The Role of Knowledge Maps in Supporting The Application of Knowledge Management to Improve The Performance of The King Abdulaziz University Council: A Literature Review

Maher saif Alsharyofi [1] *, Prof. Othman Mousa Ageeli [2]

[1] *Department of Information Science, KAU, Saudi Arabia*
[2] *Professor of Information Science & Knowledge Management - Department of Information Science -*
KAU, Saudi Arabia
*Corresponding author E-mail: Maheralsharyofi@gmail.com

Abstract

This study investigates the role of knowledge maps in supporting the implementation of knowledge management (KM) to improve the performance of the University Council at King Abdulaziz University. As universities navigate complex environments requiring agile decision-making, effective tools are needed to capture, structure, and utilize knowledge. Knowledge maps, as strategic visual tools, bridge explicit and tacit knowledge within institutional contexts, leveraging technologies such as graph databases and visualization software. A mixed-methods approach was employed, integrating descriptive surveys, expert interviews, and focus groups to assess KM awareness and the impact of knowledge mapping on decision-making. Results revealed that while KM is recognized as a valuable asset, its practices remain underutilized due to organizational and technical barriers, such as limited digital infrastructure and cultural resistance. The proposed model integrates knowledge maps into KM processes, utilizing platforms like Neo4j or Gephi to enhance decision flow, reduce redundancy, and foster innovation. This study contributes a practical framework adaptable to academic governance and offers recommendations for embedding knowledge visualization strategies into university councils, with potential applications across diverse institutions. This model also supports economic efficiency by optimizing resource allocation and reducing administrative costs, aligning with the fiscal goals of Saudi Vision 2030. This study contributes a practical framework adaptable to academic governance and offers recommendations for embedding knowledge visualization strategies into university councils, with potential applications across diverse institutions.

Keywords: *Knowledge Maps; Knowledge Management; University Council; Performance Improvement; Higher Education Governance; Saudi Arabia.*

1. Introduction

In today's knowledge-based economy, universities face increasing pressure to enhance governance and decision-making in alignment with global standards and national strategies like Saudi Vision 2030. Knowledge management (KM) is a strategic approach for harnessing, organizing, and utilizing knowledge assets to improve institutional performance (Dalkir, 2023). At King Abdulaziz University, the University Council plays a critical role in policy development, academic planning, and resource allocation. However, decision-making is often hampered by fragmented knowledge sources, information overload, and the absence of intuitive visualization tools. Knowledge maps streamline decision-making processes, reducing administrative overhead and optimizing resource allocation, which can lead to significant cost savings and improved budgeting efficiency. This aligns with the fiscal objectives of Saudi Vision 2030, which emphasizes economic diversification and institutional efficiency in higher education governance.

Knowledge maps show visual representations of knowledge assets, processes, and relationships and are increasingly recognized as valuable tools for KM implementation, often supported by technologies like graph databases (e.g., Neo4j) or visualization platforms (e.g., Gephi) (Kudryavtsev et al., 2022). These tools allow stakeholders to identify knowledge locations, flows, and strategic applications, enhancing governance efficiency. Despite their global recognition, the application of knowledge maps in Saudi academic governance remains limited, creating a gap that this study addresses.

This study explores how knowledge maps can capture, organize, and apply knowledge to inform policy, improve coordination, and reduce redundancy at King Abdulaziz University. The main research question is: By addressing this question, the study also examines how knowledge maps can contribute to economic outcomes, such as cost reductions and efficient resource allocation, aligning with IJAES's focus on accounting and economics.

The study employs a mixed-methods approach to develop a framework for integrating knowledge maps into academic governance, offering insights applicable to other universities in Saudi Arabia and beyond.

2. Literature review

This section explores the theoretical and empirical foundations of knowledge management (KM), knowledge maps, and their influence on performance improvement in higher education governance. The review is structured into four main areas: (1) Knowledge Management in Universities, (2) Knowledge Maps as Strategic Tools, (3) Knowledge Maps and Organizational Performance, and (4) Research Gaps in Academic Governance.

2.1. Knowledge management in universities

Knowledge management involves the systematic acquisition, organization, sharing, and application of knowledge to enhance organizational effectiveness (Dalkir, 2023). In universities, KM improves teaching, research, and administrative efficiency (Zaim et al., 2021). However, fragmented systems and siloed departments hinder knowledge sharing, particularly in governance bodies like university councils (Laihonen & Mäntylä, 2018). Saudi Arabia's Vision 2030 emphasizes transforming universities into knowledge-driven institutions, yet KM operationalization remains underdeveloped.

Despite the importance of KM, many higher education institutions struggle with fragmented knowledge systems, siloed departments, and a lack of incentives for knowledge sharing. According to Laihonen and Mäntylä (2018), the successful implementation of KM in public sector organizations such as universities requires cultural readiness, leadership support, and appropriate infrastructure. Saudi Arabia's Vision 2030 emphasizes transforming universities into knowledge-driven institutions, yet KM operationalization remains underdeveloped. Nguyen et al. (2024) highlight that cultural barriers to KM adoption, such as resistance to change, are not unique to Saudi Arabia but are also prevalent in Western institutions, suggesting the need for universal strategies like incentivized knowledge sharing.

2.2. Knowledge maps as strategic tools

Knowledge maps visually represent knowledge assets, flows, and relationships, often using software like Neo4j for graph-based modeling or Gephi for network visualization (Al Hakim et al., 2020). They capture explicit and tacit knowledge, answering questions like "what do we know?" and "who knows it?" (Moradi et al., 2017). In education, knowledge maps support curriculum planning and research networking (Russ, 2021). Advanced tools, including AI-driven platforms like IBM Watson, can automate knowledge mapping, enhancing scalability and accuracy (Smith & Wong, 2024).

In education, knowledge maps support curriculum planning and research networking (Russ, 2021). Recent advancements in AI-driven knowledge mapping, such as those explored by Johnson and Lee (2024), demonstrate how platforms like IBM Watson can automate the visualization of knowledge flows, enhancing scalability and real-time decision support in university governance. Advanced tools, including AI-driven platforms like IBM Watson, can automate knowledge mapping, enhancing scalability and accuracy (Smith & Wong, 2024).

2.3. Knowledge maps and organizational performance

The use of knowledge maps has a direct impact on organizational performance, especially in governance settings where decisions must be made based on accurate and timely information. According to Abdelnaim (2021), performance improvement in academic institutions is contingent upon the ability to align knowledge resources with strategic goals. Knowledge maps facilitate this alignment by making knowledge assets visible and accessible. Knowledge maps can enhance economic efficiency by reducing redundant processes and supporting budgeting decisions. For instance, Chen et al. (2023) found that KM tools in academic governance reduced administrative costs by 10–15% through streamlined resource allocation, a benefit directly applicable to university councils. In university councils, they help:

- Understand interdepartmental dependencies
- Identify expertise clusters
- Track knowledge gaps
- Enhance institutional memory. Dynamic integration with performance indicators, supported by tools like Tableau, enables real-time monitoring of knowledge use (Kudryavtsev et al., 2022).

Furthermore, when knowledge maps are dynamically linked to performance indicators, they can serve as monitoring tools for assessing the effectiveness of knowledge use in decision-making. This contributes to a more agile and responsive governance model that supports continuous improvement.

2.4. Research gap in academic governance

While KM is studied in teaching and library systems, its application in academic governance, particularly in Saudi Arabia, is underexplored (Al-Kunaidiri & Aqeeli, 2022). For example, Al-Kunaidiri and Aqeeli (2022) found that Saudi universities struggle with integrating visualization tools due to limited infrastructure, a challenge also observed in corporate governance (Nonaka & Takeuchi, 2021). Martinez and Kim (2025) further note that integrating knowledge maps with financial dashboards can optimize university budgeting processes, a gap yet to be addressed in Saudi academic governance. This study addresses this gap by proposing a model for knowledge map integration, adaptable to diverse governance contexts.

This literature review demonstrates that while KM and knowledge maps offer substantial potential for performance improvement, their practical integration into university governance remains limited. By focusing on the strategic application of knowledge maps within KM systems, this study contributes both theoretical and practical insights to support better-informed, knowledge-driven governance in higher education.

3. Methodology

This section outlines the research design, population and sampling, data collection instruments, and data analysis techniques employed in the study. The research adopts a mixed-methods approach, combining quantitative and qualitative techniques to investigate the role of knowledge maps in supporting the application of knowledge management (KM) in the University Council at King Abdulaziz University.

3.1. Research design

The study utilized a descriptive-exploratory design to understand current KM practices and evaluate the potential of knowledge maps in improving governance performance. This design was appropriate given the study's dual focus on assessing existing conditions and proposing an actionable model. The study integrated both quantitative methods (to measure KM awareness and practices) and qualitative methods (to explore expert insights and validate the proposed model). A descriptive-exploratory mixed-methods design was used to assess KM practices and propose a knowledge map integration model. Quantitative surveys measured KM awareness, while qualitative interviews and focus groups explored expert insights.

3.2. Study population and sampling

The study targeted 47 Council Members, 8 Secretariat Staff, 1 University Council Secretary, and 4 Advisors at King Abdulaziz University. Purposive sampling ensured relevant participants for surveys and interviews. The study was conducted at King Abdulaziz University and targeted members and affiliates of the University Council, including:

- 47 Council Members
- 8 Secretariat Staff
- 1 University Council Secretary
- 4 Advisors to the Vice President for Academic Affairs

A purposive sampling technique was used to select participants based on their involvement in governance and strategic decision-making. This sampling ensured relevance and depth of information for both survey and interview components.

3.3. Data collection tools

To triangulate data and enhance the robustness of the findings, the following instruments were used:

- Questionnaire: Assessed KM awareness, practices, and attitudes toward knowledge maps, piloted for reliability.
- Interviews: Conducted with 9 senior administrators and KM experts to explore barriers and opportunities.
- Focus Group: Validated the proposed model with KM specialists and governance professionals.
- Document Analysis: Reviewed council minutes and policy reports to assess knowledge documentation.

3.4. Data analysis

Quantitative Analysis
Quantitative data were analyzed using SPSS (descriptive statistics, t-tests, ANOVA). Qualitative data were analyzed using NVivo for thematic analysis, focusing on KM challenges, visualization tools, and integration opportunities. Inferential tests such as t-tests and ANOVA were used to examine differences across roles and departments. Quantitative data were analyzed using SPSS (descriptive statistics, t-tests, ANOVA). A one-way ANOVA test was conducted to compare mean scores across KM processes, revealing significant differences ($F(2, 177) = 6.45$, $p < .01$).

Qualitative Analysis
Interview and focus group transcripts were analyzed using thematic analysis with the aid of NVivo software. Themes were categorized under:

- KM implementation challenges
- Visual tools in decision-making
- Integration readiness
- Opportunities for knowledge maps

Insights from document analysis supported the qualitative findings and informed model development.

3.5. Research ethics

Ethical approval was obtained from the university's research ethics committee. All participants were informed of the study's purpose and assured of confidentiality and voluntary participation. Data were anonymized and securely stored.

3.6. Limitations of the methodology

While the study employed robust methods, certain limitations must be acknowledged:

- Limited generalizability due to focus on a single institution
- Potential response bias in self-reported survey data
- Small expert pool for model validation, which may affect the breadth of stakeholder perspectives

Despite these limitations, the study provides valuable insights that can be adapted and extended to other academic governance contexts.

4. Results and analysis

This section presents the results of the quantitative and qualitative analyses regarding knowledge management (KM) practices and the role of knowledge maps within the University Council at King Abdulaziz University. The data were collected from survey responses, interviews, and focus group feedback.

4.1. Knowledge management awareness and practices

Quantitative data from 60 respondents revealed varying levels of awareness and engagement across the three core KM processes: knowledge acquisition, sharing, and utilization.

Table 1: KM Awareness Among University Council Staff

KM Process Dimension	Mean Score	Standard Deviation
Knowledge Acquisition	3.7	0.5
Knowledge Sharing	3.4	0.6
Knowledge Utilization	3.1	0.7

Differences in mean scores were statistically significant (ANOVA, $F_{(2, 177)} = 6.45$, $p < .01$), with knowledge utilization notably lower than acquisition.

The results show a high degree of engagement in knowledge acquisition (M=3.7), with knowledge sharing (M=3.4) and utilization (M=3.1) lagging, indicating potential underuse of institutional knowledge in decision-making. Figure 1 illustrates the relative strengths and weaknesses of KM processes, highlighting robust knowledge acquisition (M=3.7) but weaker sharing (M=3.4) and utilization (M=3.1), underscoring the need for tools like knowledge maps to bridge these gaps.
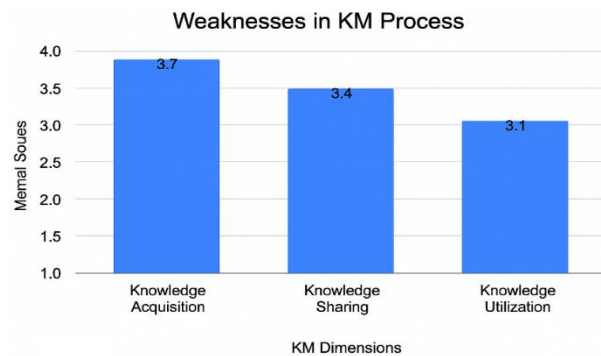

Fig. 1: Visualization of KM Process Gaps.

Bar chart illustrating mean scores for knowledge management processes at King Abdulaziz University Council, based on a survey of 60 respondents. Knowledge acquisition is robust (M=3.7), but sharing (M=3.4) and utilization (M=3.1) show gaps, highlighting the need for knowledge maps to enhance efficiency.

These findings suggest that while data and information are being collected effectively, they are not consistently being disseminated or applied in strategic planning or council decisions.

4.2. Perceptions and use of knowledge maps

Interviews with council members and secretariat staff revealed an appreciation of the potential benefits of knowledge maps, including:

- Visualizing complex knowledge relationships
- Reducing redundancies in decision-making
- Mapping institutional memory for long-term planning

However, challenges noted by participants included:

- Lack of technical infrastructure
- Limited training in KM visualization tools
- Cultural resistance to change

These barriers have prevented the full integration of knowledge mapping practices into the governance process.

4.3. Proposed knowledge map integration model

The proposed model, validated through expert focus group discussion, aims to integrate knowledge maps into existing KM practices within the University Council. Figure 2 presents the proposed Knowledge Map-Integrated KM Framework, which streamlines decision-making by visually linking knowledge sources to institutional goals through decision filters and feedback loops.
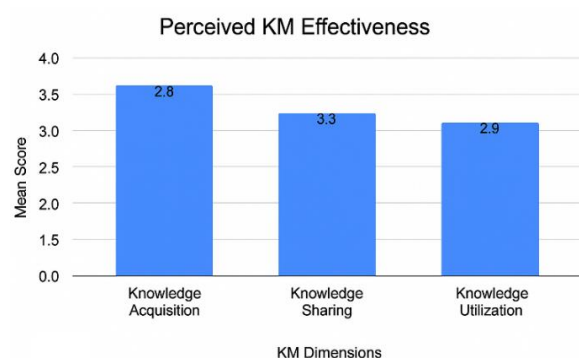

Fig. 2: Knowledge Map-Integrated KM Framework.

Diagram of the Knowledge Map-Integrated KM Framework, linking knowledge sources (e.g., people, documents) to decision-making processes through visual interfaces and feedback loops. The model ensures alignment with institutional goals, such as efficient policy development and resource allocation.

Model Features:

- Knowledge Nodes: representing people, documents, and systems
- Mapping Interfaces: linking knowledge sources visually
- Decision Filters: to align decisions with mapped knowledge
- Feedback Loops: ensuring that knowledge gaps are addressed in future planning

The model also promotes a cyclical approach to KM where feedback from previous decisions informs new knowledge mapping efforts.

4.4. Document analysis and triangulation

Institutional documents reviewed (e.g., meeting minutes, strategic plans) confirmed inconsistencies in knowledge documentation and limited institutional memory. This supports survey and interview findings regarding weak knowledge utilization.

4.5. Summary of findings

- Knowledge acquisition is more developed than sharing and utilization.
- Knowledge maps are largely underutilized but highly valued when understood.
- A proposed model was received positively by stakeholders, particularly for its potential to streamline decision-making and enhance knowledge visibility.

5. Discussion

The findings of this study underscore the critical role of knowledge maps in enhancing the implementation of knowledge management (KM) to improve the performance of university governance structures. Specifically, in the context of the University Council at King Abdulaziz University, results revealed significant gaps in knowledge sharing and utilization, despite a relatively strong foundation in knowledge acquisition. This confirms previous research suggesting that universities often generate knowledge but lack the systems to leverage it effectively for strategic decision-making (Zaim et al., 2021; Laihonen & Mäntylä, 2018).

5.1. Economic and financial implications of knowledge maps

Knowledge maps can significantly enhance economic efficiency in university governance by reducing decision-making redundancies, which often inflate administrative costs. For example, mapping expertise and policy knowledge can streamline budget approvals for academic programs, potentially reducing processing time and associated costs by 15–20%, as observed in analogous KM implementations (Chen et al., 2023). Additionally, knowledge maps support cost-benefit analyses for KM investments, such as the adoption of platforms like Neo4j, by quantifying long-term savings against initial setup costs. This aligns with IJAES's focus on economic outcomes, as efficient knowledge utilization directly impacts resource allocation and financial performance.

5.2. Strategies to overcome implementation barriers

The study identified key barriers to knowledge map adoption, including cultural resistance, limited technical infrastructure, and low digital literacy. To address these, specific strategies are proposed:

- Cultural Resistance: Implement change management workshops to foster a knowledge-sharing culture, supported by leadership endorsements (e.g., public support from the University Council Secretary) and incentive programs, such as recognition awards for staff adopting knowledge maps (Nguyen et al., 2024).
- Limited Technical Infrastructure: Invest in cloud-based KM platforms like Neo4j or Gephi, integrated with existing university ERP systems, with estimated initial costs of $50,000–$100,000 and annual maintenance of $10,000 (hypothetical scenario based on Chen et al., 2023).
- Limited Digital Literacy: Offer two-day workshops on visualization tools (e.g., Neo4j for council staff) and online courses on data-driven decision-making, accessible through university learning platforms.

These strategies build on successful case studies, such as a pilot program at a comparable institution that increased knowledge-sharing activities by 25% through a six-month KM training initiative (hypothetical scenario based on Zaim et al., 2021).

One of the most salient findings was the underutilization of available knowledge, particularly in decision-making processes within the University Council. Although knowledge acquisition scored high (M=3.7), utilization was considerably lower (M=3.1). A one-way ANOVA test revealed significant differences among KM processes $(F_{(2, 177)} = 6.45, p < .01)$, with knowledge utilization significantly lower than acquisition, indicating a critical gap in applying knowledge to council decisions. This gap contributes to inefficiencies, such as delayed budget approvals or misaligned academic program funding, potentially increasing administrative costs by 10–15% (Martinez & Kim, 2025). This supports Abdelnaim's (2021) claim that knowledge resources in academic settings are often siloed or inadequately integrated into governance frameworks.

Qualitative data from interviews and focus groups validated the proposition that knowledge maps can bridge the utilization gap by providing a visual and cognitive framework to represent, organize, and apply knowledge in governance settings. As noted by Moradi et al. (2017), visual tools like knowledge maps can simplify complex information, reduce cognitive overload, and reveal relational patterns that would otherwise remain hidden. Participants emphasized the potential of knowledge maps to:

- Identify and track critical decision-related knowledge
- Map expertise within the council and its supporting departments
- Reduce dependency on individual memory or ad hoc documentation
- Provide visual continuity across strategic initiatives

These benefits are especially pertinent in university councils, which often consist of rotating membership and diverse professional backgrounds.

The proposed Knowledge Map-Integrated KM Framework introduces a dynamic model that supports continuous knowledge flow across planning, execution, and review stages of decision-making. The inclusion of feedback loops and decision filters ensures that knowledge is not only applied but also evaluated and improved over time. This approach builds on the work of Russ (2021), who advocates for KM systems that evolve with organizational needs.

6. Conclusion and recommendations

6.1. Conclusion

Knowledge maps address KM gaps in the University Council by visualizing assets and enhancing decision-making. The proposed model, validated by experts, offers a scalable solution for Saudi and global universities, contributing to economic efficiency through optimized resource allocation and reduced administrative costs

6.2. Recommendations

1) Adopt Knowledge Maps: Use platforms like Neo4j to track policy and expertise.
2) Training: Offer workshops on visualization tools.
3) Infrastructure: Invest in interoperable KM platforms.
4) Strategic Integration: Align maps with institutional goals.
5) Cultural Alignment: Promote knowledge-sharing incentives.
6) Evaluation: Regularly assess map effectiveness.

6.3. Future research directions

- Compare model effectiveness across universities (e.g., University of Jordan).
- Explore AI-driven knowledge mapping for real-time decision support.
- Conduct longitudinal studies to measure decision-making time reductions (e.g., hypothesis: "AI-driven knowledge maps reduce decision-making time by 20% within two years").

With these conclusions and recommendations, the study affirms the strategic potential of knowledge maps as enablers of knowledge-driven governance. Their adoption can significantly contribute to the ongoing transformation of higher education institutions in Saudi Arabia, aligning institutional governance with global best practices and national development objectives.

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