The Knowledge Management Architecture in Bridging the Gap in Architectural Education and Practice

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Abstract

The field of architecture practice necessitates a fine balance of theoretical understanding and practical application. The existence of this disparity can hinder the smooth integration of architectural graduates into the industry and restrict their potential to make valuable contributions within the field of architecture. This paper aims to explore knowledge management (KM) architecture to bridge the gap between architectural education and practice. To fill this gap, this research aims to illustrate an overview of all relevant studies on the subject matter. The objective of this research is to identify the potential elements of KM architecture to facilitate the transfer, sharing, and application of knowledge. Secondly, the research examines key elements of KM architecture, including knowledge capture, organization, dissemination, and collaboration. This study's research method is based on a literature review and a questionnaire. The phrases "knowledge management", "architectural education and practice", and "knowledge management framework" were used to search the databases of ScienceDirect, Sage, Frontiers, and PubMed. The data set was restricted to English peer-reviewed academic publications published between 2010 and 2023. The records were then reviewed for relevance and eligibility using predefined inclusion and exclusion criteria. The field of architecture requires a smooth transition from academic learning to practical application, yet there is often a disconnect between the knowledge gained in educational settings and its effective utilization in professional practice. The findings suggest that an effective KM architecture can enhance architectural education by aligning curriculum with industry requirements, integrating real-world case studies and practical experiences, and promoting collaboration between academia and practitioners. In practice, it enables professionals to access relevant knowledge, best practices, and lessons learned from previous projects, leading to improved design outcomes, enhanced efficiency, and increased innovation. This would help in bridging the existing gap between architectural education and practice. Finally, by adopting the KM architecture framework and utilizing appropriate tools as a foundation, the architecture field can efficiently equip aspiring professionals with essential skills while promoting an environment that emphasizes continual learning based on knowledge-driven practices.

Keywords: knowledge management architecture, KM architecture, KM framework, architectural education and architectural practice, architectural education and practice gap

1. Introduction

The successful execution of projects in the field of architecture needs a delicate balance of academic understanding and practical application. The aim of architectural education is to provide students with a solid grasp of technical and design principles. However, it is not unusual to find a gap between the information obtained in the classroom and the reality experienced in real-world circumstances. Despite intense academic instruction, the transition from the classroom to the working world is frequently fraught with challenges. A plethora of complicated elements, including cost limits, time constraints, client preferences, and site-specific challenges, may not be fully handled in a classroom context. Furthermore, architectural education focuses mostly on hypothetical design situations, which may differ dramatically from the practical issues encountered during real-world projects.

As a result, graduates entering the architectural sector may encounter a disparity between their academic understanding and the practical needs of their profession. This mismatch can cause emotions of unpreparedness and confusion, making it difficult to apply their talents and knowledge to real-world architecture tasks. Furthermore, a lack of exposure to the complexities of project execution may hinder their capacity to effectively interact with other professionals such as engineers, contractors, and stakeholders. When newly graduated students struggle to bridge the gap between theory and practice, their ability to effect positive transformation and contribute to the growth of the profession may be hampered. As a result, this field may miss out on new ideas, innovative problem-solving, and the incorporation of newer technologies into architectural practice.

KM architecture will be used as a collaborative platform with industry professionals to transfer knowledge to students and academicians with invaluable exposure to the practical aspects of the built environment industry in order to bridge the gap between architectural education and practice. The use of KM architecture would foster a culture of knowledge sharing within the realms of architectural education and practice. The goal of this research is to identify potential KM architectural components that will help in knowledge dissemination, application, and transfer. The research also looks at critical KM architecture components such as knowledge organization, dissemination, and collaboration. The research begins with these questions in order to achieve these objectives;

RQ1. What are the elements of knowledge management in facilitating collaboration in architectural education and practice?

RQ2. How to develop the most appropriate framework for the KM architecture to bridge the gap in architectural education and practice?

KM is the methodical management of an entity's cognitive resources, which include both explicit knowledge that is organized, documented and tacit knowledge that is intuitive and based on personal experiences (McInerney, 2002). It is defined as the methods and tactics used by entities to capture, organize, share, and use information effectively. These procedures and approaches are designed to facilitate the way entities and social communities create, transmit, and use knowledge. Social KM is a technique to knowledge management that stresses the relevance of social interactions in KM (Fernando et al., 2020). Using social intelligence can assist in ensuring that information sharing proceeds smoothly and without delays or interference (Liyanage et al., 2009). There are two significant aspects of knowledge management in the realm of management. The first component is concerned with the management of general knowledge, whereas the second is

concerned with the management of knowledge in its social context. KM is a process as well as a technique that includes developing, acquiring, capturing, sharing, and using information to improve learning and the efficiency of an organization.

The collective and individual knowledge of the organization is essential for its employees and must be actively developed by management (Daland, 2016). This involves establishing in place outlined methods, tools, and procedures to turn information into a valued resource for the organization. Every organization requires a knowledge management strategy (Daland, 2016). It aids in utilizing the organization's current knowledge and ensuring that knowledge is successfully shared and given to the appropriate persons at the necessary time. Individuals can interact, exchange insights, and use information in their everyday job as a result, leading to increased organizational performance. Knowledge management is a technique that enables businesses to capitalize on their collective knowledge and experience, allowing them to make better decisions, promote innovation, and boost productivity.

Communities of practice, knowledge repositories, knowledge mapping, expert systems, and collaborative platforms are examples of effective KM techniques and methodologies. Communities of practice promote information exchange and cooperation among people who have similar interests or experience. Knowledge repositories and mapping approaches make it possible to collect, organize, and retrieve explicit knowledge (Manteghi, G., Shukri, S. M., & Lamit, H., 2019). Expert systems use technology to codify and organize knowledge, whereas platforms for collaboration allow employees to communicate and share information in real time. Despite its potential benefits, KM is fraught with difficulties. These include the complexities of information, challenges with knowledge sharing and transfer, cultural and organizational challenges, and the rapid rate of technology innovation. Future research directions in KM include investigating emerging technologies such as artificial intelligence, addressing ethical challenges in knowledge management, and further investigating the role of KM in supporting organizational resilience and sustainability.

2. Literature Review

2.1. KM Architecture

The architecture of knowledge management (KM) refers to the framework, structure, and components that enable successful knowledge management. Understanding the context of KM architecture allows for the development of knowledge management methods to overcome the knowledge gap in architectural education and practice (Fernando et al., 2020). Technology plays a vital role in KM architecture because it enables effective knowledge management operations. Intranets, document management systems, collaborative platforms, expert systems, and artificial intelligence-based solutions are all examples of Knowledge Management Systems (KMS). These technologies assist the entire KM architecture by facilitating knowledge capture, storage, retrieval, sharing, and collaboration. It is not easy to establish in place an effective KM architecture (Salama, 2008). Resistance to information sharing is one of the impediments, as is a lack of technology infrastructure, insufficient incentives for knowledge contribution, and cultural barriers that restrict knowledge flow. Addressing these issues necessitates careful thought about change management, cultivating a welcoming knowledge-sharing culture, and aligning KM initiatives with corporate goals and objectives.

With increasing trends and improvements, the context of KM architecture continues to adapt. Social knowledge sharing, mobile and cloud-based KM systems, data analytics, and AI-driven information extraction are altering the KM architecture landscape (Heylighen et al., 2007). These changes create potential for improving knowledge production, capture, and usage, while also posing new hurdles in terms of data privacy, security, and ethical issues. Keeping up with developing KM design trends ensures the most effective tactics for adapting and using new technologies and processes to maximize knowledge management projects.

2.2. KM Architecture Components

The components of a KM architecture might vary based on an organization's particular goals and setting. However, the detailed components of the KM architecture are listed below. A central repository or database for storing, organizing, and managing knowledge assets. Documents, presentations, reports, best practices, case studies, templates, and multimedia files are examples of content. Taxonomy refers to the hierarchical classification of knowledge assets, whereas metadata describes the assets. Taxonomy and metadata frameworks aid in the organization and categorization of knowledge to facilitate search, retrieval, and navigation. Users can search for specific knowledge assets within the repository using the search and retrieval methods components. Keyword-based search, complex search filters, and relevance rating algorithms can all be used to swiftly find relevant information.

Collaboration technologies enable individuals or teams to share knowledge, communicate, and collaborate. Document sharing platforms, instant messaging, discussion forums, wikis, virtual meeting tools, and project management systems are examples of such technologies. Knowledge capture methods entail gathering information from a variety of sources, including internal and external experts, documentation, project evaluations, lessons learned, interviews, surveys, and brainstorming sessions. Knowledge capture strategies should include both explicit knowledge (information that has been codified and documented) and tacit knowledge (knowledge that exists in people's brains and experiences). The component focuses on procedures and techniques for developing new knowledge and synthesizing existing information in order to produce insights and innovations. Research and development, design thinking workshops, prototyping, experimentation, and cross-functional cooperation are examples of activities that might be included.

The component of knowledge sharing and dissemination entails sharing knowledge across the company or with relevant stakeholders. Knowledge sharing events, training programs, newsletters, communities of practice, mentorship programs, and knowledge sharing platforms are examples of methods (Ibrahim, M. A., Wahab, M. H., & Shukri, S. M., 2018). To assure the correctness and reliability of knowledge assets, validation and quality control techniques are required. This may include peer evaluations, expert validation, source verification, and periodic reviews and updates of knowledge assets. Then, learning and training materials facilitate ongoing learning and professional growth. E-learning courses, webinars, workshops, training materials, guidelines, and access to other educational resources are examples.

The performance metrics and evaluation component entails developing metrics and key performance indicators (KPIs) to assess the efficacy and impact of KM initiatives. It comprises assessing knowledge utilization, knowledge contribution, user happiness, and organizational results connected to knowledge application and innovation. Governance and policies, including governance structures, regulations, and guidelines, are required to properly administer the KM

architecture. Roles and duties, access permissions, security mechanisms, intellectual property rights, and compliance with legal and regulatory requirements are all part of this. It is vital to notice that these components are interrelated and interdependent rather than separate pieces. A well-designed KM architecture takes these components into account and aligns them to provide a complete and effective system for managing corporate knowledge.

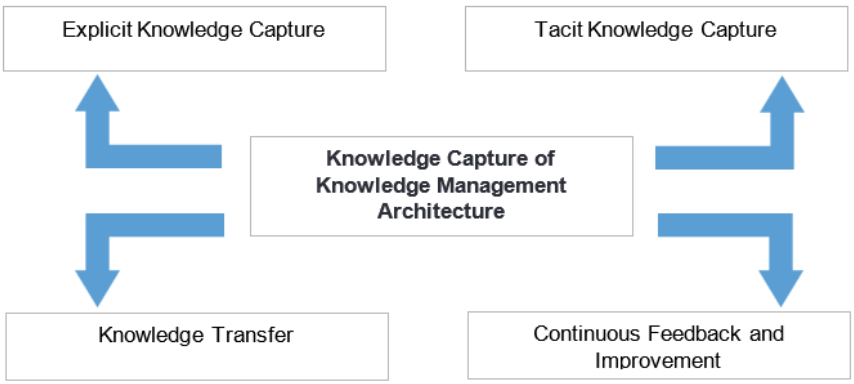
2.3 KM Architecture Elements

The importance of KM in bridging the gap between architectural education and practice is critical. Architects may improve their abilities and keep up to speed with the newest innovations in the industry by successfully gathering, organizing, and sharing knowledge. The major parts of KM architecture that must be identified to construct the framework of KM Architecture are listed below.

2.3.1 Knowledge Capture and Knowledge Organization

Architectural education institutes and professional practices should have strong knowledge capture methods in place. This may be accomplished through a variety of techniques, including design process documentation, case studies, project evaluations, and research papers (Stenholm et al., 2019). Capturing tacit information (i.e., knowledge that is difficult to explain) through interviews or apprenticeship programs with experienced practitioners is also quite important. The capturing of knowledge is a critical component of the KM architecture. It entails systematic knowledge gathering, compilation, and organization from diverse sources inside an organization. This information can originate from both explicit (documents, databases, and specialists) and tacit (individual experiences and insights) sources (Zou, 2012). The goal of knowledge capture is to avoid important knowledge from being lost or vaporized and to preserve its availability for future use. In addition, architecture KM has evolved as a critical topic of research within the subject. Organizations may increase the efficiency and efficacy of future development by sharing and reusing architectural information, including design decisions and their reasons (Shukri, S. M., Manteghi, G., Wahab, M. H., Amat, R. C., & Ming, W. H., 2018). Figure depicts four elements of knowledge capture: explicit knowledge capture, tacit knowledge capture, knowledge transfer, and continual feedback and improvement (Shukri, S. M., Wahab, M. H., Awaluddin, Z. L., Aminuddin, A. M. R., & Hasan, M. I.,2022). Organizations may assure the preservation, accessibility, and exploitation of significant knowledge assets by efficiently capturing information through these factors, supporting improved decision-making, innovation, and continual learning inside the firm.

Figure 1: The Elements of Knowledge Capture

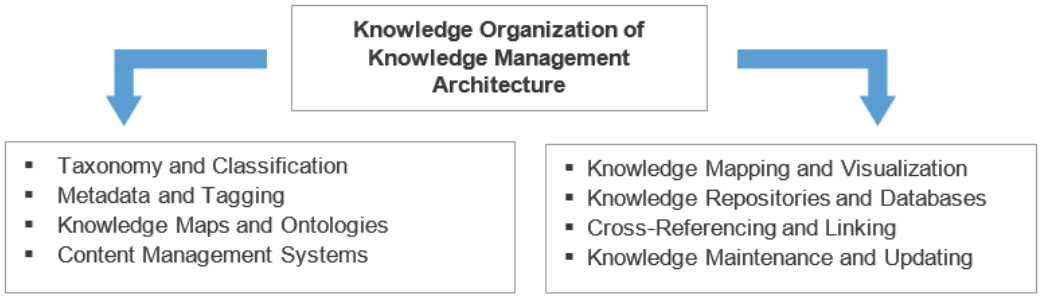


Knowledge that is formalized and easily transferred is referred to as explicit knowledge capture (Zontek & Whitworth, 2016). Documents, reports, guidelines, processes, templates, and other physical forms of information are included. Documentation, templates, and guidelines, as well as content management systems, will be used to collect explicit knowledge. Tactic knowledge, on the other hand, is personal and context-specific information that is frequently difficult to express or codify (Uslar et al., 2019). Capturing tacit knowledge is critical because it includes the expertise and insights obtained via interviews and conversations, shadowing and observation, and apprenticeship programs. The successful transfer of information from one individual or group to another is referred to as knowledge transfer (Shah & Hussin, 2018). It guarantees that information inside the company is shared, distributed, and conserved. This included training programs, the formation of communities of practice where professionals with similar interests and expertise can interact, share knowledge, and collaborate, as well as the creation of knowledge artifacts such as videos, recorded presentations, podcasts, and interactive tutorials that capture and transfer knowledge in a multimedia format.

2.3.2 Knowledge Organization

Knowledge organization is a critical component of a KM architecture because it enables optimal knowledge asset storage, retrieval, and usage (Jokanovi et al., 2020). Once knowledge has been recorded, it must be arranged for simple retrieval and accessible. Architectural firms can create knowledge repositories or databases that organize information depending on project type, design principles, construction processes, and sustainability initiatives (Stenholm et al., 2019). To promote efficient retrieval, metadata, tags, and search functionality can be included. Knowledge organization is a critical component of a KM architecture because it facilitates optimal knowledge asset storage, retrieval, and usage. The fundamental parts of knowledge organization within a KM architecture are depicted in Figure 2 below.

Figure 2: The key elements of Knowledge Organization of KM Architecture



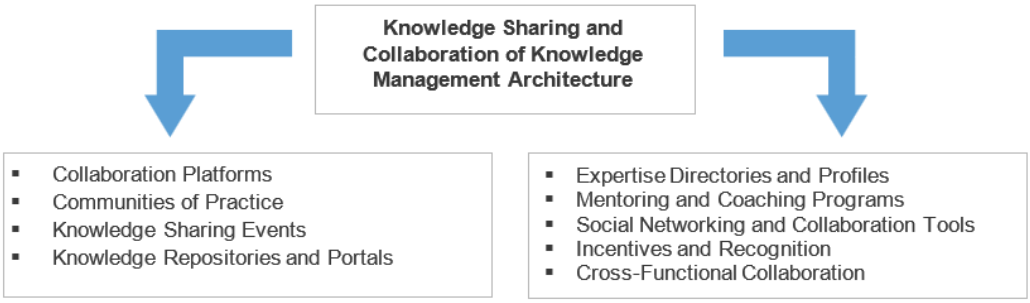
Taxonomy refers to the hierarchical categorization system used to identify and organize knowledge assets based on their subject, domain, or other relevant features (Raza et al., 2018). Creating a well-defined taxonomy aid in knowledge structure and effective search and retrieval. It entails developing a categorization strategy, identifying categories, and building linkages among various knowledge assets (Shukri, S. M. et al., 2018). Taxonomy can be defined using common industry frameworks or adapted to the organization's particular needs. The second type of metadata is descriptive information about knowledge assets, which makes them easier to identify and retrieve (Chang, 2006). It contains information such as the title, author, date, keywords, and a brief synopsis. Metadata improves the discoverability and searchability of knowledge assets. Tagging is the process of attaching relevant keywords or tags to knowledge assets in order to improve

search and retrieval (Shukri, S. M. et al., 2018). Users may rapidly identify relevant knowledge items using metadata and tagging based on specified criteria or search phrases.

2.3.3 Knowledge Sharing and Collaboration

An effective KM architecture should encourage knowledge sharing and cooperation among architects and educators (Mukhtar et al., 2020). Collaborative dialogues, idea exchanges, and the transmission of best practices can all be facilitated through online platforms, intranets, or shared databases. This can be accomplished using forums, social networks, or virtual collaborative spaces. The fundamental features of information sharing and collaboration within a KM architecture are depicted in Figure 3 below.

Figure 3: The key elements of Knowledge Sharing and Collaboration of KM Architecture



Project management systems, shared workspaces, instant messaging applications, and virtual meeting solutions are examples of collaboration platforms or technologies that enable real-time communication, document sharing, and virtual collaboration (Cerchione et al., 2015). Such technologies enable individuals and teams to collaborate on projects, exchange ideas, and collectively add to the organization's knowledge base. Through the formation of communities of practice (CoPs), which bring together people with similar interests, experience, and knowledge areas (Barnett et al., 2014). Professionals may use CoPs to network, exchange experiences, debate difficulties, and collaborate on problem resolution. They promote a culture of lifelong learning, peer support, and knowledge exchange in specialized areas of competence or interest.

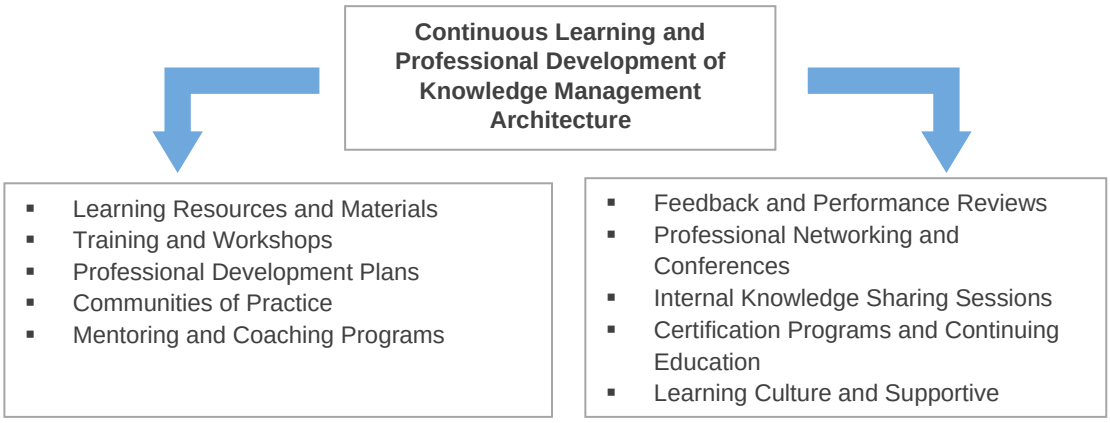
To successfully achieve information sharing and cooperation, knowledge sharing events such as seminars, workshops, conferences, or brown bag sessions where individuals may discuss their work, research findings, or creative ideas (Malkawi & Rumman, 2016) are organized. These events enhance information diffusion, generate conversations, and foster collaboration among participants. Through one-on-one encounters and information exchange, these programs allow the transmission of tacit knowledge, give direction, and stimulate professional development (Rozaly, M. Z. M., Shukri, S. M., Latip, N. S. A., & Abdullah, A., 2018). Organizations may build an environment that supports information sharing, collaboration, and the collaborative growth of knowledge assets by incorporating these components into a knowledge management architecture.

2.3.4 Continuous Learning and Professional Development

The study of architecture should not cease with graduation. Architects must participate in ongoing learning and professional development to bridge the gap between education and practice. Access to e-learning resources, webinars, conferences, and training programs can be provided through KM systems (Cerchione et al., 2015). Mentorship programs and communities of practice

may also help experienced architects pass on their knowledge to new practitioners. Figure 4.0 depicts the major parts of a KM architecture connected to continuous learning and professional development. Muggli and Westermann (2019) provide access to a variety of learning tools and materials, such as e-learning courses, webinars, online tutorials, research papers, industry reports, and books. For simple access and self-paced learning, these materials can be vetted and arranged in a centralized knowledge repository or learning management system.

Figure 4: The key elements of Continuous Learning and Professional Development of KM Architecture



The second step is to provide training programs and seminars on specific themes, tools, or approaches relevant to the company (Asadi et al., 2022). Internal specialists, external trainers, or collaborations with educational institutions or industry groups can facilitate these workshops. Individuals can gain new information and abilities through training and seminars, which encourage interaction and collaboration among participants. The third element is professional development plans, which include helping employees to establish and implement personal professional development plans (M. et al., 2022). These plans detail their educational objectives, desired abilities, and the measures they will take to obtain them. Organizations can give individuals direction, tools, and support to help them improve their skills and knowledge in accordance with their professional goals. They foster possibilities for ongoing learning through engagement with peers and subject matter experts. Implementing mentorship or coaching programs that link experienced professionals with others with less expertise. Mentors offer advice, share their knowledge and experiences, and assist mentees in developing their skills and expertise (Clarke et al., 2019). Organizations may establish a learning environment that fosters continuous learning and professional growth by including these factors into a KM architecture. Individuals may improve their knowledge and skills, adapt to changing industry demands, and contribute to organizational development and innovation as a result of this.

2.3.5 Feedback and Iteration

The design of KM should promote feedback loops between education and practice (Loan, 2019). Architectural practice may give insights for curriculum revisions, while academic research can supply creative ideas and theories for application in practice. Regular feedback sessions, industrial collaborations, and collaborative research projects can assist in aligning instructional content with real-world concerns (Hodgson, 2019). Figure 5 depicts the major parts of a KM architecture connected to feedback and iteration. The gathering of information, thoughts, and ideas

from users, stakeholders, and participants in KM projects is a component of building feedback systems (Singh & Singh, 2019). Surveys, suggestion boxes, feedback forms, focus groups, and interviews are examples of these techniques. Feedback assists in identifying the KM architecture's strengths, flaws, and opportunities for growth. Then, to quantify the efficacy and impact of knowledge management activities, perform periodic reviews and assessments (Firrdhaus Mohd Sahabuddin, M., Aminuddin, A., Muhammad-Sukki, F., & Shukri, S. M., 2022). Assessing aspects such as information use, user happiness, knowledge contribution, organizational results, and alignment with strategic objectives may all be part of this. The findings of evaluations give useful information for detecting gaps, making informed decisions, and promoting changes.

Figure 5: The key elements of Feedback and Iteration KM Architecture

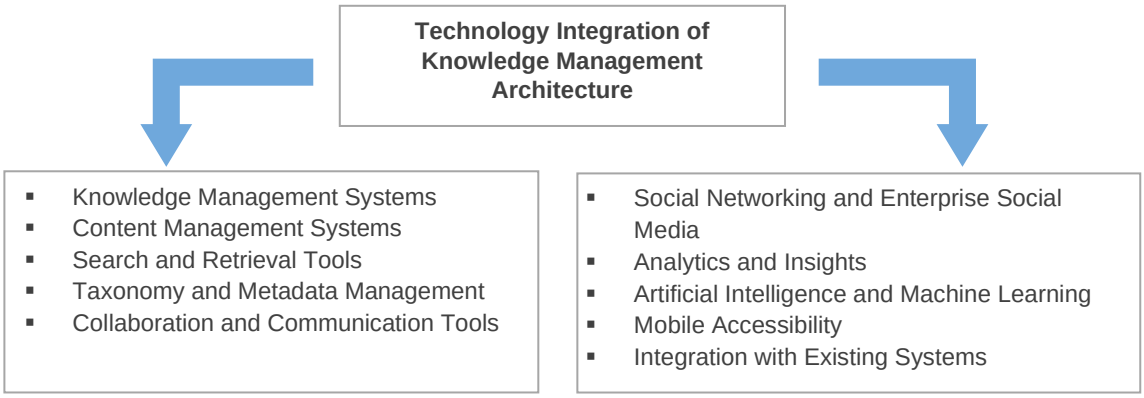
Roy et al. 2022 undertake organized sessions to record and document lessons acquired through knowledge management efforts, projects, and experiences. Sessions on lessons learned aid in determining what went well, what may be improved, and what should be avoided in future initiatives. These sessions' observations feed future revisions of the KM architecture. Continually by building an organizational culture of continuous improvement in which feedback and insights are respected and innovation is fostered (Eisenberg et al., 2018). This culture encourages ongoing development of KM architecture in response to lessons learned, new best practices, and changing organizational needs. Finally, by forming a KM steering committee or a comparable regulatory body to monitor the feedback and iteration procedures (Kazilinas, 2012). The committee can analyze assessment results, feedback, and performance data to make educated choices, prioritize improvements, allocate resources, and drive the ongoing evolution of the KM architecture. This iterative approach guarantees that the design remains in sync with corporate goals, user demands, and developing market trends, enhancing its value and effect.

2.3.6 Technology Integration

Technology is critical in KM. Architectural practices may collect, organize, and visualize information using technologies such as project management software, BIM platforms, and virtual reality (VR) apps (Cerchione et al., 2015). Furthermore, new technologies such as artificial intelligence (AI) may be utilized to evaluate massive volumes of data and give insights for decision-making. Figure 6.0 depicts the major parts of a KM architecture's technological integration. To begin, specialized KM systems or platforms that act as a central hub for storing, organizing, and accessing knowledge assets are implemented (Roy et al., 2022). To facilitate information sharing and retrieval, these systems include features such as document management, version control, metadata management, search capabilities, and collaborative tools. Following that,

using technological solutions to manage taxonomy and metadata related to knowledge assets (Shahmoradi et al., 2017). Automated systems can aid in the creation and maintenance of taxonomies, the application of metadata tags, and the maintenance of consistency among knowledge assets. This makes it possible to efficiently categorize, organize, and retrieve knowledge assets based on their qualities.

Figure 6: The key elements of Technology Integration of KM Architecture

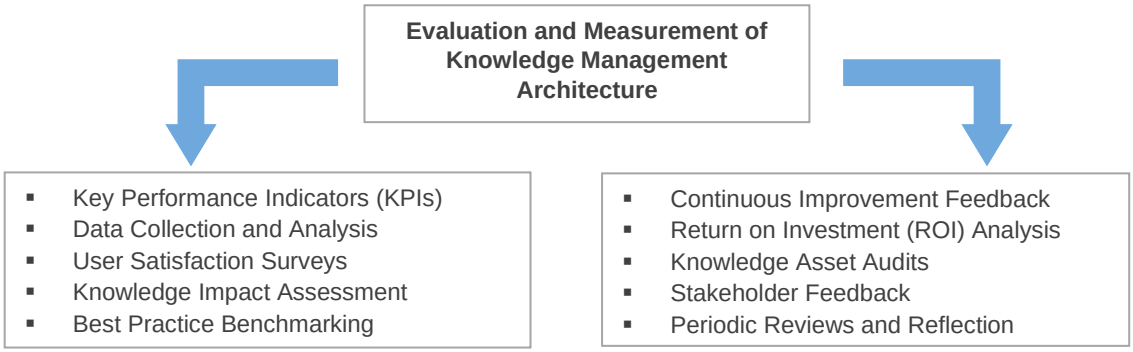


Collaboration and communication technologies should be included to promote knowledge sharing and cooperation across individuals and teams (Cerchione et al., 2015). Instant messaging networks, project management software, shared workspaces, video conferencing tools, and virtual collaboration platforms are examples of such technologies. The integration of these tools improves real-time collaboration, information exchange, and the generation of common knowledge. Then, using analytics tools, Shahmoradi et al. (2017) gained insights on knowledge usage, contribution patterns, and user behaviors inside the KM system. Analytics may assist businesses in identifying popular subjects, areas of expertise, and knowledge gaps, allowing them to make data-driven decisions to improve KM procedures and content relevancy. Organizations may maximize information capture, organization, retrieval, and collaboration processes by incorporating technology into their KM architecture. Technology-driven solutions improve efficiency, accessibility, and usability, which leads to better information exchange, creativity, and organizational performance.

2.3.7 Evaluation and Measurement

It is critical to set metrics and assessment mechanisms to assure the efficacy of the KM architecture. Regular assessments, surveys, and feedback mechanisms can assist in determining the efficacy of knowledge management activities on bridging the gap between architectural education and practice (Roy et al., 2022). This information may then be utilized to fine-tune and improve the KM architecture. Figure 7 depicts the major parts of a KM architecture linked to assessment and measurement.

Figure 7: The key elements of Evaluation and Measurement of KM Architecture



By establishing particular KPIs that are in line with the organization's goals and expected outcomes (Cunha et al., 2023). KM KPIs should be quantifiable and represent the influence of KM on organizational performance. Knowledge usage rate, knowledge contribution rate, employee satisfaction with KM, innovation success rate, and time saved due to information sharing are examples of KPIs. The second step is to build methods for collecting appropriate data linked to knowledge management activities and results (Omoush, 2019). Surveys, interviews, use data, feedback forms, and analytics tools are all examples of this. To get insights into the success and impact of KM activities, data should be gathered, analyzed, and evaluated.

Finally, KM processes may be benchmarked against industry best practices or recognized standards (Liew & Luetge, 2018). This assists businesses in identifying areas for improvement, learning from others, and putting in place efficient KM methods and procedures. Organizations may get insights into the efficacy, impact, and value of their KM projects by adding evaluation and measurement features into their KM architecture (Teng, T. G., Aminuddin, A., Sarkum, S. A., & Shukri, S. M., 2022). This allows businesses to make data-driven choices, promote continuous improvement, and optimize their KM procedures in order to achieve the intended results.

2.1 KM Architecture in Education and Practice

KM is important in architectural education and practice because it allows for the effective collection, exchange, and application of knowledge and skills. KM in architectural education enables students and faculty members to get access to a diverse set of architectural knowledge resources. Architectural design concepts, building processes, historical references, and case studies of successful projects are examples of resources (Shukri, S. M., Wahab, M. H., & Jamala, N., 2021). Architectural education may provide a complete and up-to-date curriculum that represents the most recent innovations in the profession by adopting knowledge management. Furthermore, KM in architecture education helps students develop critical thinking and problem-solving abilities. It also encourages collaboration and communication among students and faculty members, allowing them to share ideas, experiences, and insights while also facilitating the integration of theory and practice in architectural education by giving students access to real-world examples and case studies. Knowledge acquisition processes are critical for fostering the development of critical knowledge required for the effective production of built environments (Salama, 2008).

KM is equally important in architectural practice. It helps architects to easily access and use a tremendous quantity of architectural information that has been acquired through time. Architects' tacit knowledge is obtained through their participation in various architectural projects and is mostly the result of experience learning (Heylighen et al., 2007). Drawings, specifications, and architectural references are examples of explicit knowledge. Architects must have a mix of technical knowledge, creative abilities, inventive thinking, and expertise in order to develop practical, usable, helpful, and aesthetically beautiful products (Lawson, 2006). Architects may make better informed design decisions, eliminate mistakes and rework, improve project results, and increase overall efficiency and productivity by integrating knowledge management in their practices. In addition, KM in architectural practice encourages continual learning and professional development.

Architectural education and practice can benefit from the organized organization and accessibility of architectural knowledge resources through knowledge management. This helps architects and students to make better informed decisions, cooperate more efficiently, and learn and develop on a constant basis (Shukri, S. M. et al., 2020). Transformative pedagogy was suggested as a type of pedagogy that may be integrated into conventional teaching methods, building on critical pedagogy and the hidden curriculum notion (Salama, 2013). Finally, KM is critical in both architectural education and practice. It contributes to the improvement of educational quality by providing students with comprehensive and up-to-date architectural information, strengthening critical thinking and problem-solving abilities, encouraging cooperation and communication, and combining theory and practice.

3. Methodology

A literature review, descriptive questionnaire, and case studies are used in this study to give a comprehensive understanding of knowledge management architecture and its function in bridging the gap between architectural education and practice. The first stage is to perform extensive literature research to acquire existing information and theories about knowledge management in architectural education and practice. The terms "knowledge management", "architectural education and practice", and "knowledge management framework" were used to search the databases of ScienceDirect, Sage, Frontiers, and PubMed. The data collection was limited to peer-reviewed academic articles in English published between 2010 and 2023. Using predetermined inclusion and exclusion criteria, the records were then assessed for relevancy and eligibility. A descriptive questionnaire was distributed to a sample of architecture educators and professionals to acquire insights on the current status of KM techniques in architectural education and practice. The questionnaire aims to learn about their thoughts on the efficacy of KM systems, the obstacles they confront, and potential prospects for closing the gap.

Descriptive statistical approaches are used to examine the questionnaire results in order to uncover common trends, patterns, and areas for improvement. Case studies are also carried out to give in-depth insights into the actual use of KM architecture in architectural education and practice. Document analysis and observation of KM processes inside these businesses are used to collect data. The case study findings are then qualitatively reviewed to discover effective tactics, best practices, and lessons learned. The information gathered from the literature study, descriptive questionnaire, and case studies is combined and evaluated to discover common themes, patterns, and obstacles in KM architecture. The investigation focuses on how good KM strategies may bridge the knowledge-practice divide in architecture.

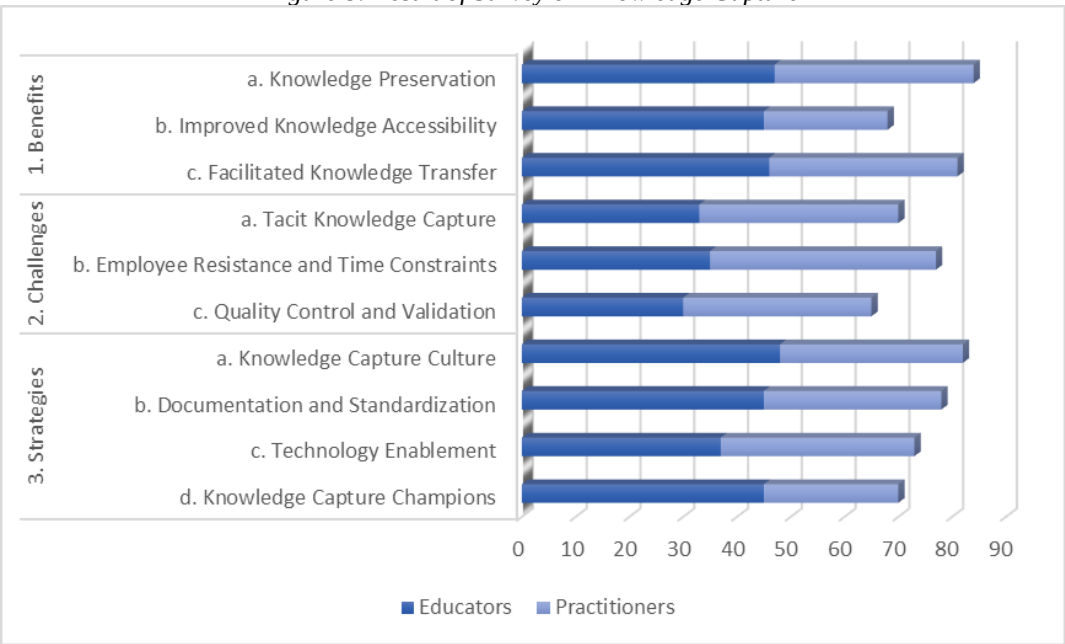
4. Result and Discussion

To gain insights into the practices and perceptions of knowledge organization, a questionnaire was administered to respondents among architectural educators and practitioners with experience in KM roles. The questionnaire aimed to assess the benefits, challenges, and strategies related to KM Architecture. This section presents the key findings derived from the questionnaire analysis.

4.1 Knowledge Capture

Figure 8 below show that validates that knowledge capture has significant benefits, with 84% agreeing that it preserves valuable knowledge. While only 68% recognized improved accessibility, 81% agreed the importance of facilitating knowledge transfer. Challenges in knowledge capture, as highlighted by the survey, include capturing tacit knowledge (70%), employee resistance and time constraints (77%), and quality control and validation (65%). To achieve successful knowledge capture, key strategies identified by the survey include fostering a knowledge capture culture (82%), which entails promoting knowledge sharing, recognizing contributions, and integrating it into performance evaluations. Documentation and standardization (78%) play a vital role, emphasizing the need for templates, guidelines, and frameworks to ensure consistency and accuracy in capturing and storing knowledge. Leveraging technology tools (73%), such as knowledge management systems and digital repositories help to facilitate effective knowledge capture, organization, and retrieval. Additionally, having knowledge capture champions (70%) within the organization helps drive initiatives, provide training, and overcome resistance to knowledge capture efforts.

Figure 8: Result of Survey on Knowledge Capture



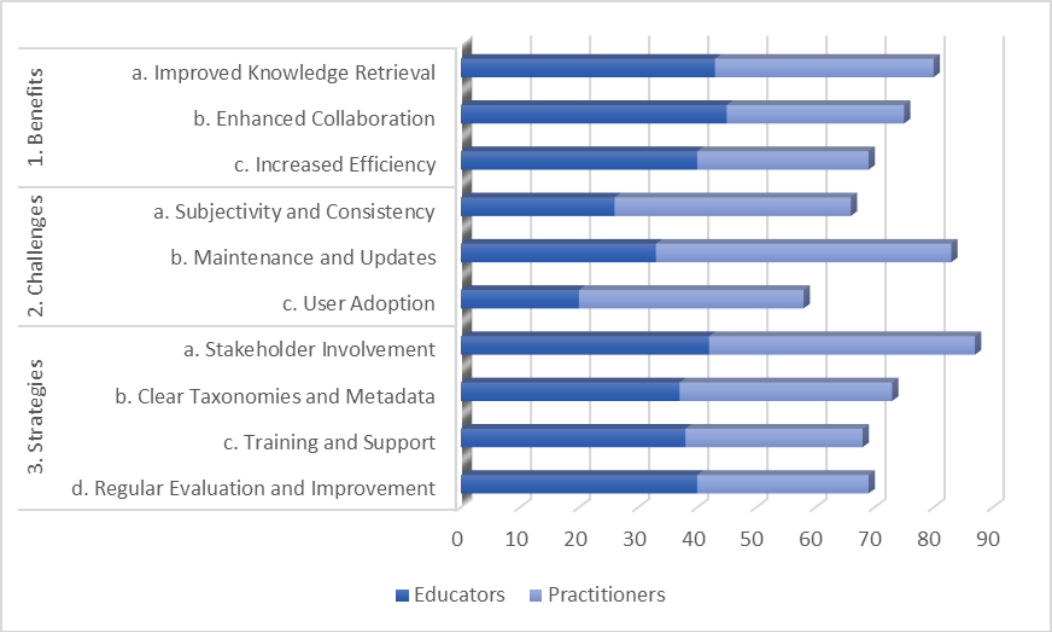
The questionnaire's findings highlight the benefits and challenges of knowledge capture in a knowledge management architecture. The benefits include knowledge preservation, improved accessibility, and facilitated knowledge transfer. Challenges include capturing tacit knowledge, employee resistance, and quality control. Strategies such as fostering a knowledge capture culture,

documentation and standardization, technology enablement, and knowledge capture champions are important for success. Further evaluation reveals the architecture's effectiveness in capturing knowledge from diverse sources, but inconsistencies exist. Capturing tacit knowledge is a challenge, automation is successful, and user feedback improves usability. These insights from the analysis inform organizations on improving knowledge capture processes, addressing challenges, aligning with goals, and optimizing user experience.

4.2 Knowledge Organization

As shown in Figure 9 below, effective knowledge organization offers key benefits, with 80% agreeing that it improves knowledge retrieval, 75% of the respondents recognizing enhanced collaboration, and 69% reporting increased efficiency. The results showed that 66% noted the challenge of subjective interpretations and inconsistent categorizations, hindering knowledge retrieval, while 83% highlighted the difficulty of maintaining and updating knowledge organization structures, requiring dedicated resources to ensure accuracy and relevance. It must be acknowledged that 58% reported challenges in user acceptance and adoption, citing resistance to change and difficulties navigating complex structures. Regarding strategies for successful knowledge organization, involving key stakeholders was emphasized by 87% to align structures with their needs and promote ownership. Clear guidelines for categorization and tagging were highlighted by 73% to enhance system usability. Providing training and support for effective tool utilization was suggested by 68%. Additionally, 69% emphasized the importance of ongoing evaluation and improvement to ensure relevance and accuracy of knowledge organization structures.

Figure 9: Result of Survey on Knowledge Organization



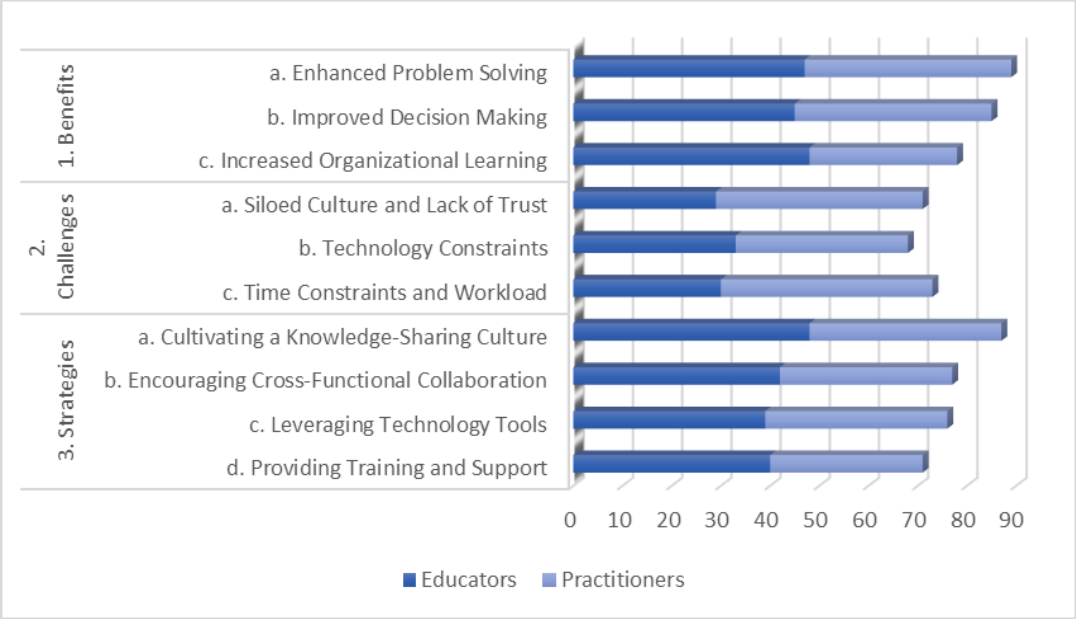
The questionnaire’s findings underscore the benefits of knowledge organization, including improved knowledge retrieval, enhanced collaboration, and increased efficiency. However, challenges related to subjectivity, maintenance, and user adoption need to be addressed. Strategies

such as stakeholder involvement, clear taxonomies, training, and regular evaluation play crucial roles in successful knowledge organization initiatives. These findings provide valuable insights for organizations aiming to optimize their knowledge management architectures through effective knowledge organization practices. The evaluation reveals valuable insights that KM may demonstrate a well-structured taxonomy and classification system, enhancing navigation and knowledge retrieval. However, inconsistencies and incompleteness in categorization indicate room for improvement. Effective use of metadata and tagging enhances search capabilities. User feedback highlights areas for interface and search optimization. Integration of external knowledge sources expands the available information base. The analysis offers insights for stakeholders to assess and improve their knowledge organization strategies, including refining classification schemes, enhancing metadata and tagging, improving navigation and search functionalities, and ensuring scalability and flexibility.

4.3 Knowledge Sharing and Collaboration

As shown in Figure 10 below, Knowledge sharing and collaboration provide substantial benefits, with 89% agreeing on enhanced problem-solving, 85% recognizing improved decision-making, and 78% highlighting increased organizational learning. Challenges include a siloed culture and lack of trust (71%), technology constraints (68%), and time constraints or workload (73%). Strategies for successful knowledge sharing and collaboration involve cultivating a knowledge-sharing culture (87%), encouraging cross-functional collaboration (77%), leveraging technology tools (76%), and providing training and support (71%). These findings emphasize the importance of fostering a collaborative culture, breaking down barriers, utilizing appropriate technology, and equipping employees with necessary skills to maximize knowledge sharing and collaboration efforts.

Figure 10: Result of Survey on Knowledge Sharing and Collaboration



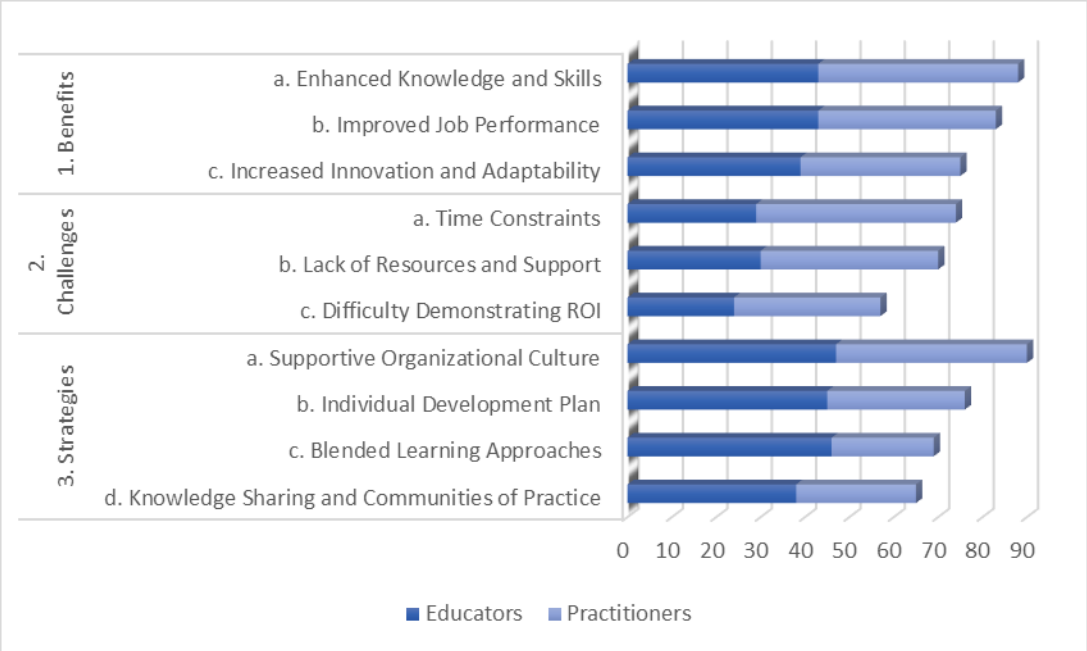
The questionnaire's findings highlight the benefits of knowledge sharing and collaboration, including improved problem-solving, decision-making, and organizational learning. Challenges

related to culture, trust, technology, and time constraints need to be addressed. Strategies such as cultivating a knowledge-sharing culture, encouraging cross-functional collaboration, leveraging technology tools, and providing training and support are crucial for successful initiatives. The evaluation reveals insights into effective mechanisms and tools for promoting knowledge exchange and collaboration, including high participation, increased cross-functional collaboration, enhanced innovation, user feedback, and successful integration. Analysis of these findings guide organizations in improving usability, fostering innovation, optimizing decision-making, and enhancing overall knowledge exchange and collaboration initiatives.

4.4 Continuous Learning and Professional Development

The result on the figure 11 below on questionnaire in relation to the continuous learning and professional development shows that KM bring numerous benefits, with 88% agreeing on enhanced knowledge and skills, 83% recognizing improved job performance, and 75% highlighting increased innovation and adaptability. Challenges include time constraints (74%), lack of resources and support (70%), and difficulty demonstrating ROI (57%). Strategies for success involve a supportive organizational culture (90%), individual development plans (76%), blended learning approaches (69%), and knowledge sharing and communities of practice (65%).

Figure 11: Result of Survey on Continuous Learning and Professional Development



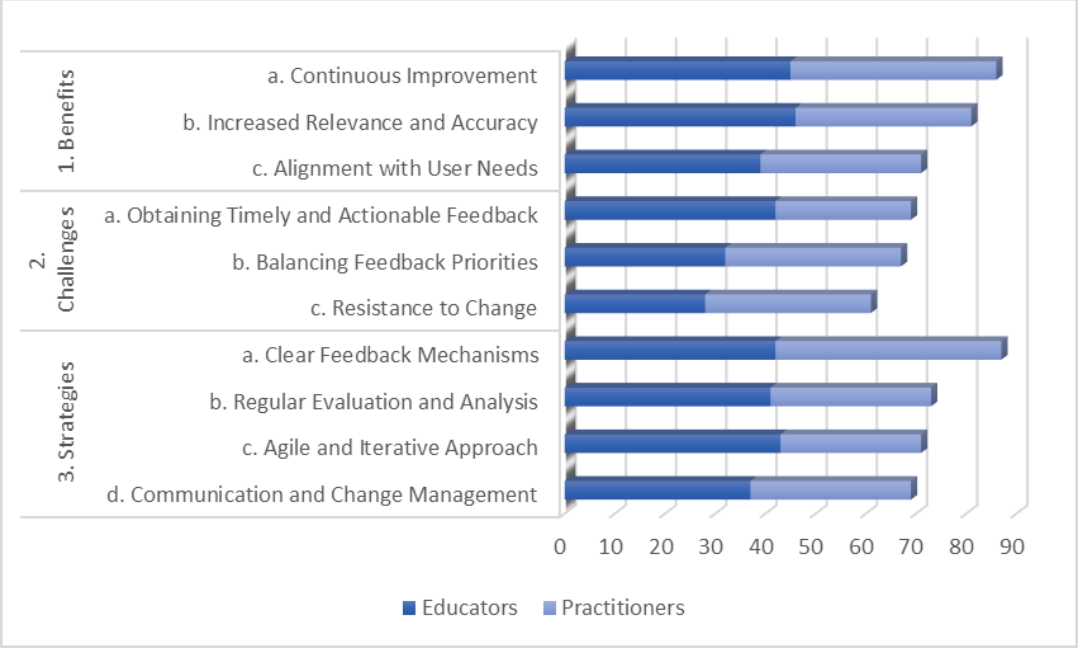
The questionnaire's findings highlight the benefits of continuous learning and professional development, including enhanced knowledge and skills, improved job performance, and increased innovation and adaptability. Challenges such as time constraints, lack of resources and support, and difficulty demonstrating ROI need to be addressed. Strategies like fostering a supportive culture, individual development plans, blended learning approaches, and knowledge sharing play crucial roles. Further evaluations reveal an active engagement in continuous learning, well-aligned learning resources, seamless integration with work processes, measurement of outcomes and impact, and integration with external platforms. These findings inform optimization efforts in

refining resources, addressing feedback, enhancing integration, measuring outcomes, fostering collaboration, and improving the architecture.

4.5 Feedback and Iteration

This section presents findings in exploring feedback and iteration practices within KM architecture. The result on the Figure 12 below explain on the analysis reveals benefits including continuous improvement (86%), increased relevance and accuracy (81%), and alignment with user needs (71%). Challenges include obtaining timely and actionable feedback (69%), balancing feedback priorities (67%), and resistance to change (61%). Strategies for success involve clear feedback mechanisms (87%), regular evaluation and analysis (73%), an agile and iterative approach (71%), and effective communication and change management (69%).

Figure 12: Result of Survey on Feedback and Iteration



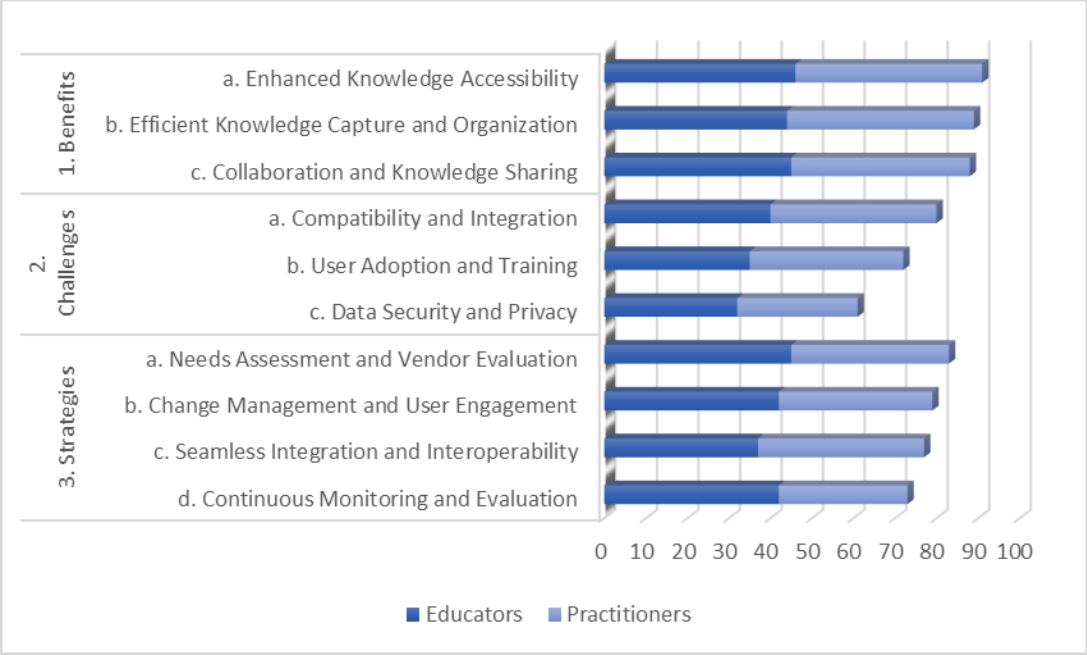
The questionnaire's findings highlight the benefits, challenges, and strategies related to feedback and iteration in KM architecture. These include continuous improvement, increased relevance and accuracy, and alignment with user needs. Challenges such as obtaining timely and actionable feedback, balancing feedback priorities, and managing resistance to change need to be addressed. Strategies such as establishing clear feedback mechanisms, regular evaluation and analysis, adopting an agile approach, and effective communication and change management play crucial roles in promoting successful feedback and iteration processes. The evaluation provides insights into the effectiveness of feedback collection and utilization for iterative improvements in the KM architecture. Regular feedback collection, user satisfaction, identification of pain points, continuous iteration, and transparent communication are observed. These findings inform organizations on optimizing feedback processes and driving iterative improvements within their KM frameworks. By analyzing these results, organizations can enhance feedback collection mechanisms, utilize feedback effectively, prioritize improvements, foster a culture of continuous improvement, and improve communication channels to align the architecture with user needs. The

goal is to evolve the architecture iteratively based on user feedback and ensure continuous alignment with user expectations.

4.6. Technology Integration

The questionnaire's findings provided on the Figure 13 below explain the valuable insights into technology integration within KM architecture. 91% of respondents agree that technology integration improves knowledge accessibility, while 89% recognize its role in efficient knowledge capture and organization. Additionally, 88% highlight technology integration's facilitation of collaboration and knowledge sharing. Challenges such as compatibility and integration (80%), user adoption and training (72%), and data security and privacy (61%) need to be addressed. Strategies for successful technology integration include conducting needs assessments and vendor evaluations (83%), implementing change management and user engagement practices (79%), prioritizing seamless integration and interoperability (77%), and continuous monitoring and evaluation (73%).

Figure 13: Result of Survey on Technology Integration

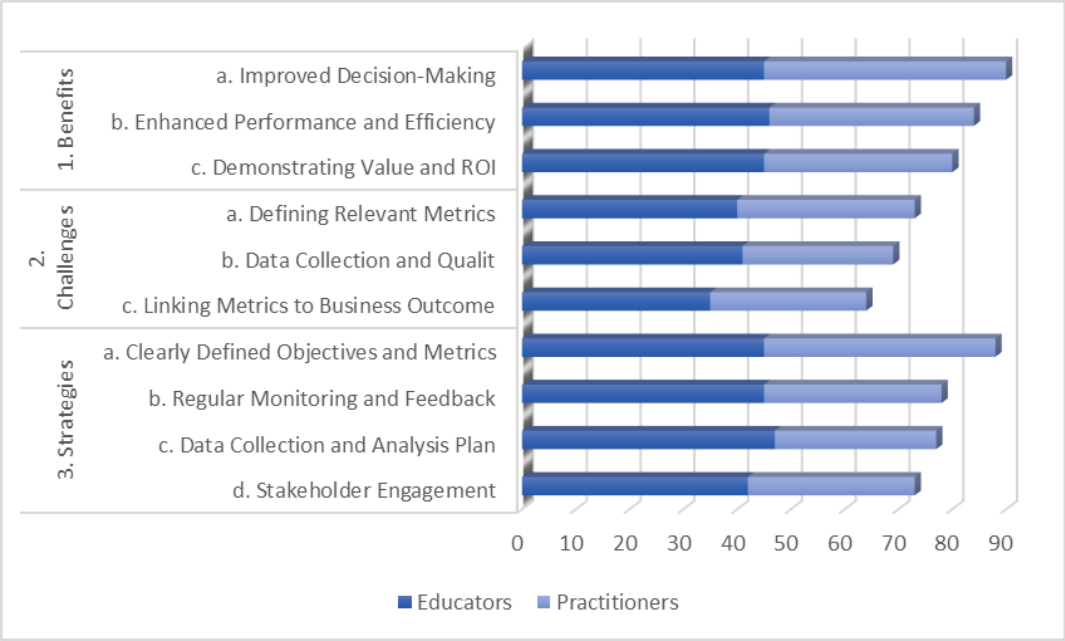


The questionnaire's findings highlight the benefits of technology integration in KM architecture, including enhanced knowledge accessibility, efficient capture and organization, and improved collaboration. Challenges in compatibility, user adoption, and data security need to be addressed. Strategies such as needs assessment, change management, seamless integration, and continuous evaluation are crucial for successful technology integration. The analysis reveals seamless integration with existing systems, challenges in integrating with legacy systems, scalability, and adaptability of the architecture, integration with cloud-based platforms and services, integration of analytics and AI capabilities, and the importance of user feedback. These findings guide organizations in optimizing technology integration, improving usability, and ensuring scalability for efficient KM.

4.7. Evaluation and Measurement

Figure 14 below presents the findings from a questionnaire on evaluating and measuring KM architecture. The analysis reveals the benefits of evaluation and measurement, including improved decision-making (90%), enhanced performance and efficiency (84%), and demonstrating value and ROI (80%). Challenges involve defining relevant metrics (73%), data collection and quality (69%), and linking metrics to business outcomes (64%). Strategies for success include clearly defining objectives and metrics (88%), regular monitoring and feedback (78%), a comprehensive data collection and analysis plan (77%), and stakeholder engagement (73%).

Figure 14: Result of Survey on Evaluation and Measurement



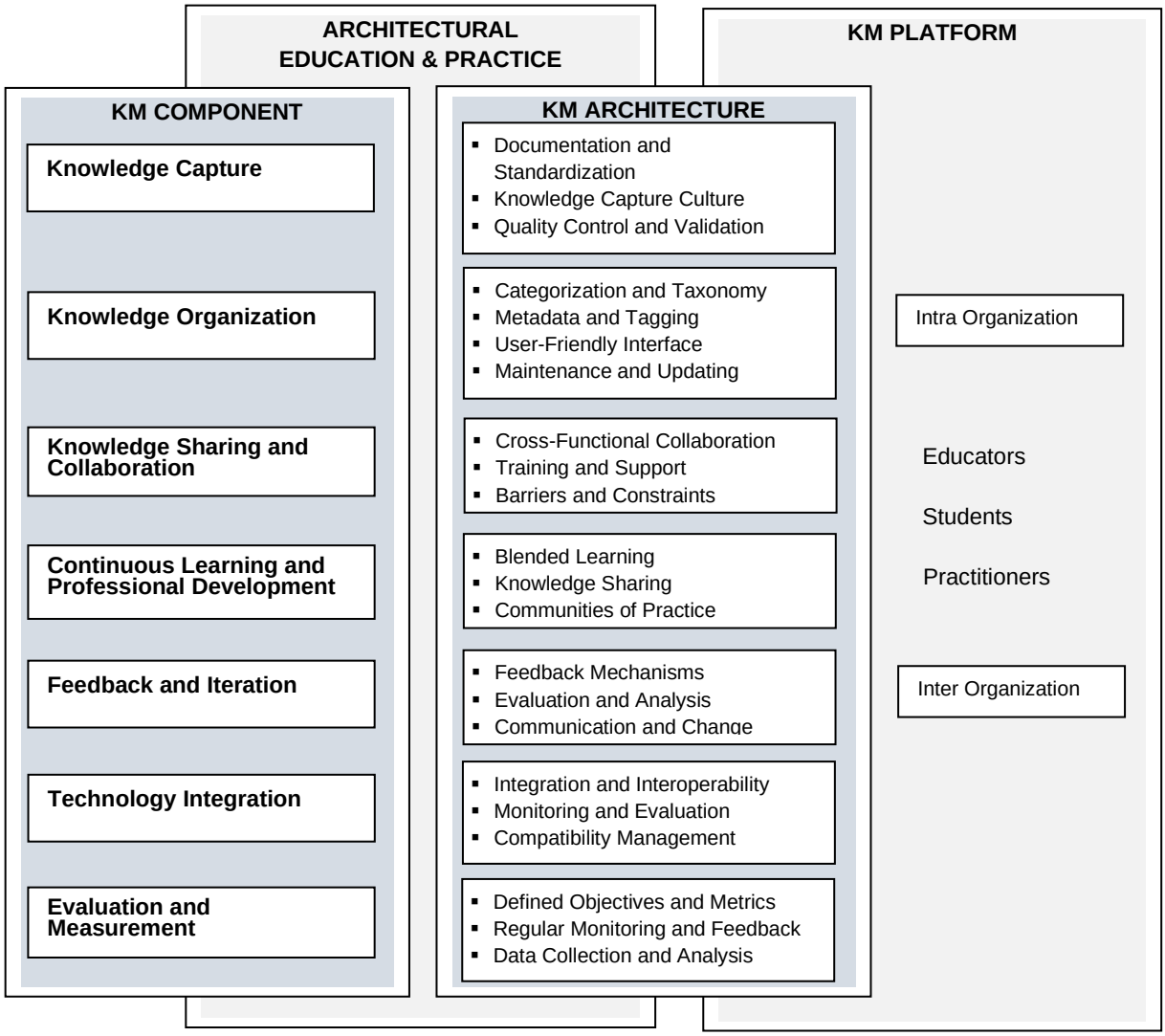
The findings highlight the benefits of evaluation and measurement in KM architecture, including improved decision-making, enhanced performance and efficiency, and demonstrating value and ROI. Challenges such as defining relevant metrics, data collection and quality, and linking metrics to business outcomes need to be addressed. The evaluation reveals the KM architecture's effectiveness in improving knowledge sharing and collaboration, enhancing knowledge capture and creation, increasing knowledge reuse and application, improving organizational performance and outcomes, and achieving high user satisfaction and adoption. These insights inform organizations on areas for further improvement and optimization. By analyzing these results, organizations can refine processes, enhance usability, address identified areas for improvement, provide additional training or support, and align the KM architecture with evolving organizational needs. The goal is to continuously optimize the architecture to drive effective knowledge management, collaboration, and organizational success.

4.8 KM Architecture Framework

Based on the above analysis, a framework focuses on the key areas specific to approach in KM architecture can be developed to addresses knowledge organization, capture, sharing,

collaboration, continuous learning, feedback and iteration, technology integration, and evaluation and measurement within the context of IT system. KM Architecture framework is shown in Figure 15 below.

Figure 15. Framework for KM Architecture



The framework facilitates collaboration, enhances practical skills development, and promotes a culture of innovation and continuous learning, ultimately contributing to the growth and success of the architectural profession. By implementing this KM architecture framework, architectural educational institutions and industry practitioners can effectively bridge the gap between education and practice. It provides a structured approach for knowledge creation, storage, sharing, application, and continuous improvement.

5. Conclusion

Bridging the gap between architectural education and practice is essential to ensure a seamless transition for graduates entering the industry and maximize their potential contributions.

This research has explored the role of knowledge management (KM) architecture as a solution to address this disparity. By examining relevant studies and utilizing a literature review and questionnaire, this study has identified the potential elements of KM architecture that facilitate the transfer, sharing, and application of knowledge in the architectural field. The findings emphasize the role of knowledge management practices in addressing the gaps between architectural education and practice. Through the proposed KM architecture framework, educational institutions and industry practitioners can facilitate knowledge transfer, enhance collaboration, and foster continuous learning and innovation. The framework encompasses crucial components such as knowledge creation and acquisition, storage and retrieval, sharing and dissemination, application and utilization, technology and infrastructure, organizational culture and leadership, and evaluation and continuous improvement. Implementing this framework provides a structured approach to bridge the gap, seamlessly integrating theoretical knowledge and practical application while fostering the development of industry-relevant skills. By recognizing the importance of effective knowledge transfer, collaboration, and continuous learning, stakeholders can collectively work towards bridging the gap, fostering innovation, and contributing to the growth and success of the architectural profession in meeting the evolving needs of society and the built environment.

Effective KM architecture can significantly enhance architectural education by aligning curriculum with industry requirements, integrating real-world case studies and practical experiences, and promoting collaboration between academia and practitioners. This approach ensures that students acquire the necessary knowledge and skills that are directly applicable to the professional practice of architecture. Furthermore, in professional practice, the adoption of a KM architecture framework allows practitioners to leverage a repository of valuable knowledge and expertise. Professionals can access relevant information, documented best practices, and lessons learned from previous projects, enabling them to make informed decisions and deliver high-quality designs. This approach fosters continual learning and promotes a knowledge-driven culture within the architectural industry.

By implementing KM architecture and utilizing appropriate tools as a foundation, the architecture field can effectively bridge the gap between education and practice. It equips aspiring professionals with the essential skills needed for success in their careers while creating an environment that emphasizes continuous learning and knowledge-driven practices. This comprehensive approach ensures that graduates are well-prepared to meet the challenges of professional practice and contribute meaningfully to the field of architecture. In conclusion, the integration of KM architecture in architectural education and practice provides a powerful framework to bridge the existing gap. It fosters collaboration, enhances knowledge transfer, and promotes a culture of continuous learning. By embracing this approach, the architecture field can effectively bridge the gap and create a harmonious connection between education and professional practice, ultimately elevating the standards and achievements of the architectural profession.

References

Asadi, F., Hosseini, M. A., & Gomar, T. (2022). Effectiveness of Training Workshop on ICD-10 Cancer Coding Guidelines for Clinical Coders. *International Journal of Cancer Management*, *15*(2).

Barnett, S., Jones, S. C., Caton, T., Iverson, D., Bennett, S., & Robinson, L. (2014). Implementing a virtual community of practice for family physician training: a mixed-methods case study. *Journal of medical Internet research, 16*(3), e3083.

Camarata, T., & Slieman, T. A. (2020). Improving student feedback quality: A simple model using peer review and feedback rubrics. *Journal of medical education and curricular development*, *7*, 2382120520936604.

Cerchione, R., Esposito, E., & Spadaro, M. R. (2015). The spread of knowledge management in SMEs: A scenario in evolution. *Sustainability, 7*(8), 10210-10232.

Chang, S. F. (2006, October). Constructing Hierarchical Topic Knowledge Window for Chinese News Browsing and Retrieval. In *9th Joint International Conference on Information Sciences (JCIS-06)* (pp. 273-276). Atlantis Press.

Chebii, M. K., & Ngari, J. K. (2018). Influence of knowledge creation on organizational performance of state owned commercial enterprises in Kenya. *Journal of Business and Strategic Management*, *3*(1), 18-30.

Clarke, A. J., Burgess, A., van Diggele, C., & Mellis, C. (2019). The role of reverse mentoring in medical education: current insights. *Advances in medical education and practice*, 693-701.

Cunha, F., Dinis-Carvalho, J., & Sousa, R. M. (2023). Performance measurement systems in continuous improvement environments: obstacles to their effectiveness. *Sustainability*, *15*(1), 867.

Daland, H. (2016). Managing knowledge in academic libraries.: Are we? Should we?. *LIBER Quarterly: The Journal of the Association of European Research Libraries*, *26*(1), 28-41.

Eisenberg, A., Ignatjeva, S., Iliško, D., & Rauckiene-Michaelsson, A. (2018). Adaptation of the organizational learning culture (OLC) dimension methodology in the Israeli local authorities context. *Discourse and Communication for Sustainable Education*, *9*(1), 50-63.

Fernando, E., Meyliana, A. N. H., & Prabowo, H. (2020). Factors Influencing Social Knowledge Management in Social Society: A Systematic Literature Review. *Advances in Science, Technology and Engineering Systems*, *5*(3), 198-206.

Firrdhaus Mohd Sahabuddin, M., Aminuddin, A., Muhammad-Sukki, F., & Shukri, S. M. (2022). Indoor and Outdoor Air Quality in Densely Populated Areas: Case Studies of High-Rise Social Housing in Kuala Lumpur. *Pertanika Journal of Science & Technology*, *30*(2).

Han, I. (2021). Development of professional identity and related metacognitive thinking procedures of English language teachers through spontaneous collaboration for pedagogical problem-solving. *Sage Open*, *11*(2), 21582440211009483.

Heylighen, A., Martin, W. M., & Cavallin, H. (2007). Building stories revisited: unlocking the knowledge capital of architectural practice. *Architectural Engineering and Design Management*, *3*(1), 65-74.

Hodgson, P. (2019). Opportunities, Challenges and Creative Teaching Practices of New International and Local Recruits in Hong Kong. *Athens Journal of Education*, *6*(2), 111-125.

Ibrahim, M. A., Wahab, M. H., & Shukri, S. M. (2018). Revealing Urban Marketplace Identity: Pudu. *Planning Malaysia*, *16*.

Jnr, B. A., Pa, N. C., Nor, R. N. H., & Josoh, Y. J. (2017). Knowledge mapping process model for risk mitigation in software management. *International Journal of Software Engineering and Computer Systems*, *3*(1), 1-16.

Jokanović, B., Zivlak, N., Okanović, A., Ćulibrk, J., & Duđak, L. (2020). The model of knowledge management based on organizational climate. *Sustainability*, *12*(8), 3273.

Kaziliūnas, A. (2012). The knowledge management process for implementing quality improvement programs. *Informacijos mokslai*, (62), 97-108.

Lawson, B. (2006). *How designers think: The design process demystified*. Routledge.

Liew, P. Y., & Luetge, C. (2018). Literature Review of Management System Frameworks for CSR and Other Sustainability Concepts. *J. Mgmt. & Sustainability*, *8*, 22.

Li, W., Li, X., & Wu, W. (2022). Knowledge Innovation Mechanism Based on Linkages between Core Knowledge and Periphery Knowledge: The Case of R&D Cooperation between Latecomers and Forerunners. *Complexity*, *2022*.

Liao, C., He, Y., & Xiong, G. (2017, July). Studies on ontology-based TCM knowledge base construction mode. In *2017 9th International Economics, Management and Education Technology Conference (IEMETC 2017)* (pp. 388-393). Atlantis Press.

Liyanage, C., Elhag, T., Ballal, T., & Li, Q. (2009). Knowledge communication and translation–a knowledge transfer model. *Journal of Knowledge management*, *13*(3), 118-131.

Loan, N. T. T. (2019). Reflective teaching in an EFL writing instruction course for Thai pre-service teachers. *Journal of Asia TEFL*, *16*(2), 561.

David, M. (2022). Professional Development of School Leaders in Supporting Effective Teaching and Learning in the Shiselweni Region, Eswatini. *International Journal of Scientific Research and Management (IJSRM)*, *10*(05), 2385-2397.

Malkawi, M. S., & Rumman, A. A. H. A. (2016). Knowledge management capabilities and its impact on product innovation in SME's. *International Business Research*, *9*(5), 76-85.

Manteghi, G., Shukri, S. M., & Lamit, H. (2019). Street geometry and river width as design factors to improve thermal comfort in Melaka City. *Journal of Advanced Research in Fluid Mechanics and Thermal Sciences*, *58*(1), 15-22.

McInerney, C. (2002). Knowledge management and the dynamic nature of knowledge. *Journal of the American society for Information Science and Technology*, *53*(12), 1009-1018.

Muggli, J. I. V., & Westermann, W. (2019). Effectiveness of OER use in first-year higher education students' mathematical course performance: A case study. *The International Review of Research in Open and Distributed Learning*, *20*(2).

Mukhtar, M., Sudarmi, S., Wahyudi, M., & Burmansah, B. (2020). The Information System Development Based on Knowledge Management in Higher Education Institution. *International Journal of Higher Education*, *9*(3), 98-108.

Omoush, M. M. (2019). Impact of intangible assets (Intellectual Capital, Knowledge Management) on innovation: A study on tourist agencies in Jordan (Tourist Agencies in Irbid). *International Journal of Business and Management*, *14*(6), 138.

Park, I., Lee, K., & Yoon, B. (2015). Exploring promising research frontiers based on knowledge maps in the solar cell technology field. *Sustainability*, *7*(10), 13660-13689.

Raudeliūnienė, J., Davidavičienė, V., & Jakubavičius, A. (2018). Knowledge management process model. *Entrepreneurship and Sustainability Issues*, *5*(3), 542-554.

Raza, U., Ahmad, W., & Khan, A. (2018). Transformation from manufacturing process taxonomy to repair process taxonomy: a phenetic approach. *Journal of Industrial Engineering International*, *14*, 415-428.

Roy, S., Khan, I. A., Bhuyan, J., Rani, S., Indira, R., & Jayadatta, S. Implementation of knowledge management and utilizing tools in healthcare for making evidence-based decisions.

Rozaly, M. Z. M., Shukri, S. M., Latip, N. S. A., & Abdullah, A. (2018). Reweaving the Urban Fabric of the Historic Riverfront Townscape of Masjid India, Kuala Lumpur. *Engineering & Technology*, *7*, 81-85.

Salama, A. M. (2008). A theory for integrating knowledge in architectural design education. *ArchNet-IJAR: International Journal of Architectural Research*, *2*(1), 100-128.

Salama, A. M. (2013). Seeking responsive forms of pedagogy in architectural education. *Field*, *5*(1), 9-30.

Shah, K. M., & Hussin, N. (2018). From Knowledge Retention to Knowledge Transfer. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 329-334.

Shahmoradi, L., Safadari, R., & Jimma, W. (2017). Knowledge management implementation and the tools utilized in healthcare for evidence-based decision making: a systematic review. *Ethiopian journal of health sciences*, *27*(5), 541-558.

Shukri, S. M., Wahab, M. H., Awaluddin, Z. L., Aminuddin, A. M. R., & Hasan, M. I. (2022). The Role of Attachment in Creating Sustainable Sense of Place for Traditional Streets in Alor Setar, Malaysia. *Journal of Design and Built Environment*, *22*(1), 55-71.

Shukri, S. M., Wahab, M. H., & Jamala, N. (2021). The Architectural Concept of Malay Royal Town. *Journal of Design and Built Environment*, *21*(3), 52-62.

Shukri, S. M., Wahab, M. H., & Amat, R. C. (2020). Revealing Malay Royal Town Identity: Seri Menanti, Negeri Sembilan. In *IOP Conference Series: Earth and Environmental Science* (Vol. 409, No. 1, p. 012034). IOP Publishing.

Shukri, S. M., Wahab, M. H., Amat, R. C., Taib, I., & Ismail, S. (2018). The Morphology of Early Towns in Malay Peninsula. *International Journal of Engineering & Technology*, *7*(3.9), 77-80.

Shukri, S. M., Wahab, M. H., Amat, R. C., Taib, I., & Rozaly, M. Z. M. (2018). Definition and physical attributes that characterise settings of malay royal towns in Malaysia. *International Journal of Engineering & Technology*, *7*(3.9), 55-58.

Shukri, S. M., Manteghi, G., Wahab, M. H., Amat, R. C., & Ming, W. H. (2018). Preserving and Conserving Malay Royal Towns Identity in Malaysia. *The Journal of Social Sciences Research*, 852-860.

Singh, S. K., & Singh, K. (2019). Knowledge management process and innovation in indian nationalised bank. *International Journal of Innovative Technology and Exploring Engineering*, *8*(12), 4650-4657.

Stenholm, D., Catic, A., & Bergsjö, D. (2019). Knowledge reuse in industrial practice: evaluation from implementing engineering checksheets in industry. *Design Science*, *5*, e15.

Teng, T. G., Aminuddin, A., Sarkum, S. A., & Shukri, S. M. (2022). Sustainable Architecture in the Urban Studies on Walkability in Public Housing. *Journal of Design and Built Environment*, *22*(2), 62-84.

Uslar, M., Rohjans, S., Neureiter, C., Pröstl Andrén, F., Velasquez, J., Steinbrink, C., ... & Strasser, T. I. (2019). Applying the smart grid architecture model for designing and validating system-of-systems in the power and energy domain: A European perspective. *Energies*, *12*(2), 258.

Varajão, J., Lourenço, J. C., & Gomes, J. (2022). Models and methods for information systems project success evaluation–A review and directions for research. *Heliyon*.

Zhao, W., & Liu, J. (2022). Application of knowledge map based on BiLSTM-CRF algorithm model in ideological and political education question answering system. *Mobile Information Systems*, *2022*.

Zontek, Z., & Whitworth, C. (2009). Managing Knowledge: Social Organizations in the UK and Poland. *Management*, *15*, 15-31.

Zou, P. (2004). Knowledge management practice in two Australian Architecture-Engineering-Construction (AEC) companies. *Construction Economics and Building*, *4*(2), 19-32.

.