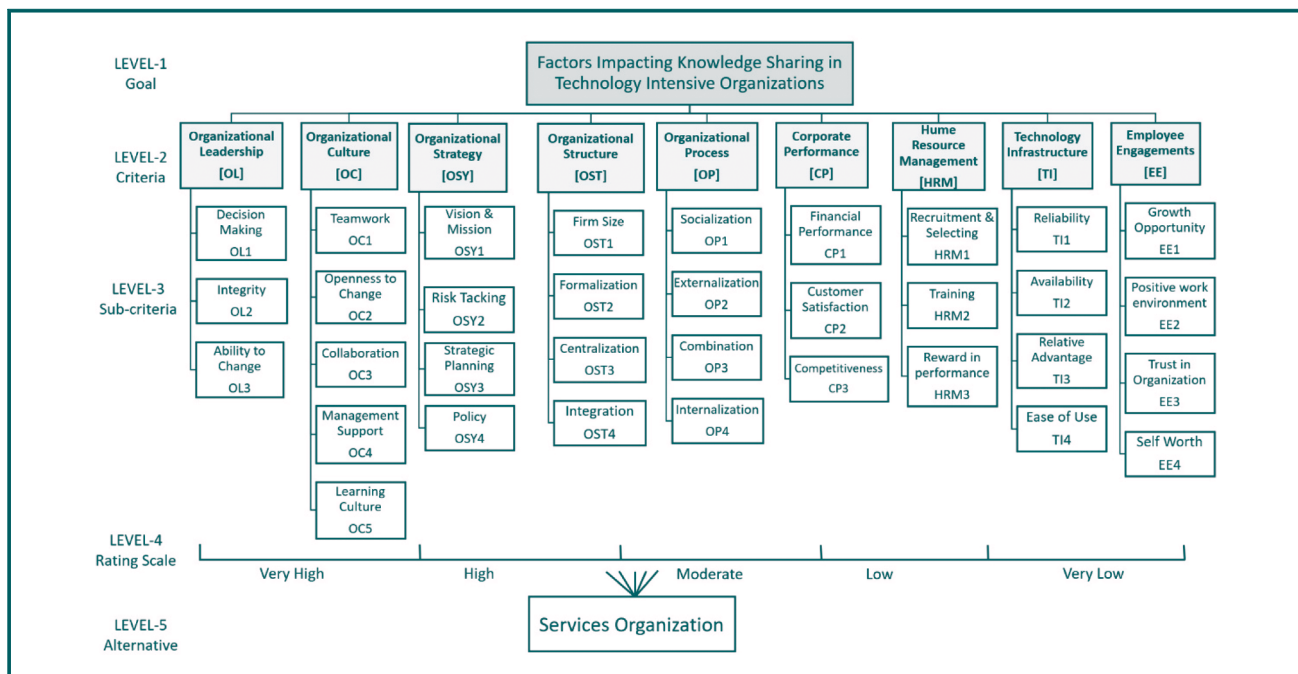


Table XII A nine-point scale for determining the pair-wise comparison criteria

Intensity of importance definition explanation	Definition	Explanation
1	Equal importance	Two criteria equally contribute to the objective
3	Moderate importance	Judgement slightly favours one over another
5	Strong importance	Judgement strongly favours one over another
7	Very strong importance	A criterion is strongly favoured, and its dominance is demonstrated in practice
9	Absolute importance	The importance of one over another is affirmed at the highest possible order
2,4,6,8	Intermediate values	Compromise is needed

comparison. To check for consistency, we used the consistency index (CI). Saaty (1987) defined consistency as follows:

Consistency index (CI) = $(\lambda_{\max} - n)/(n-1)$, where $\lambda_{\max}$ is the maximum eigenvalue in the matrix of the importance ratios and n is the number of factors. Then, the consistency ratio (CR) assesses whether a matrix is sufficiently consistent. This is the ratio of the CI to the random index (RI), where the CI for a matrix of comparisons is randomly generated:

$$\text{Consistency Ratio (CR)} = \text{CI/RI}$$

Random pair-wise comparisons were simulated to produce average random indices for different sized matrices. The values of RI are provided below in Table XIII.

This inconsistency is acceptable if CR is less than or equal to 0.10 (Saaty, 1987). As Saaty (2008) suggested, the geometric mean approach, rather than the arithmetic approach, is used to combine the individual pair-wise comparison judgement matrices to obtain the consensus pair-wise comparison judgement matrices for all evaluators. Table XIV presents

Table XIII Random index

N	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.48

Note: N is the number of factors

Table XIV Pair-wise comparisons of primary KS factors in technology-intensive organizations

Criteria	OL	OC	OSY	OST	OP	CP	HRM	TI	EE	Priority weight	Rank
OL	1	2.96	3.11	2.73	3.09	2.10	2.89	1.57	1.02	0.205	1
OC	0.34	1	3.43	3.22	3.36	3.05	4.12	3.19	1.44	0.193	2
OSY	0.32	0.29	1	4.34	3.76	2.74	3.82	2.65	1.65	0.158	3
OST	0.37	0.29	0.23	1	0.93	1.31	3.52	1.43	0.96	0.076	7
OP	0.32	0.31	0.27	1.08	1	1.71	2.95	1.92	1.55	0.086	5
CP	0.48	0.33	0.36	0.76	0.58	1	4.79	2.70	2.51	0.101	4
HRM	0.35	0.24	0.26	0.28	0.34	0.21	1	0.99	0.54	0.038	9
TI	0.64	0.31	0.38	0.70	0.52	0.37	1.01	1	1.71	0.063	8
EE	0.98	0.69	0.61	1.04	0.65	0.40	1.86	0.58	1	0.079	6

Note: CR = 0.10

the geometric means for the pair-wise comparisons for the primary factors and sub-factors of KS in technology-intensive organizations.

The next step is to define the relative priorities in the criteria, which are shown in the final column of [Table XIII](#) above. This was (0.10), which is acceptable as defined by [Saaty \(1987\)](#). In addition, the priority weight that corresponds to the primary factors in KS could be analysed with the priority vector.

According to [Saaty \(2008\)](#), finding the “priority vectors” introduces the consistency principle. In addition, as [Sachdeva et al. \(2015\)](#) stated, the consistency principle equation is ($a_{ik} = a_{ij} \cdot a_{jk}$) and the subsequent argument is to use the special case of the consistency matrix that is formed by elements ($a_{ik} = w_i/w_j$), where w_i & w_j are the elements of the priority weight that correspond to criteria i and j . The result in the last row of Table-3 shows that the OL factor has the highest weight (0.205) that impacts KS in technology-intensive organizations. OC was the next competitive priority (0.193), followed by the OSY factor (0.158) and then the CP factor (0.101). The least important factor was the HRM (0.038). All the above results indicate some challenges in this process, and these results are discussed in greater detail in the next section.

The final step is to define the relative priorities for the criteria and the global priority weight of the sub-factors, which is shown in [Table XV](#).

The results of the priorities of the criteria were accepted because they were all equal to or less than 0.1. This finding is acceptable, as defined by [Saaty \(1987\)](#). The finding of the global priority weight for KS sub-factors shows that the Collaboration sub-factor ranked first with global priority (0.15), followed by trust/integrity (0.13) and firm size (0.11). Management support and learning culture ranked fourth (0.09). Lead change and decision-making ranked fifth (0.07), while recruitment/selecting and technology reliability ranked sixth (0.06), formalization ranked seventh (0.05) and centralization ranked eighth (0.04), the relative advantage and ease of use in technology ranked ninth (0.03) and training ranked tenth (0.02). The least important sub-factor was rewards for performance (0.01).

4. Analysis and discussion

According to the results, OL has the highest impact on KS. This could be because OL stimulates communication and collaboration to motivate people and build trust, which creates engagement in day-to-day performance and sets the appropriate conditions for enabling and supporting KS as a source of competitive advantage for companies ([Biloslavo, 2005](#)). This finding is acceptable because it matches the previous literature and the local Emirati culture. The second highest impacting factor is OC, which is the company's ability to obtain continually improved performance. Therefore, it was also expected that OC would be the second highest impacting factor. OSY is the third highest-impact factor and reflects the company's ability to enable KS. The most successful companies in the current market have developed knowledge-centred strategies, and those companies demand that their employees experience an iterative process of generating, testing and sharing ideas to structure viable business proposals ([Fudaliński, 2015](#)). The major factors that have had a middle-level impact on KS are CP, OP, EE and OST.

KS is clearly and positively impacted by CP, which was ranked as the fourth most impactful factor. A firm's ability to transform and exploit knowledge may determine its level of innovation. Reacting to the market demand by promoting innovation allows companies to reduce the time to market, which is a key factor for harvesting the market's initial reaction to new products before competition reduces margins and dilutes the demand ([Wang and Wang, 2012](#)). Similarly, the firm's recent performance may affect its ability or disposition for promoting KS because conservative approaches are used as defensive strategies for reducing exposure to losses ([Fudaliński, 2015](#)). OP was identified as the fifth-most impactful factor, with a mid-level effect and may refer to an internal dimension, concretely, a set of organizational resources that are aligned, arranged and integrated around the core process

Table XV Global priority weight for the KS sub-factors in technology-intensive organization

Sub-criteria	[OL1]	[OL2]		[OL3]		Global priority weight	Rank
[OL1]	1		1.08		1.57	0.37	2
[OL2]	0.92		1		3.73	0.46	1
[OL3]	0.64		0.27		1	0.17	3
CR = 0.09							
Sub-criteria	[OC1]	[OC2]	[OC3]	[OC4]	[OC5]	Global Priority Weight	Rank
[OC1]	1	2.76	3.03	1.45	1.49	0.33	1
[OC2]	0.36	1	3.53	2.71	2.09	0.27	2
[OC3]	0.33	0.28	1	1.72	2.20	0.15	3
[OC4]	0.69	0.28	0.58	1	1.72	0.14	4
[OC5]	0.67	0.37	0.46	0.58	1	0.11	5
CR = 0.10							
Sub-criteria	[OSY1]	[OSY2]		[OSY3]	[OSY4]	Global priority weight	Rank
[OSY1]	1	4.07		2.27	2.04	0.45	1
[OSY2]	0.25	1		0.67	1.00	0.14	4
[OSY3]	0.44	1.50		1	1.98	0.24	2
[OSY4]	0.49	1.50		0.50	1	0.17	3
CR = 0.07							
Sub-criteria	[OST1]	[OST2]		[OST3]	[OST4]	Global priority weight	Rank
[OST1]	1	1.30		1.04	0.66	0.24	3
[OST2]	0.77	1		0.76	0.62	0.19	4
[OST3]	0.96	1.31		1	2.04	0.32	1
[OST4]	1.52	1.31		0.49	1	0.25	2
CR = 0.03							
Sub-criteria	[OP1]	[OP2]		[OP3]	[OP4]	Global priority weight	Rank
[OP1]	1	3.11		1.78	1.54	0.39	1
[OP2]	0.32	1		0.61	1.02	0.16	4
[OP3]	0.56	1.65		1	0.86	0.22	3
[OP4]	0.65	1.65		1.16	1	0.24	2
CR = 0.07							
Sub-criteria	[CP1]	[CP2]		[CP3]		Global priority weight	Rank
[CP1]	1	2.10		4.65		0.58	1
[CP2]	0.48	1		3.23		0.31	2
[CP3]	0.22	0.31		1		0.11	3
CR = 0.01							
Sub-criteria	[HRM1]	[HRM2]		[HRM3]		Global priority weight	Rank
[HRM1]	1	1.17		2.14		0.42	1
[HRM2]	0.86	1		2.67		0.41	2
[HRM3]	0.47	0.38		1		0.17	3
CR = 0.01							
Sub-criteria	[TI1]	[TI2]		[TI3]	[TI4]	Global priority weight	Rank
[TI1]	1	2.56		2.86	2.76	0.47	1
[TI2]	0.39	1		2.51	1.48	0.25	2
[TI3]	0.35	0.40		1	1.63	0.16	3
[TI4]	0.36	0.40		0.61	1	0.12	4
CR = 0.00							
Sub-criteria	[EE1]	[EE2]		[EE3]	[EE4]	Global priority weight	Rank
[EE1]	1	2.39		2.21	2.51	0.42	1
[EE2]	0.42	1		2.04	2.46	0.27	2
[EE3]	0.45	0.49		1	1.88	0.18	3
[EE4]	0.40	0.49		0.53	1	0.13	4
CR = 0.06							

of KS (Hung *et al.*, 2009). EE is another concrete expression of the leadership's vision and strategic approach for KS, as a core process of the firm. As described above, the organization sets the conditions and the culture for promoting KS as a regular practice, but the success of this approach depends on the employee's willingness to share their knowledge. Companies must continuously seek to align its workforce with KS philosophy to produce an expected outcome (Wang and Wang, 2012).

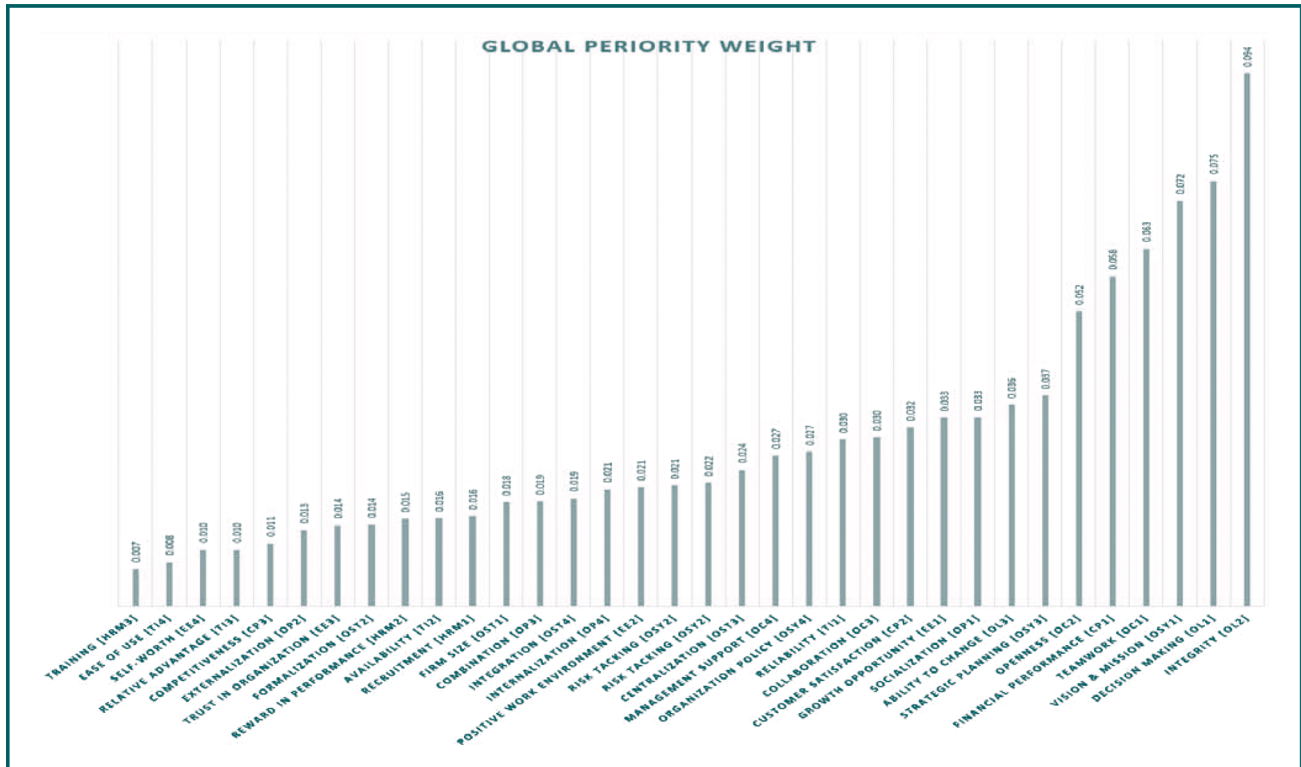
As part of the set of factors with a mid-level impact on KS, we identified that OST is an important condition for KS. These elements correspond to the design of the company structure and practices that enable and promote KS (Lei *et al.*, 2000). TI and HRM were the lowest impacted factors in the survey. However, this finding is in contrast to previous research. For the role of TI, we expected that this factor would be a primary impacting factor; however, the results are not consistent with the literature. This may be caused by the target organizations, which already use technology and may not view technology as a critical factor for KS. In addition, the survey was implemented in technology-intensive organizations. When organizations do not have a good TI, it is difficult to use disposable knowledge (Biloslavo, 2005). In the age of information, when data are an important raw material and an organization's ability to process and analyse data are central to enabling innovation, taking advantage of the increasing power of TI capabilities is a key factor for enhancing the capabilities of the organization (Lee, 2016).

Finally, the findings for HRM contrasted previous research. HRM is an effective approach that allows companies to establish a strong connection between the key areas of HRM, such as training, decision-making, performance appraisal and compensation and rewards with important areas of KS, such as knowledge acquisition, documentation, transfer, creation and application (Yahya and Goh, 2002). But, key tasks in HRM, such as communication, development, education and remuneration, are main weaknesses in HRM processes (Mulolli *et al.*, 2015) which might be reason for this result in current study.

The in-depth analysis of each of the factors revealed a set of sub-factors that had a high impact in the group and in the results of the global priority weight, which is shown in Figure 4. The most impactful sub-factors are decision-making and trust/integrity, which are sub-factors of OL. These two had the highest impact on KS. The decision-Making (OL1) and trust/integrity (OL2) sub-criteria are related to the role modelling that the company leadership exercises from top-to-bottom in a firm (Madu, 2012). This finding from the survey is consistent with the literature. The vision and mission (OSY1) sub-factor was the third highest impact sub-factor. Vision and mission are foundational elements of the strategic planning process as they frame the entire structure for outlining the strategy, strategic actions and performance measures.

Another important sub-factor is teamwork (OC1), which was the fourth high impact sub-factor. This impact was explained by needing to fuel results by combining skills and resources in a synergic process to obtain the expected outcome. OC must enable and stimulate teamwork (Biloslavo, 2005), and, thus, teamwork must be an inherent part of OC. The fifth highest impacting sub-factor was financial performance (CP1). This finding is consistent with the literature and was expected because the survey was implemented in revenue-driven organizations. This finding illustrates that allocating resources to the design of an organization based on knowledge does not generate short-term returns; therefore, companies must develop an ability to accelerate the creation of competitive advantages based on their learning abilities for KS (Melton *et al.*, 2006). Successful KS has a large impact on the success of an organization, specifically an organization in which KS is associated with the key variables that improve general organizational performance, consistent with Cummings and Teng (2003). Many researchers state that the field of KS lacks several key factors that influence KS success (Al-Azri *et al.*, 2010). Thus, this study is helpful for technology-intensive organizations to have an efficient and successful KS practices by considering critical factors, especially in growing economies, such as the UAE.

Figure 4 Global priority weights for sub-factors in technology-intensive organizations



5. Conclusion and recommendations

This empirical study on technology-intensive organizations in the UAE used AHP to assess the competitive dimensions of KS. The nine competitive priority factors: organizational leadership, organizational culture, organizational strategy, organizational structure, organizational process, corporate performance, HRM, technology infrastructure and employee engagement, were the primary factors that impacted KS in organizations. In the literature review, other sub-factors were also identified for each primary factor and were analysed in the four steps of AHP. In step one, the AHP model was constructed to understand the relation of different KS factors that impact KS and to provide a hierarchical model for KS decision-making in technology-intensive service organizations. The second step was to check the consistency, which demonstrated that all the results were acceptable because CR was smaller or equal to 0.10. The third step was to determine the pair-wise comparisons in the AHP model criteria for KS factors, and the last step was to develop the global priority weight for the sub-factors to identify the most impactful sub-factor on KS.

Based on these findings, OL, OC and OS are the primary factors that impact KS. In addition, OP, CP, EE and OST are second, which show that organizations should exert more efforts for these factors, which are important for KS and positively impact the organizations in different ways. Finally, TI and HRM had the lowest impact on KS, which was not expected in technology-intensive organizations. There was little interest in TI, which may be based on the belief that the organization should not invest in improving TI because the existing infrastructure is “good-enough.” Both assumptions reflect a potential show-stopper in these organizations if this belief continues to prevail, which will impact KS and other aspects of the organizations and are specifically related to the technology-intensive nature of the organization. Therefore, these organizations should employ an intensive TI by continuously updating their TI to satisfy their operational needs.

The findings above provide insight to organizations, specifically technology-intensive organizations, which have an interest in KS activity. Moreover, the findings from this study can be structured as extended research into two directions: including different constructs and other business sectors. Additionally, future empirical testing of this framework in similar and different organizational settings in different countries should lead to a better understanding of the validity and generalizability of the current findings. Future studies could also use structural equational modelling to better understand the critical factors for KS.

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