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A knowledge management implementation strategy for architectural firms in Gauteng, South Africa

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Background: The application of knowledge management (KM) practices in architectural firms differs across firms. By developing a KM implementation strategy, architectural firms will optimally benefit from KM.

Objectives: The objective was to investigate the application of KM practices in architectural firms and to develop an implementation strategy for architectural firms to benefit from KM.

Method: Based on Nonaka's socialisation, externalisation, combination and internalisation (SECI) model, the study investigates how architectural firms generate, disseminate and preserve knowledge. Employing a qualitative, multi-case study methodology, semi-structured interviews were carried out at five architectural firms to identify factors that either facilitate or impede KM adoption.

Results: Large architectural firms implement customised KM systems, whereas smaller firms face difficulties with established methodologies because of resource limitations. Notable challenges include the capture of tacit knowledge, time restrictions and financial limitations. Supportive elements include backing from leadership, promoting a learning culture and using building information modelling (BIM) technologies.

Conclusion: The study suggests an 11-step strategy for implementing KM, focusing on cost-effective technological solutions, ongoing professional development and environments that encourage collaborative learning. This organised approach aims to enhance project results, boost organisational effectiveness and ensure the sustainability of KM practices.

Contribution: The article presents insights that can inform and improve KM practices within the architectural industry. By tackling the specific challenges confronting architectural firms in South Africa, the recommendation to building industry professionals and policymakers highlights the transformative potential of effective KM practices in fostering innovation, improving efficiency and securing competitive advantages within the architectural field.

Keywords: knowledge management; architectural firms; socialisation, externalisation, combination, and internalisation model; tacit knowledge; building information modelling; South Africa.

Introduction

Knowledge management (KM) is an essential organisational procedure that focuses on creating, collecting, storing and disseminating knowledge to improve decision-making, foster innovation and boost performance. In architecture, where projects are naturally intricate and knowledge-driven, KM is crucial for achieving efficiency and sustaining a competitive edge (Korkmaz 2018). Successful KM practices allow architectural firms to handle both tacit knowledge – personal, experience-based and often challenging to articulate – and explicit knowledge, which is documented and easily shared (Marzo, Dumay & Scarpino 2024; Meyer 2025; Nonaka & Toyama 2003). However, despite its significance, adopting KM in architectural firms encounters considerable obstacles, particularly in South Africa, where the construction industry functions in a fluctuating and resource-limited landscape (Schindler & Eppler 2003; Statista Research Department [SRD] 2023).

South Africa's architectural firms play a vital role in the construction sector, aiding infrastructure development and overall economic growth. Nonetheless, inefficiencies in KM processes, particularly in capturing and disseminating tacit knowledge, have been recognised as significant hindrances to the effective implementation of projects (Squire 2023). This issue is particularly evident in project-based organisations (PBOs), such as architectural firms, where knowledge is

spread across teams that frequently dissolve after project completion, resulting in considerable knowledge loss (Nonaka 1994; Ajmal, Takala & Kekäle 2008; Tuna, Brusoni & Schulze 2019). As a result, these firms face challenges related to 'organisational amnesia', described by Dooley, Lupton and O'Sullivan (2005), as a limitation to their capacity to learn from previous projects and enhance their processes over time.

The global construction industry is recognised as a knowledge-driven field that depends significantly on efficient cooperation among various participants, such as architects, engineers, contractors and clients (Egbu & Robinson 2008). In South Africa, problems such as incomplete designs, frequent alterations to projects and ineffective communication have led to delays and inflated costs in significant construction initiatives and loss of market intelligence in a highly competitive environment (Asante 2025; Baloyi & Bekker 2011; Patrick 2014). To tackle the concerns of inflated costs, it is essential to implement strong KM practices that enable knowledge exchange, encourage organisational learning and improve project results (Marzo 2024; Squire 2023).

Strong KM practices have their roots in theories linked to knowledge sharing and creation through socialisation, externalisation, combination and internalisation (SECI) of knowledge (Dedunu, Weerasinghe & Wickcramasinghe 2025). This research is based on Nonaka's SECI model for creating organisational knowledge because the most recent critical evaluation of the model determined that it is relevant in the digital age (Dedunu et al. 2025; Kahrens & Früauff 2019). The SECI model illustrates how tacit and explicit knowledge interact dynamically within an organisation, enhancing innovation and learning (Nonaka & Toyama 2003). For example, architects frequently acquire tacit expertise through their experiences and collaborative efforts, which can then be transformed into explicit knowledge through documentation and collaborative tools, such as building information modelling (BIM). Likewise, explicit knowledge documented in project files can be assimilated by team members to enhance their future endeavours. Utilising the SECI model enables this research to examine KM practices in a structured way and suggest approaches that effectively address both the generation and sharing of knowledge within architectural firms.

This article is organised as follows: The literature review describes current KM theory and challenges specific to the construction industry, focusing on the architectural sector in South Africa. The methodology section outlines the qualitative multicase study approach for data collection and analysis. The findings and discussion section reveal insights into KM practices, facilitators and obstacles identified in the firms involved. The proposed KM implementation strategy suggests practical steps to improve KM, emphasising the importance of nurturing a learning culture and utilising technologies, such as BIM. Finally, the conclusion and recommendation encapsulate the study's contribution by filling the research gap and propose directions for future research.

Research gap

Even though previous studies investigated KM practices across various industries, few studies focus on implementing KM in architectural firms, specifically within the South African landscape, emphasising cost-effective solutions (Baloyi & Bekker 2011; López & Yepes 2024; Othman & Elkady 2021). Knowledge sharing is a cost-neutral solution; when knowledge sharing is affected, the architectural firm does not benefit from best practice (Squire 2023). According to Asante et al. (2025), knowledge sharing is vital for facilitating the creation of knowledge within an organisation. Larger architectural companies typically create customised KM systems, while smaller firms encounter difficulties stemming from limited resources and the absence of organised KM strategies (Shokri-Ghasabeh & Chileshe 2014; Yap, Lim & Skitmore 2022). Additionally, although BIM is acknowledged as a revolutionary technology that supports KM, its implementation varies among firms because of financial constraints and skill gaps (Atencio, Mancini & Bustos 2025; Goldstein 1986). This research aims to fill these voids by examining how architectural firms in Gauteng, South Africa, adopt KM, recognising the elements that promote or impede its implementation, and suggesting a detailed KM implementation framework. By examining how architects in Gauteng firms adopt KM practices, this study tackles the distinct challenges architectural firms encounter, thereby reducing the current research gap.

Research objectives

The research aim is to develop a practical KM implementation strategy suited to the requirements of architectural firms. In particular, the research aims to:

- Understand architects' perspectives on KM
- Identify elements that promote the adoption of KM
- Examine the difficulties architects encounter in executing KM
- Formulate a KM implementation strategy that addresses the difficulties encountered by architects

These objectives focus on expanding knowledge of KM while providing feasible solutions to enhance project results and organisational effectiveness of project-based organisations.

Literature review

The theoretical foundation of KM is well-established. This section reviews existing knowledge on KM linked to the effectiveness of PBOs.

Knowledge management: Theoretical foundations

The KM involves the organised processes of generating, capturing, storing and disseminating knowledge to improve organisational learning, innovation and performance (Nonaka & Toyama 2003). The KM processes include two main types of knowledge: tacit and explicit. Tacit knowledge

is embedded in personal experiences and challenging to express, while explicit knowledge is documented and easily communicated through resources such as manuals and databases (Dedunu et al. 2025; Ferrada et al. 2014). Unifying these two types of knowledge is fundamental to Nonaka's SECI model, which offers a useful framework for comprehending organisational knowledge creation through socialisation, externalisation, combination and internalisation.

The SECI model illustrates the transformation process of knowledge creation and knowledge sharing through these dynamic interactions according to Nonaka and Toyama (2003):

- *Socialisation*: Sharing implicit knowledge through collaborative experiences and teamwork.
- *Externalisation*: Transforming implicit knowledge into explicit formats, such as written documentation.
- *Combination*: Merging explicit knowledge into a cohesive knowledge framework.
- *Internalisation*: Assimilating explicit knowledge to develop new implicit insights.

The SECI model is especially relevant for architectural firms, where projects depend significantly on explicit knowledge, such as plans and timelines, and implicit knowledge, such as creative design intuition and team dynamics. Dooley et al. (2005), Baloyi and Bekker (2011), Patrick (2014) and Babcock (2023) mention team dynamics, creativity, synchronising timelines and project management as typical strengths and weaknesses of PBOs.

Knowledge management in project-based organisations

Project-based organisations, including architectural firms, encounter specific challenges related to KM because of their project-specific and temporary nature. Knowledge frequently resides with individual team members, and the dissolution of project teams after a project's completion often results in considerable knowledge loss. Dooley et al. (2005) refer to knowledge loss as amnesia of PBOs. In addition, the repetitive nature of projects within PBOs makes it difficult to systematically capture and reuse knowledge from one project to another (Ajmal et al. 2008).

Given the nature of PBOs, it is important to establish a learning culture, promoting open communication, collaboration and the proactive sharing of tacit and explicit knowledge (Ferrada et al. 2014; Styhre 2011). However, challenges, such as time restrictions, budget constraints and resistance to change often obstruct efforts to create a learning organisation (Ferrada et al. 2014). The absence of standardised KM frameworks further intensifies the challenges, especially in smaller firms with limited resources (Shokri-Ghasabeh & Chileshe 2014). Some of the challenges of KM in architectural firms, being a category of PBOs, are because of the work dynamic and intricate nature of PBOs, for example:

- *Sharing tacit knowledge:* Tacit knowledge, often linked to individual skills, is challenging to formalise and disseminate. A study in the Spanish construction industry indicated that ineffective sharing of tacit knowledge results in significant errors and inefficiencies (Forcada et al. 2013).
- *Fragmentation of projects:* Architectural projects involve stakeholders, such as clients, engineers and contractors, each with isolated knowledge. The temporary composition of project teams further hinders the transfer and retention of knowledge (Squire 2023).
- *Limited resources:* Smaller firms frequently lack the financial and technological means to implement thorough KM systems. Consequently, this leads to improvised KM practices that do not adequately capture and reuse knowledge (Shokri-Ghasabeh & Chileshe 2014).
- *Integrating technology:* Although tools such as BIM enhance KM by acting as storage for project knowledge, their usage is not uniform. High expenses and a shortage of skilled personnel pose significant challenges (Goldstein 1986; López & Yepes 2024).

The challenges linked to the work dynamic and intricate nature of PBOs can be observed in the lessons learned from construction projects.

Lessons from South African construction projects

South Africa's construction industry has encountered notable KM obstacles in significant projects, providing essential insights for architectural companies. A brief overview of three cases from the literature review presents insight into the necessity of KM:

- *2010 Fédération Internationale de Football Association (FIFA) World Cup projects*: Building facilities for the 2010 FIFA World Cup encountered delays and excess costs because of unfinished designs, frequent modifications and poor decision-making (Baloyi & Bekker 2011). These challenges underscore the necessity of strong KM practices, such as effective communication and detailed documentation.
- *Medupi power station*: Design alterations and technological hurdles during the construction of the Medupi power station highlighted the importance of comprehensive feasibility studies and collaboration among stakeholders (Thomas 2013). Open dialogue and early detection of potential issues are essential for alleviating risks.
- *Gautrain rapid rail project*: Many difficulties were experienced in the Gautrain project, where delays and budget excesses stemmed from insufficient planning and risk management (Patrick 2014). These experiences reinforce the significance of KM in facilitating precise cost estimation, risk evaluation and timely decision-making.

From the literature review, a clear picture emerges of the necessity of KM. Studies show that larger firms benefit most from customised KM systems; however, these solutions are expensive and often out of reach for smaller firms (Kale & Karaman 2012; Lee & Egbu 2007; Pellicer et al. 2014; Shokri-Ghasabeh & Chileshe 2014; Venkateswaran & Aundhe 2013).

The process of knowledge creation in architectural design is exceptionally dynamic, necessitating ongoing learning and adaptation (Styhre 2011). The lack of organised KM frameworks hampers architectural firms' ability to effectively utilise their past experiences (Ferrada et al. 2014; Pellicer et al. 2014). The KM practices frequently overlook cultural obstacles that hinder knowledge sharing among varied project teams (Ajmal et al. 2008). Architectural firms must remain aware of emerging trends and opportunities.

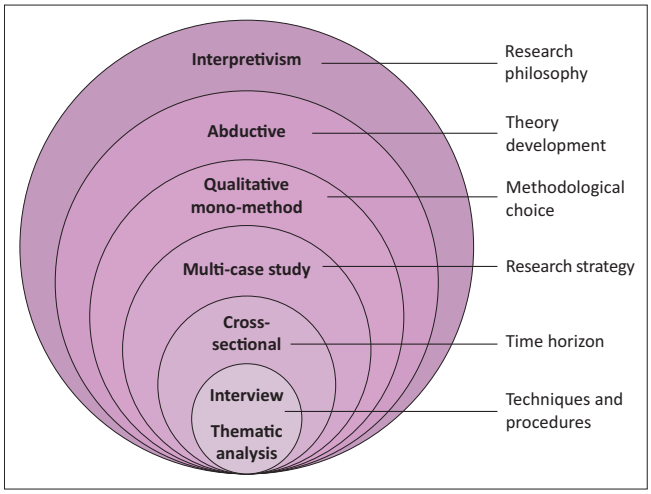
Advances in technology, particularly BIM technology and tools, offer new opportunities for improving KM in architectural firms. Since its earliest conception, BIM has seen many improvements as a centralised platform for storing, sharing and accessing project knowledge, enhancing collaboration and reducing errors (Anireddy 2024; Goldstein 1986; Hamid 2020; He 2017; Succar 2009). The BIM is useful for fostering a learning culture through a platform for professional development programmes and workshops to address some of the barriers to tacit knowledge sharing in PBOs (Ahankoob et al. 2023; Anireddy 2024; Forcada et al. 2013). By tackling the issues related to the sharing of tacit knowledge and limited resources, and by making use of fitting technology, architectural firms can leverage their knowledge assets to promote innovation and increase efficiency.

The theoretical foundation of the study is that efficient KM is crucial for architectural firms to enhance knowledge sharing, project outcomes, boost organisational performance and sustain their competitive edge. The theoretical framework links KM processes, benefits and challenges of knowledge creation and transfer to the renowned SECI model with application to architectural firms. At the same time, insights drawn from South African construction projects highlight the necessity of strong KM practices. Next, to develop a KM implementation strategy designed for South African architectural firms requires a fitting research methodology.

Research methods and design

This research utilised a qualitative methodology to explore how KM practices are applied by architectural firms in Gauteng, South Africa. Figure 1 illustrates the research onion, adopted from Saunders, Lewis and Thornhill (2016:164), which outlines the study's philosophical alignment and methodological choices. The study was rooted in interpretivism, focusing on the subjective experiences of architects and their interactions with KM practices. The abductive research approach focused on grasping personal experiences and socially constructed interpretations, which aligns with an interpretivist research philosophy.

Figure 1 illustrates the study's philosophical alignment and methodological choices. The abductive research approach enabled exploring how participants perceived and implemented KM in their organisational contexts. The SECI model provided the theoretical framework for developing a KM implementation strategy based on the research findings from data from the qualitative mono-method, that is, the interview data collection method. A multicase study research strategy was chosen to obtain comprehensive insights into the distinct challenges and prospects concerning KM in architectural firms across the Gauteng province of South Africa. To operationalise the investigation of KM practices within various architectural firms required interviews with architects representing five architectural firms. Eleven architects agreed to participate in the research as described in the sample description further below. The interview schedule utilised Nonaka's SECI model (Nonaka & Toyama 2003), taking into consideration that the order of questions should be combination, externalisation, socialisation and internalisation (C-E-S-I) to accommodate architectural firms' utilisation of BIM. In other words, socialisation and combination had to exchange places to accommodate how BIM has transformed architectural practice. Table 1 presents the interview schedule with questions grouped according to the modified sequence, thereby creating a unique C-E-S-I technique for the investigation of KM practices at architectural firms.



Source: Adopted from Saunders, M., Lewis, P. & Thornhill, A., 2016, *Research methods for business students*, 6th edn., Pearson Education, Harlow

FIGURE 1: The research onion.

TABLE 1: Combination, externalisation, socialisation and internalisation interview schedule.

Type of knowledge	Questions
Combination	What knowledge management tools does your firm use to enhance collaboration and information sharing among architects?
	Regarding project collaboration, how does your firm manage knowledge transfer between team members?
Externalisation	How does your firm capture and document tacit and explicit architectural knowledge?
Socialisation	How do you share information and knowledge among architects to capture expertise from each other?
Internalisation	In what ways does your firm encourage a culture of continuous learning in the firm?
General knowledge management	What challenges or barriers have you encountered in implementing knowledge management within your architectural firm?
	How did you overcome these challenges?
	What specific measurements have been put in place to protect sensitive or proprietary knowledge within your firm?
	What is your opinion about the underlying causes of the knowledge management problems?
	In your opinion, what could be the solution to knowledge management problems?

Table 1, the interview schedule, guided the data collection phase aimed at gathering rich data to form insights on the KM practices of various architectural firms. The C-E-S-I technique facilitated the process of developing a thorough understanding of the elements affecting the implementation and execution of KM from a representative sample.

The study population was architectural firms in the Gauteng province of South Africa. According to the SRD (2023), the size assortment of Gauteng architectural firms in 2023 ranged from micro-companies (1 to 9 employees) to medium-to-large companies (500 to 999 employees). The study sample consisted of 5 of the 25 architectural firms listed by SRD (2023). A purposive stratified sampling technique was utilised, focusing on participants who met specific requirements. Participants had to be based in the Gauteng province, as Gauteng represents one of the two major hubs of the South African construction industry. Participants had to be qualified as architects, actively involved in the construction industry in the past 5 years, and represent the level of Junior Architect, Senior Architect or director. Participants were selected from two micro-companies and three medium-to-large architectural firms to capture various opinions. These five architectural firms were represented by architects in their capacity as Director: Lead Architect (one participant), Director: Professional Architect (three participants). Director: Senior Architect (one participant), Senior Architect (one participant) and Junior Architect (five participants), in total, 11 architects. The names and roles of the participants were anonymised to protect their identities as per the ethical considerations.

Ethical considerations

Ethical clearance was obtained by the University of Johannesburg School of Consumer Intelligence and Information Systems research Ethics Committee (No. CBERECIKM2023SCiiS024).

The following ethical guidelines were followed to maintain the confidentiality of data:

- *Informed consent*: Participants received complete information regarding the research objectives and gave their written consent.
- *Confidentiality*: All collected data were anonymised to safeguard the participants' identities.
- *Voluntary participation*: Participants were made aware of their right to withdraw without facing any repercussions.

Once ethical clearance was obtained, data collection proceeded by means of a semi-structured interview. The semi-structured interview offered the flexibility to explore participants' experiences in depth while ensuring uniformity across the interviews. Each interview lasted between 30 min and 60 min and was conducted either face-to-face or online, depending on the availability of the participants. The data were collected from an in-depth interview with 11 participants underwent analysis through thematic analysis, utilising Braun and Clarke's (2006) six-phase framework of familiarisation, generating initial codes, searching for themes, reviewing themes, defining and naming themes and writing up themes into a cohesive narrative of the research findings.

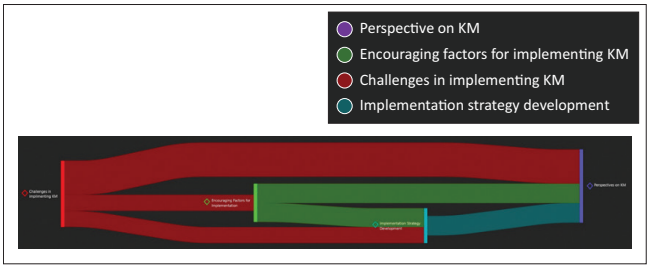
Results

The findings and discussion of themes are linked to the research objectives, namely the perspectives of participants regarding KM, encouraging factors for implementing KM, challenges or obstacles faced in implementing KM and elements of implementation strategy development specifically for architectural firms. The thematic analysis was conducted using ATLAS.ti qualitative data analysis software, which enabled effective coding and visualisation of themes (Figure 2).

Figure 2 presents one example of the code-occurrence Sankey diagrams linked to the themes created using intentional coding for perspectives on KM, identifying patterns of encouraging factors for implementing KM, the challenges in implementing KM and implementation strategy development. Figure 3 demonstrates the findings from the ATLAS.ti sentiment analysis dashboard.

Figure 3 demonstrates participants' sentiment towards KM in terms of sharing tacit knowledge. The positive sentiment findings highlighted the significance of mentorship and informal knowledge-sharing meetings in transferring tacit knowledge. Seasoned architects played a key role in mentoring junior staff, emphasising the importance of personal relationships for transferring knowledge. The positive sentiment findings identified the utilisation of explicit knowledge; design standards and project documentation were considered vital for ensuring consistency and reducing the need for rework. The positive sentiment was that well-structured documentation repositories improved their capability to reference previous projects and guide new designs. A combination of positive and neutral sentiments shows KM promotes teamwork and enhances project results, mostly when Key Performance Indicators (KPIs) and feedback mechanisms have been established. The negative sentiment findings identified limited resources and uneven implementation, highlighting a combination of hopefulness and doubt.

Figure 4 demonstrates the utilisation of the ATLAS.ti network analysis dashboard to arrive at the findings.



KM, knowledge management.

FIGURE 2: Code-occurrence Sankey diagram.

The objective of Figure 4 is to illustrate one of many views of the network analysis performed to arrive at the findings discussed next; therefore, the illustration does not intend to present readable words; instead, it captures the connections (Ngwenya 2025).

Discussion

The discussion is linked to the theoretical framework to integrate the factors contributing to successful KM practices in architectural firms. The discussion is

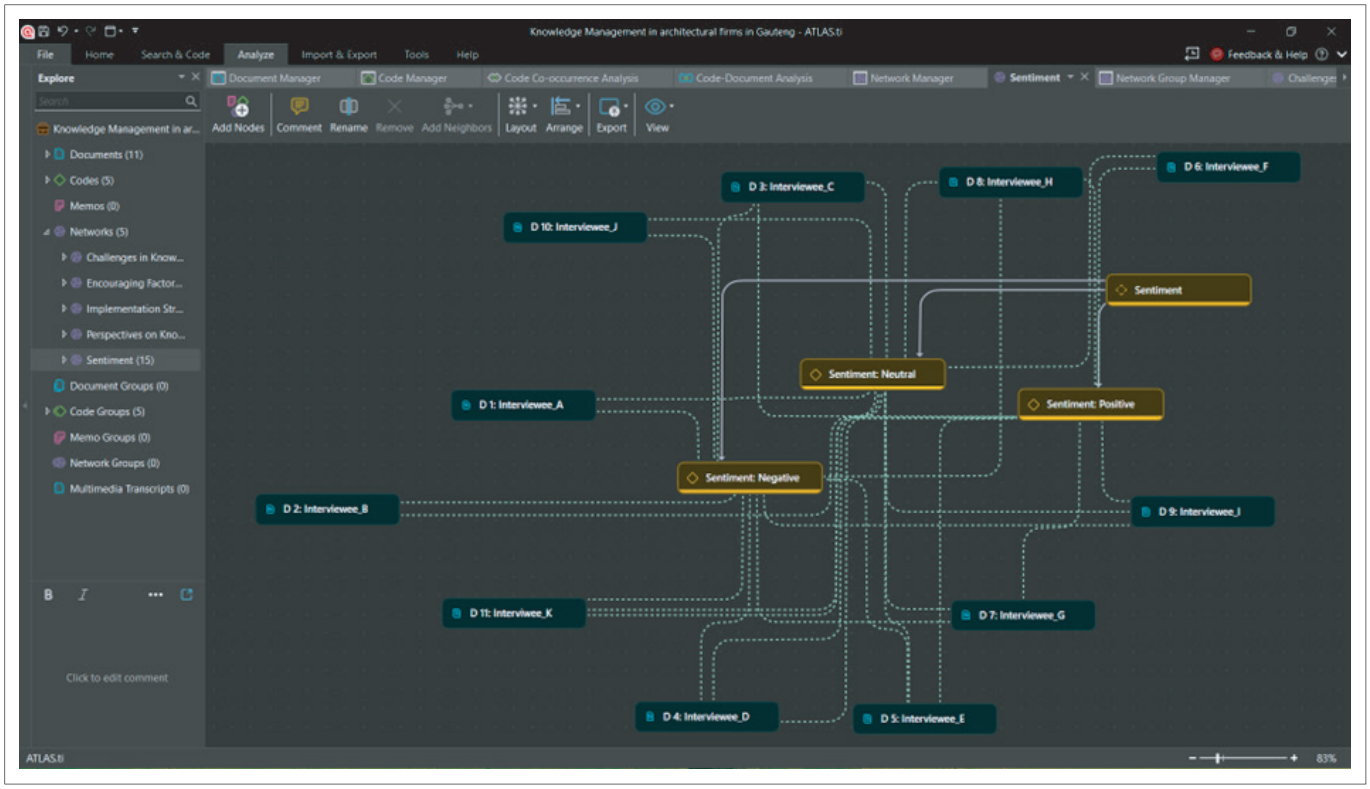


FIGURE 3: Sentiment analysis of the theme – Perspective of knowledge management.

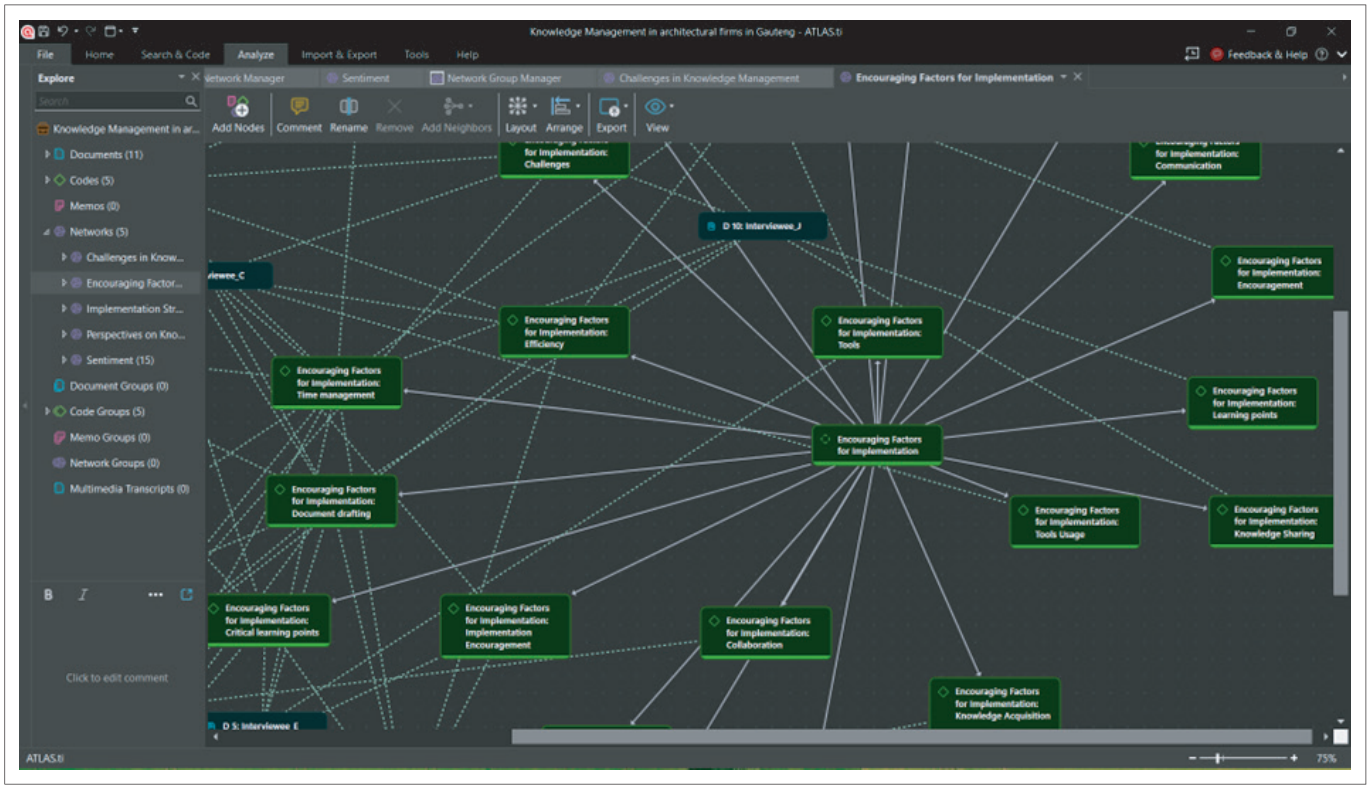


FIGURE 4: Network analysis of factors contributing to successful knowledge management implementation.

structured around the research objectives, namely, to understand architects' perspectives on KM, to examine the challenges architects encounter in executing KM, to identify elements that promote the adoption of KM and to formulate a KM implementation strategy that addresses the difficulties encountered by architects.

Perspectives regarding knowledge management

Participants noticed the dynamic nature of architectural work, which requires a smooth combination of tacit and explicit knowledge. Tacit knowledge is essential, as it supports creative problem-solving and decision-making. Participants viewed KM as crucial for boosting project efficiency, minimising mistakes and encouraging innovation.

Challenges in implementing knowledge management

Challenges such as time limitations and cultural barriers hinder the combination and internalisation stages, preventing the complete realisation of KM's capabilities. Participants encountered considerable obstacles that impede the practical application of KM:

- *Time limitations*: With stringent project timelines, participants must focus on immediate outputs rather than engaging in documentation and knowledge-sharing activities.
- *Resource constraints*: The necessary financial and technological resources required to invest in KM restrict small firms' efforts. Particularly, BIM is largely unattainable despite being recognised as an effective KM tool because of high expenses and a shortage of trained staff.
- *Absence of standardised procedures*: Lack of established KM frameworks causes uneven knowledge-sharing practices. Knowledge transfer relies on the proactive efforts of individual team members instead of being driven by an organisational directive.
- *Cultural challenges*: Resistance to adapting to change and hesitance to share knowledge emerged as significant cultural challenges. A guarded culture of reluctance to disclose proprietary techniques or design insights, fearing potential misuse or jeopardy to their competitive edge.

These challenges describe the main difficulties affecting KM implementation in architectural firms. Next, The next section discusses the enabling factors for successful KM.

Enabling factors for successful knowledge management

Consistent with Nonaka's SECI model, this study's findings highlight the interaction between tacit and explicit knowledge as essential for promoting organisational learning and innovation (Kahrens & Früauff 2019; Nonaka & Toyama 2003). Participants identified several enablers that facilitate KM practices, including:

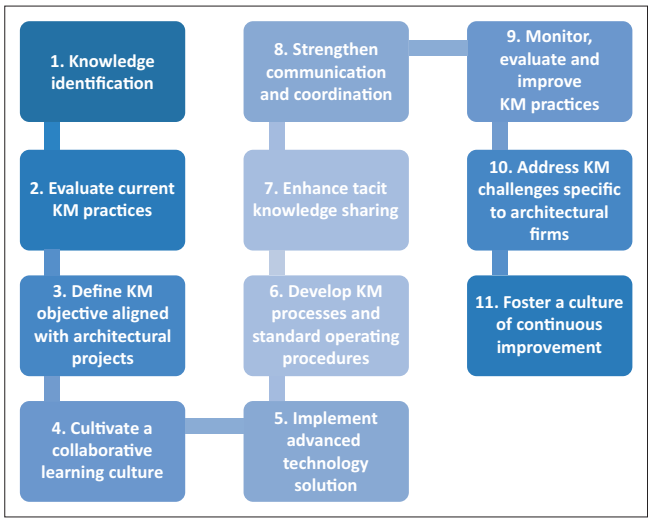
- *Leadership support*: Strong leadership is a critical KM enabler. Proactive leaders who champion KM initiatives and invest in technology and training increase effective KM adoption.
- *Organisational culture*: A culture of collaboration and continuous learning enhances KM efforts. Team-building activities and professional development programmes create an environment conducive to knowledge sharing.
- *Technological integration*: While the adoption of BIM was limited in smaller firms, participants from larger firms highlighted its benefits in facilitating real-time knowledge sharing, improving coordination among stakeholders and serving as a centralised knowledge repository.
- *Documentation practices*: Robust documentation protocols equip firms to capture and reuse explicit knowledge. Participants emphasised that maintaining organised and accessible documentation archives was vital for ensuring knowledge continuity.

The findings emphasise leaders' role in actively supporting KM initiatives. The socialisation aspect was observed in mentorship and informal knowledge-sharing practices, while externalisation was demonstrated through documentation efforts. Investing in supporting technologies connects knowledge creation with its practical application. This observation supports previous and recent studies that emphasise the significance of leadership in integrating KM into organisational workflows (Ajmal et al. 2008; Dedunu et al. 2025). The inconsistent adoption of BIM, unfortunately, still aligns with ancient literature pointing to resource limitations in smaller enterprises (Goldstein 1986), which means that although BIM has the potential to revolutionise KM by consolidating and optimising information, its practical implementation still requires dealing with the same old issues related to costs and training. While larger firms implement customised KM systems, smaller firms face difficulties with established methodologies because of resource limitations.

Knowledge management implementation strategy

From the abovementioned challenges, which include the capture of tacit knowledge, time restrictions and financial limitations, and the supportive elements, which include backing from leadership, promoting a learning innovation culture and using BIM technologies, the elements of the KM implementation strategy were identified. The KM implementation strategy has 11 steps (Figure 5). Each step incorporates the research findings for developing a customised implementation strategy for architectural firms (Figure 6).

In Figure 5, each step is shown in a box linked to the next box, representing the progression from one step to another, emphasising that a sequential approach will contribute to successful implementation. The steps of the KM implementation strategy are:



KM, knowledge management.

FIGURE 5: Steps of a knowledge management implementation strategy.

- *Knowledge identification*: Recognise various knowledge types and map knowledge sources by documenting the locations of knowledge.
- *Evaluate current KM practices*: Conduct a knowledge audit and assess KM maturity by reviewing the current state of KM practices.
- *Define KM objectives aligned with architectural projects*: Establish KM objectives that are in line with the existing architectural projects and create a long-term vision that corresponds with the firm's strategic goals.
- *Cultivate a collaborative learning culture*: Foster a cooperative learning environment by promoting cross-disciplinary teams and developing mentorship initiatives.
- *Implement advanced technology solutions*: Deploy advanced technological solutions, such as BIM and integrated design software, while creating centralised digital libraries.
- *Develop KM processes and standard operating procedures*: Create KM processes and protocols, including documentation standards and knowledge capture methods.
- *Enhance tacit knowledge sharing*: Form communities of practice and utilise platforms for knowledge sharing.
- *Strengthen communication and coordination*: Organise regular knowledge-sharing sessions and enhance stakeholder engagement.
- *Monitor, evaluate and improve KM practices*: Oversee and enhance KM practices by establishing KPIs and feedback mechanisms.
- *Address KM challenges specific to architectural firms*: Identify and address challenges related to time management, budget limitations and change management.
- *Foster a culture of continuous improvement*: Foster a culture of ongoing improvement, benchmark progress and continuously emphasise professional development and innovative thinking.

The steps of the KM implementation strategy are applied to architectural firms in Figure 6, and each action step expands in its application to architectural firms, as illustrated further in Figure 7.

Figure 6 demonstrates how the KM implementation strategy steps practically apply to the specific needs of architectural firms as actionable steps to achieve effective KM in architectural firms. For example, the first action step focuses on identifying knowledge, the second action step is to evaluate current KM practices the last action step on fostering a culture of continuous improvement. Ngwenya (2025) describes each action step and how it expands in its application to architectural firms. Figure 7 presents an example of how an action step expands to ensure the successful implementation of KM for architectural firms.

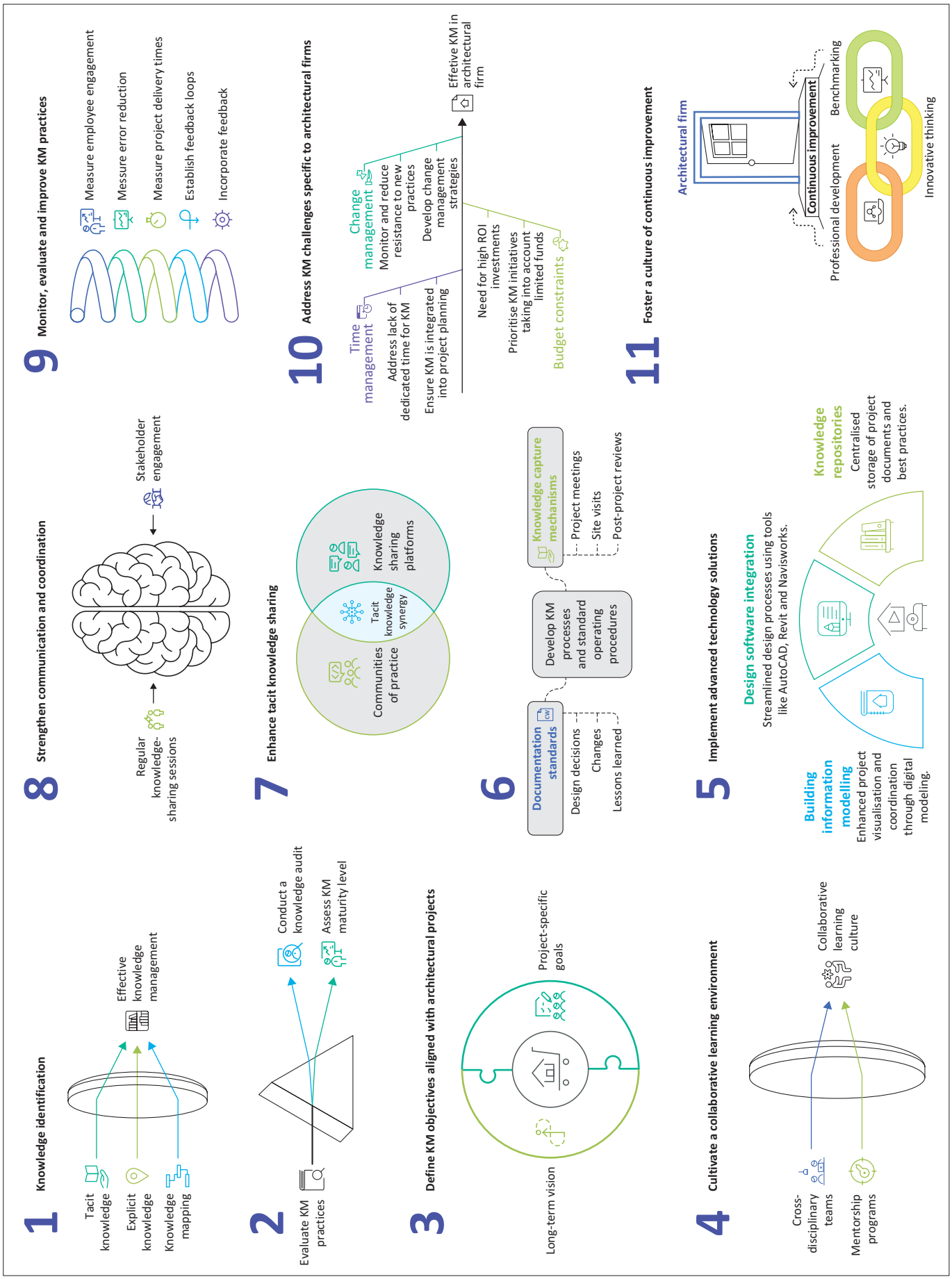
Figure 7 demonstrates how each action step expands to ensure the successful implementation of KM for architectural firms. For example, implementing advanced technology solutions requires investment in BIM to enhance project visualisation and coordination through digital modelling, with design software integration to streamline processes using AutoCAD, Revit and Navisworks, and build knowledge repositories to be utilised as centralised digital libraries for storing project documents, design templates and best practices. Each of the action steps illustrated in Figure 6 correlates with the SECI model and expands as demonstrated by Ngwenya (2025). This article reports the findings of one section of a larger study (Ngwenya 2025), with the emphasis on developing a KM implementation strategy for architectural firms.

Contribution to the existing body of knowledge

The article presents an 11-step KM implementation strategy that offers a practical guide for architectural firms to address challenges and utilise their knowledge resources effectively. By promoting a culture of knowledge sharing, investing in technology and aligning KM goals with organisational objectives, firms can boost innovation, enhance project results and attain sustainable growth.

Recommendation

As the target population included both large and small architectural firms, recommendations are made separately. For large architectural firms, KM implementation begins with allocating resources to systems with KM features, such as BIM and enterprise-wide knowledge repositories for accurate knowledge identification and information retrieval. These systems can consolidate knowledge resources and enhance collaboration among departments and projects. Develop structured KM policies, create formal KM frameworks and protocols to ensure team uniformity, including standardised documentation processes and scheduled knowledge-sharing meetings. Designate specific KM roles, assign knowledge officers or teams to manage the development, implementation and assessment of KM practices, ensuring effective use and maintenance of knowledge assets. Encourage innovation and learning across projects by organising cross-project reviews and knowledge-sharing sessions where insights from completed projects can benefit ongoing and future endeavours.



KM, knowledge management.

FIGURE 6: Knowledge management implementation strategy for architectural firms.

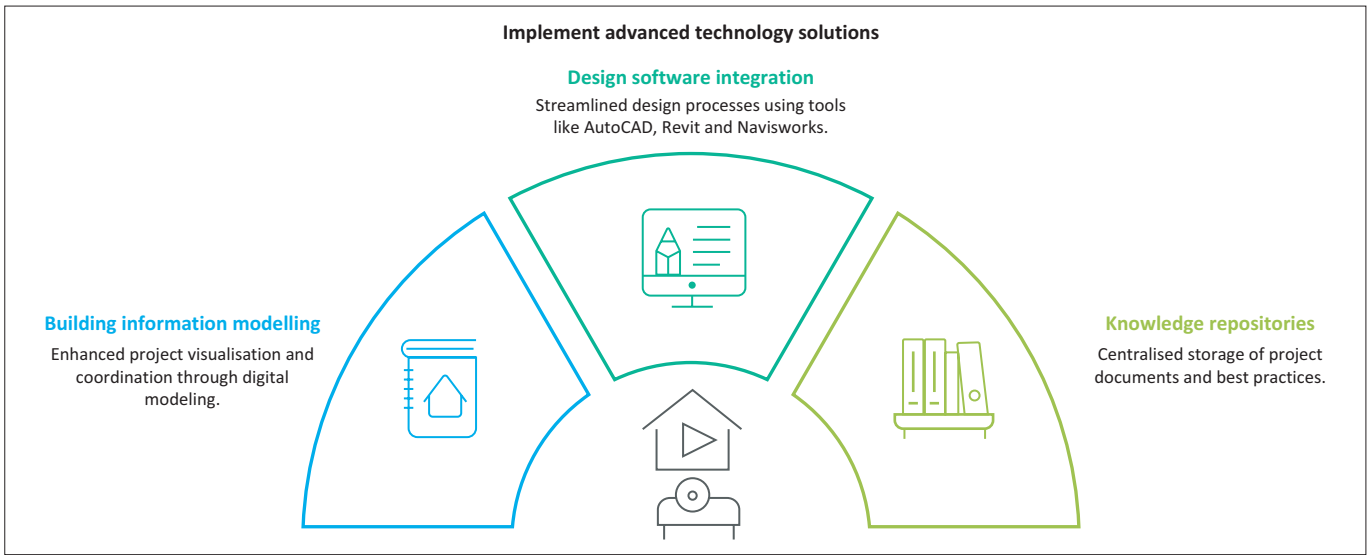


FIGURE 7: Expanding an action step for successful implementation.

The recommendation for small architectural firms is that KM begins with utilising scalable KM tools like cloud-based solutions or open-source applications for knowledge identification, documentation and collaboration. Small architectural firms should emphasise informal knowledge exchange, implement informal strategies, such as regular team gatherings, brainstorming workshops and mentorship programmes to promote knowledge sharing with minimal financial outlay. It is recommended that small architectural firms simplify documentation processes by creating straightforward processes to record project information, design choices and lessons learned. A standardised folder structure with explicit naming conventions can be a practical starting point. Small architectural firms must tap into external networks, join open access repositories of philanthropic industry organisations or knowledge-sharing forums to access best practices and innovations from other companies.

Regardless of the size of the architectural firm, KM implementation begins with employees actively participating in knowledge identification and exchange. By engaging in team meetings, workshops and informal learning activities, employees share knowledge and gain insights from coworkers. Seasoned architects should guide junior team members in passing on implicit knowledge effectively. Architectural firms must keep thorough documentation, they must maintain records of design methodologies during projects, record decisions made, and challenges faced throughout projects. This approach supports knowledge retention and enhances organisational learning. Architectural firms must adopt technology and be familiar with digital tools, such as BIM and cloud-based KM platforms, to optimise workflow and enhance team collaboration. Architectural firms must embrace a learning attitude, remain informed about developments in the construction industry, share and gain best practices through training sessions, webinars, conferences and continuously learn from innovations.

Limitations

The research design focused on participants' self-reported experiences, which could be biased. However, the research design made it possible to gain an in-depth understanding of KM practices from a purposive stratified sample sharing detailed experiences, which made it possible to uncover essential insights into the difficulties and prospects associated with implementing KM in large and small architectural firms.

Conclusion

This study utilised the SECI model (Nonaka & Toyama 2003) to investigate KM practices of large and small architectural firms in Gauteng, South Africa. The study concludes that larger architectural firms utilise resources to benefit from KM systems, whereas smaller businesses need to implement practical, scalable methods to identify knowledge, share knowledge and benefit from lessons learned. Smaller firms face difficulties because of limited resources, time constraints and resistance to change. Regardless of size, architectural firms share tacit knowledge mainly through mentorship. Explicit knowledge exchange depended on documentation and tools, such as BIM, which was under-utilised because of cost and skill limitations. Employees are essential contributors of knowledge. Regardless of size, all architects are the main contributors to cultivating a culture of collaboration and sharing, which enhances organisational knowledge. Actioning the steps of the KM implementation strategy can improve the overall impact of KM in architectural firms. Future studies could investigate the long-term effects of KM and conduct regional comparisons further to unlock the transformative potential of KM in architecture.

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Competing interests

The authors declare that they have no financial or personal relationship that may have inappropriately influenced them in writing this article.

Authors' contributions

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Data availability

The data that support the findings of this study are available from the corresponding author, T.D., upon reasonable request.

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