

Strategies for Knowledge Management Readiness at an Engineering Consulting Organization in South Africa

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Abstract: *Aim.* This article investigates knowledge management readiness at an engineering consulting firm in South Africa known as Zutari (Pty) Ltd, or Zutari, and suggest a strategy to achieve readiness in engineering firms. Engineering consulting firms are knowledge-intensive firms that offer specialised services in the provision of independent expert knowledge in the fields of engineering, science and other related areas in the public and private sectors, infrastructure, and construction sectors. Although knowledge management is widely acknowledged as a strategic enabler in engineering consulting firms, most initiatives fail, making a knowledge management readiness assessment essential before implementation. *Methodology.*

The target population was Zutari's permanently employed technical professionals. Stratified and systematic sampling methods were applied to select a sample of 285 technical professionals. A questionnaire was used to gather quantitative data. The assessment model of Aydin and Tasci (2005) was used to assign readiness levels for the critical success factors under investigation. *Findings.* The findings reveal that the level of knowledge management awareness among Zutaria staff is quite high, even though knowledge management is practised informally. A knowledge management readiness strategy is suggested to get Zutaria to the expected level of readiness. Knowledge management is widely acknowledged as a strategic enabler by employees in Zutari, with information technology currently the only critical success factor at the expected level of readiness. *Conclusion.* A knowledge management strategy is suggested to assist Zutaria in achieving the expected level of readiness. Further research could test the effectiveness of the readiness strategy in different contexts using mixed methods research. This research will add new knowledge to the body of knowledge in the engineering consulting sector and help firms planning to implement knowledge management. *Implication.* Not many studies have been conducted to test the organisational readiness for knowledge management in engineering consulting firms. This article adds to the body of knowledge in this field.

Keywords: Knowledge management readiness, Engineering consulting, Knowledge, Knowledge management, Knowledge processes

1. Introduction

Knowledge management in engineering consulting firms will leverage knowledge and best practices, providing prompt response to customer requests, avoiding reinventing the wheel and curbing the loss of knowledge when experts leave the company (Rubin & Powers 2017; Majorize & Buckley 2019; Bishop 2009; Parsons 2017; Pope 2019). Engineering consulting firms are knowledge-intensive firms that employ knowledge workers such as engineers, architects and design thinkers who provide professional consultancy to clients by assisting them in identifying and analysing problems and recommending and implementing solutions (Robinho 2015; Mazorodze and Buckley 2019; Kou 2019). Due to the large amounts of knowledge, generated most of these firms struggle to leverage the knowledge scattered across the organisation or to locate experts to assign to new projects (Mesher, Abdul-Malak, Mazorodze and Buckley 2019). A knowledge management readiness assessment will serve as a guide in planning and implementing knowledge management initiatives, thus minimising risks (Mohd Zin and Egba 2010). Mohd Zin and Egba (2010) define knowledge management readiness as the degree to which the employees in an organisation, the knowledge management processes, and information technology are ready to take advantage of the benefits accruing from knowledge management implementation.

Zutari is among the 580 engineering consulting firms in South Africa with a membership at Consulting Engineers South Africa with vast amounts of tacit and explicit knowledge. This firm has a long-standing history in the engineering consulting field dating back 90 years (Zutari 2021). It became an independent company in 2020 following the demerger of the African business and Aurecon Australia, a global international engineering and infrastructure advisory company (Aurecon Africa 2020). It has 16 offices in South Africa and 13 in other African countries with the head office is in Pretoria. Zutari has 1900 employees: 1600 are technical professionals and 300 are support staff. This firm works with clients to co-create solutions in asset management and digitisation, power generation, storage, transmissions and distribution, environment and climate resilience and many other areas (Zutari 2021). However, most of the workers in this firm work in silos; this affects the production of timely, high-quality project proposals and bids, as revealed by the Chief Executive Officer of Zutari in his address to staff at the beginning of 2021. Considering its geographically dispersed locations on the continent and its potential to become a benchmark for other companies in the engineering consulting sector in South Africa, this study sought

to ascertain Zutari's readiness for implementing knowledge management. The research outcome will help Zutari and other engineering consulting firms prepare for knowledge management implementation.

2. Problem Statement

Knowledge management in engineering consulting firms can lead to improved client satisfaction and decision-making, enhanced work quality and improved overall job performance and satisfaction, thus keeping these firms competitive (Rubin and Powers 2017; Alaudin et al. 2019). Knowledge management at Zutari is still elementary as the organisational structure and delegation of authority are yet to be defined. The question that seeks to be answered are: What is the current state of knowledge management readiness at Zutari? How can the knowledge management readiness strategies at Zutari be enhanced?

3. Knowledge in Engineering Firms

knowledge is defined by Nonaka and Takeuchi (1995:58) as a justified true belief and dynamic human process of justifying personal belief toward the 'truth'. The different typologies of knowledge highlighted in the literature may be classified into two major subcategories as tacit and explicit knowledge. The number of engineering consulting firms investing in knowledge management globally is increasing. Organisations without structured knowledge management may be wasting resources considering that an employee may spend 16% of their weekly 40 hours of work looking for information, and 44% of the time failing to find the information (Rubin & Powers 2017). In global engineering firms, employees are spread across geographically dispersed locations, making it difficult to access the tacit knowledge and to connect employees for collaboration, creation, and knowledge sharing (Barnard and Rothe 2003, Learning Uncut 2019). Despite the benefits of knowledge management by engineering consulting firms, the uncertainty on implementing a viable and cost-effective knowledge management initiative presents a barrier to knowledge management implementation in engineering consulting firms. A knowledge management readiness assessment is necessary to determine the level of readiness for implementing knowledge management; it minimises risks as it serves as a guide to leaders in planning and implementing knowledge management initiatives (Mohd Zin & Egbu 2010).

4. Organisational Readiness for Knowledge Management

Organisational knowledge management readiness is its ability to adopt knowledge management successfully and use it to benefit the organisation (Mohammadi et al. (2009). A readiness assessment will reveal the needs of the organisation, its strengths and weaknesses, any opportunities, threats, and risks regarding knowledge management implementation. Knowledge management readiness requires effective investment in the implementation of critical success factors (Davenport, De Long and Beers 1998; Hasanali 2002; Wong 2005). The common themes that determine readiness are people, structure, processes, infrastructure, technology, culture, content, community, and computing (Lee & Choi 2003; Razi, Karim and Mohamed 2017; Andrawina et al. 2018; Gurubie and Tengan 2019; Kaburuan 2019) as noted in Table 1 below. It is clear from Table 1 that and the reviewed literature on knowledge management readiness that people, process, IT, organisational structure and culture are recurring factors.

Table 1: A Summary of Recurring Elements by Different Scholars in their Measurement Frameworks

References	People	Process	Organisational culture	IT Technology	Organisational structure
Lee and Choi (2003)			✓□	✓□	✓□
Nagarajan et al. 2009	✓□	✓□		✓□	
Mohd Zin & Egbu (2010)	✓□		✓□	✓□	✓□
Shahidi et al. (2015)	✓□	✓□	✓□	✓□	
Pradana et al. (2015)	✓□				✓□
Ramadhan and Andrawina (2015)		✓□	✓□	✓□	

Razi et al. 2017; Razi and Karim (2010)	✓□		✓□	✓□	✓□
Andriwana et al. (2018)	✓□	✓□	✓□	✓□	✓□
Kaburuan (2019)		✓□	✓□	✓□	

People are the source of knowledge and critical to knowledge management. They play one of manager's employees' and use their skills or to share personal knowledge (Obaide 2004; Pradana et al. 2015; Andrawina et al. 2018). Botha (2007) refers to them as repositories of knowledge since tacit knowledge resides in people's heads. People provide leadership and sponsorship, support knowledge sharing processes, manage and measure knowledge flows, and content is the knowledge what is managed. It is widely accepted that organisational culture plays an important role in knowledge management implementation in engineering consulting firms (Mohd Zin and Egbu 2010; Maraura 2015; Enshassi, Falouji, Alkilani, and Sundermeieri 2016). Cultural readiness is the extent to which an organisational culture promotes the adoption of knowledge management processes among the employees (Hasanali 2002). The variables suggested in the literature for measuring cultural readiness for knowledge management are collaboration, trust, learning, business strategy, management support and reward. The organisational structure influences knowledge management success. An organisational structure defines how an organisation is divided to manage and support knowledge management (Andrawina et al. 2018). Razi and Karim (2010) classify organisational structures as decentralised and informal. Nonaka and Takeuchi (1995) argue that the rigid horizontal and vertical divisions in hierarchical organisational structures distort knowledge. Mohd Zin and Egbu (2010) encourage organisations to adopt organisational structures that promote teamwork, project-based work and multi-skilled employees that encourage coordination among peers. Knowledge management theorists also recommend flexible and non-hierarchical organisational structures for knowledge management implementation.

IT is critical to knowledge management success and has been used by some scholars to assess IT readiness (Lee and Choi 2003, Razi and Karim 2010; Razi et al. 2017, Shahidi et al. 2015; Kaburuan 2019). A reliable technological infrastructure connects the people to the knowledge processes. Knowledge management also involves different interdependent knowledge processes such as creation, storage, retrieval, transfer and application, defined differently by different authors. Gonzalez and Martins (2017) highlight acquisition, storage, distribution and use. Hansen, Nohria and Tierney (1999) identify two basic strategies for managing knowledge as codification and personification. Codification focuses on capturing explicit knowledge in electronic format and availing it for retrieval. Personification focuses mainly on interpersonal knowledge transfers through personal interaction on communities of practice (CoPs) and enterprise socialisation spaces. A knowledge management strategy should be centred on people in the organisation, not technology (Becerra-Fernandez and Sabherwal 2010). The knowledge management strategy should align with the business strategy of each organisation (Guribie and Tengan 2019).

5. Theoretical Frameworks

The readiness model of Razi et al. (2017) was adopted in this study for identifying critical success factors, the Aydin and Tasci (2005) model to assign a knowledge management readiness level to each variable. Razi et al. (2017) identifies knowledge creation processes, organisational culture, organisational structure, IT, individual perception, and organisational members' behavioural intention in the knowledge management readiness assessment framework. The readiness assessment model of Aydin and Tasci (2005) was used to assign a knowledge management readiness level to each variable, critical success factor and the overall organisational knowledge management readiness level using the calculated mean values. This model enables easy coding and assessment; the alternatives are coded 1, 2, 3, 4 and 5, as in a 5-point Likert-type scale. The 3.41 mean score is the expected level of readiness. It is obtained by identifying the critical level using the formula: 4 intervals/5 categories = 0.8. The divisions of 0.8 demarcate the intervals. Other mean scores are either less or higher than the expected level of readiness. Lower scores indicate that they are not ready and require some work. Higher scores indicate readiness but require some work still. Based on this analysis, the levels of readiness are depicted in Figure 1.

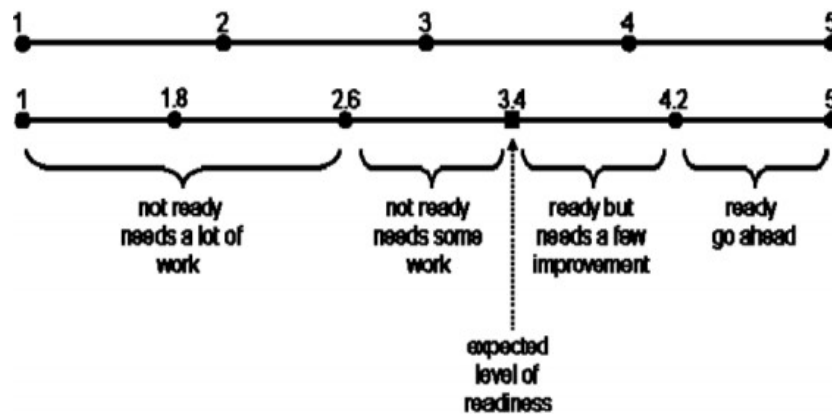


Figure 1: Readiness Assessment Model (Aydin & Tasci 2005)

6. Research Methodology

A quantitative research approach and a case study research design using Zutari as a unique case were adopted in this study. Questionnaires were used to collect data. The accessible population consisted of 1 443 technical experts

working on a permanent basis. A proportionate stratified sampling of the departments was made. Hayes's formula (2021) was used to determine the proportionate stratified random samples of the units as (sample size/population size). For a stratum size of 167, the sample size is calculated as $(285/1443) * 167$ to obtain 33. This was followed by systematic random sampling using the formula of Taherdoost (2017). Using the target population of 1 443, with a confidence level (Z) of 94%, percentage occurrence of a state (P) of 50% and the maximum error (E) of 5%, the sample size (n) was 285 employees.

The study was guided by the following objectives:

- Assess the level of knowledge management readiness for implementing a knowledge management initiative.
- Suggest a knowledge management readiness strategy to guide Zutari in implementing a successful knowledge management initiative.

7. Knowledge Management Readiness by Variable

The variable means shown in Table 2 below were assigned a readiness level using the readiness model of Aydin and Tasci (2005) in Figure 1 above.

Table 2: Knowledge Management Readiness by Variable

Critical success factor	Variable	Mean	Readiness
People	Knowledge of knowledge management	3.1	Not ready, needs some work
	Perceived usefulness	3.7	Ready, needs a few improvements
	Socialisation	3.1	Not ready, needs some work
	Externalisation	3.2	Not ready, needs some work
	Combination	3.4	Expected level of readiness
	Internalisation	3.1	Not ready, needs some work
Process	Knowledge creation	3.3	Not ready, needs some work
	Knowledge identification	3.1	Not ready, needs some work
	Knowledge storage	3.2	Not ready, needs some work
	Knowledge sharing	3.2	Not ready, needs some work

Critical success factor	Variable	Mean	Readiness
IT	IT support	3.2	Not ready, needs some work
	ICT use	3.4	Expected level of readiness
	ICT	3.5	Ready, needs a few improvements
Organisational structure	Distribution of authority and control	3.4	Expected level of readiness
	Flexibility	3.0	Not ready, needs some work
Organisational culture	Collaboration	3.2	Not ready, needs some work
	Trust	3.4	Expected level of readiness
	Learning	3.3	Not ready, needs some work
	Strategy	3.1	Not ready, needs some work
	Top management support	3.1	Not ready, needs some work
	Reward and recognition	2.5	Not ready, needs some work

The average value of the mean values of each variable was used to calculate the mean for the corresponding critical success factor. Each critical success factor mean value is assigned a readiness level in Table 3 below.

Table 3: Critical Success Factor and Overall Organisational Mean and Readiness

CSFs	Mean	Readiness level
People	3.9	Ready needs a few improvements
Process	3.2	Not ready needs some work
IT	3.4	Expected level of readiness
Organisational structure	3.2	Not ready needs some work
Organisational culture	3.1	Not ready needs some work
Overall organisational mean	3.3	Not ready needs some work

The overall readiness score for the people dimension is 3.9, which shows that Zutari strongly values its people as they are the source of knowledge and create, acquire, and share knowledge; this is in line with Obaide (2004)'s recommendations to invest in people. The use of people-centred techniques, such as succession planning, mentoring, tutoring, discussions, technical forums, real-time document collaboration tools and lessons-learned sessions have been encouraged (Carrillo 2004 and Bishop 2009). . The overall readiness score for process as a critical success factor was 3.2, indicating that Zutari's processes are elementary. Knowledge is created in the organisation through learning, research, and development, problem-solving, creativity and innovation. Tacit knowledge is shared through formal and informal socialisation such as mentorship, meetings, CoPs and brainstorming sessions. Creating an organisational culture and structure conducive to knowledge sharing and nurturing the attitude of seeking help among staff helps to improve tacit knowledge sharing (Obaide 2004; Collison and Parcell 2009).

ICT had the highest mean score of 3.5 and ICT support had the lowest mean score of 3.2. ICT use had a mean of 3.4, equivalent to the expected level of readiness. The overall readiness score for the IT critical success factor was 3.4, which equates to the expected readiness level. IT should not be an end; it should complement a pre-existing knowledge-sharing culture as recommended by Frost (2014). Knowledge management is more than the mere application of IT (Ragab and Arisha 2013; Kuo 2019); there should be a balance between people, process and technology (Bishop 2009; Kuo 2019). The overall readiness level for organisational structure was 3.2. Zutari has a flexible, flat and decentralised organisational structure that facilitates development, acquisition and sharing, and shortens the lines of communication between employees and their management. Zutari employs functional groupings that allow knowledge development and interchange of ideas between experts in the same discipline. The organisational structure has a bearing on the culture as it supports networking and knowledge sharing among the employees. The overall readiness level for organisational culture was 3.1, which indicates that it still needs some effort to get it to the expected level of readiness. Strategy and management support had a mean score of 3.1, reward and recognition 2.5, collaboration 3.2 and learning 3.3, indicating that they all

require some work to get them to the expected level of readiness. Reward and recognition had the lowest mean score of 2.5. Though there is evidence that reward and recognition do take place, it is unclear to most staff. Reward and recognition of those willing to learn, teach and share is a strategic tool to promote knowledge sharing (Becerra-Fernandez and Sabherwal 2010), and must be done visibly for all to see. Examples of informal rewards recommended in the literature include nominating a knowledge management employee of the month and peer recognition is considered a strong motivation with a more sustainable impact when compared to financial rewards (Collison and and Parcell 2004).

8. Knowledge Management Readiness Strategy for Zutari

There is a need to define a strategy for knowledge management implementation at Zutari. The strategic focus areas are: incorporate knowledge management as a business objective, conduct knowledge management awareness campaigns, put in place the necessary infrastructure to support the knowledge management processes and ensure regular monitoring by conducting progress reviews. Each sub-strategy is discussed in chronological order in subsequent paragraphs, starting with the first stage, as presented in Figure 2 below.

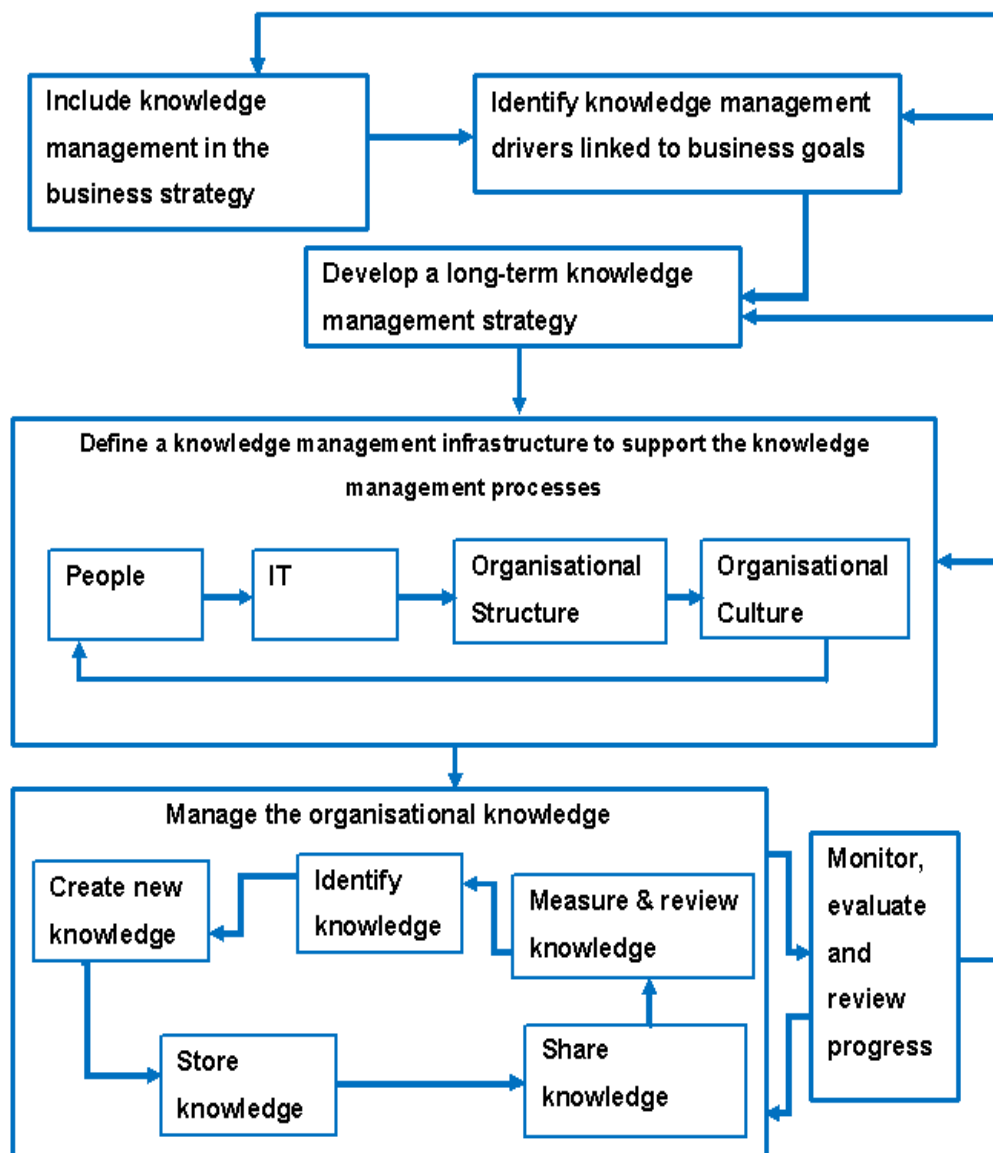


Figure 2: Strategy to Guide Knowledge Management Implementation in Zutari

The research findings reveal that Zutari has an information management standard instead, pointing to the possible existence of confusion between knowledge management and information management. A knowledge

management strategy should be developed that entails identifying and defining knowledge management roles and responsibilities and setting up a knowledge management team. A knowledge management strategy is the overall organisational approach to aligning all its knowledge with its business strategy's knowledge requirements (Mohd Zin and Egbu 2010).

Knowledge management infrastructure is a critical success factor for knowledge management implementation. A balanced knowledge management infrastructure facilitates knowledge identification, creation, storage, sharing and its measuring and reviewing for improvement. The framework of Razi et al. (2017) adopted for this study focuses on the importance of people, process, technology, organisational structure and culture. People influence organisational knowledge management readiness in terms of knowledge creation, leadership, sponsorship, management support, skills, participation and involvement (Harper 2019). Obaide (2004) suggests developing and nurturing employee knowledge management skills. Zutari should develop knowledgeable employees by implementing programmes that facilitate active learning and offering training in areas where knowledge is needed, as recommended by Farnese et al. (2019).

IT timeously connects the people who require the right content (Harper 2019). Although the research findings reveal that Zutari's IT is ready for knowledge management implementation, with a readiness score of 3.4, Zutari should however stay alert given that technology evolves rapidly. IT should be continuously reviewed and kept current. Zutari should continue to provide adequate training for all ICT tools and technologies for effective knowledge management.

The readiness score for organisational structure was 3.2, indicating that Zutari's organisational structure is not ready and needs some work to get it to the expected level of readiness. The firm should promote formal and informal networks and cross-functional teams to increase knowledge sharing. Nurturing CoPs or social networks to enhance knowledge sharing (Wenger, McDermott and Snyder 2002). In terms of organisational culture, it was 3.2 indicating that Zutari not ready for knowledge management implementation. Nenungwi and Garaba (2022) identify organisational culture as a determinant of administrative norms and values, beliefs, and work ethics that either encourage or hinder learning and knowledge sharing.

The readiness level score of knowledge management processes revealed that Zutari's is not ready for the implementation of knowledge management. Zutari should employ knowledge creation processes, among which are learning and development, problem-solving, innovation and creativity, socialisation, externalisation, combination and internalisation (Gonzalez and Martins 2017). Zutari significantly invests in its employees' development through formal and informal training programmes, workshops, conferences, coaching and mentorships. This experience can be formalised and documented as best practices, user manuals, procedures, check lists and reports that can be stored and shared over time to enhance performance and support innovation (Farnese et al. 2019). Zutari should develop programmes that promote externalisation of tacit knowledge such as mentoring, apprenticeship and demonstrations, and a strong knowledge-sharing culture to preserve the core knowledge.

Knowledge becomes passive if it is not reviewed or modified. Guribie and Tengan (2019) recommend ongoing monitoring and review to assess knowledge management maturity. Given that Zutari operates in a volatile technological and global competitive environment, it should implement knowledge review processes to evaluate and replenish knowledge components, help the business adapt to environmental stimuli, solve current organisational problems, and address the current applicability and risk of knowledge. If not reviewed, a large part of the knowledge repository may be forgotten or ignored.

9. Conclusion

The study sought to determine the knowledge management readiness of Zutari and suggest a strategy for implementing knowledge management. The findings revealed that Zutari is not ready for knowledge management implementation. It requires the development of a knowledge management readiness strategy to help it achieve the expected level of readiness. The research outcomes of this study will be generalised to engineering consulting firms in South Africa and Africa Other engineering firms grappling with knowledge management are set to benefit from adopting and using this strategy. Engineering and consulting firms will learn how to conduct a knowledge management readiness assessment and avoid the pitfalls in knowledge management. Further research could test the effectiveness of the readiness strategy in different contexts using mixed methods research to improve to strengthen reliability and internal validity.

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