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Keywords: cloud-based knowledge management system (CKMS), organizational innovation, transitional economies, resource-based view (RBV), dynamic capabilities

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Designing cloud-based knowledge management systems to improve organizational innovation

Abstract

Organizations in transitional economies face significant challenges in implementing effective knowledge management systems owing to infrastructure limitations, post-conflict instability, and cultural barriers that prioritize tacit knowledge over formal documentation. This study addresses this critical gap by developing and evaluating a context-sensitive Cloud-based Knowledge Management System (CKMS) specifically designed for Iraqi firms operating in resource-constrained conditions. Employing a Design Science Research (DSR) methodology integrated with an explanatory sequential mixed-methods approach, we collected data from 350 knowledge workers across ten organizations and conducted structural equation modeling to examine the relationships between CKMS implementation, knowledge management capabilities, and organizational innovation outcomes. The findings demonstrate that CKMS significantly enhances all four knowledge management capabilities—acquisition, storage, sharing, and application—with particularly strong effects on knowledge storage ($\beta = 0.72$, $p < 0.001$) and knowledge application ($\beta = 0.70$, $p < 0.001$). These enhanced capabilities subsequently drive substantial improvements in organizational innovation, with process innovation showing the strongest impact ($\beta = 0.56$, $p < 0.001$), followed by product innovation ($\beta = 0.42$, $p < 0.001$) and business model innovation ($\beta = 0.38$, $p < 0.001$). Leadership support and organizational culture emerge as critical moderating factors that amplify the effectiveness of CKMS. This study extends Dynamic Capabilities and Resource-Based View theories by demonstrating how context-adapted technological solutions can function as strategic resources in transitional economies, providing a validated framework for digital transformation that prioritizes accessibility and cultural fit over technological sophistication, thereby offering actionable insights for organizations and policymakers operating in similar post-conflict settings.

1. INTRODUCTION

In today's knowledge-economy-driven world, organizations more than ever rely on intellectual capital management as a source of innovation and a long-term sustainable competitive edge (International Monetary Fund, 2025; Nonaka & Takeuchi, 2019). Cloud computing has drastically transformed information technology by providing a scalable, economical, and accessible infrastructure for constructing Knowledge Management Systems (KMS) (Mell & Grance, 2011; Marston et al., 2011). While traditional KMS often suffered from silos and high maintenance costs, Cloud-based Knowledge Management Systems (CKMS) foster a cross-functional collaborative culture that accelerates organizational innovation through real-time data accessibility (Wang & Liu, 2022; Liu et al., 2023).

However, organizations in transitional economies such as Iraq have significant socio-technical issues. These include fragmented infrastructure, post-conflict instability, and cultural values that prioritize tacit knowledge and face-to-face relationships over formal documentation (Nijkamp et al., 2025; Rathmell, 2005). While research on CKMS has progressed rapidly in developed nations and large emerging markets (Chang & Lin, 2015), the literature remains limited in demonstrating how CKMS can be designed for and utilized in the particular context of transitional economies, as is the case in Iraq. Existing literature on Iraqi knowledge management has focused predominantly on conventional KMS or generic organizational performance, without addressing the unique contribution of cloud-based solutions in facilitating innovation (Kareem et al., 2021).

Filling this void, the current study examines the design and implementation of a context-aware CKMS model appropriate for the socio-technical environment of Iraqi firms. Drawing upon the Resource-Based View (RBV) and Dynamic Capabilities frameworks (Cooper et al., 2023), the research aims to contribute to practice and theory alike by delivering practical recommendations to drive organizational innovation in light of Iraq's chronic economic diversification and post-conflict realities.

As indicated by the established research gap, this study aims to achieve four interrelated objectives whose combined objective is to advance theoretical understanding and practical utility of cloud-based knowledge management in transition economies. The initial objective is to design and evaluate a Cloud-based Knowledge Management System (CKMS) tailored to the socio-technical profile of Iraqi organizations, addressing infrastructure capacity constraints, cultural attitudes, and institutional loopholes inherent in post-conflict contexts. Subsequently, the study seeks to assess the cumulative impact of CKMS implementation on various aspects of organizational innovation, including product, process, and business model innovation, thereby empirically validating the system's efficacy across these innovation types. The third aim examines the moderating functions of the most important organizational drivers—i.e., culture, leadership support, and absorptive capacity—on the interaction between CKMS adoption and innovation performance, recognizing that technology alone is insufficient without facilitators within the proper organizational context. Finally, the study aims to utilize and apply well-established existing theoretical frameworks, that is, the Resource-Based View (RBV) and Dynamic Capabilities theories, to more precisely characterize terms CKMS-driven innovation processes in transitional economies and thereby contribute original ideas to the theoretical body of knowledge management literature and provide a sound conceptual framework with which to understand how cloud-based systems of knowledge operate as strategic resources and dynamic capabilities in fast-changing and resource-scarce environments.

This paper is divided into the following sections: Section 2 offers a critical review of relevant works on knowledge management systems, cloud computing, and organizational innovation, concluding with a comparative summary table that situates this study within the existing literature. Section 3 describes the research methodology, including the scientific research design framework, mixed-methods methodology, participant selection, research instruments, development of knowledge management system tools, and the underlying assumptions that govern the study's design and interpretation. While Section 4 offers quantitative and qualitative results, including structural equation modeling results, adjusting effects, sectoral differences, and key thematic findings from interviews and focus groups. Section 5 offers a comprehensive discussion of the results in light of existing theory and previous empirical work, followed by practical implications for organizations and policymakers, correlation analysis, a clear explanation of the study's limitations, and directions for future work. In addition, Section 6 concludes the work by summarizing the main contributions and highlighting the broader significance of this research for knowledge management and digital transformation practices in transition economies.

2. RELATED WORKS

Knowledge management theory has evolved substantially since its origins, from document-based approaches to large-scale socio-technical systems that address explicit and tacit knowledge processes. Cha and Kim (2024) laid the theoretical foundations for describing how organizations can build knowledge systematically and leverage it to achieve continued innovation by identifying the key coordination between technological infrastructure and organizational capabilities. Subsequently, empirical studies have consistently sought to identify robust correlations between organizational performance outcomes and best practices in knowledge management.

Shujahat et al. (2018) provided robust evidence that knowledge management initiatives do enhance innovation performance, particularly where companies invest in cross-functional coordination systems and knowledge-worker satisfaction. Their research foregrounded the mediating effects of employees on satisfaction in linking knowledge management investments and measurable innovation outcomes. Similarly, Giampaoli et al. (2017), through large-scale research presented by an Italian firm found that knowledge management capability has a direct impact on problem-solving quality and organizational performance as a whole, and the highest impacts were in organizations that integrate knowledge processes systematically into strategic decision-making

Inkinen (2016) conducted a review of empirical studies on knowledge management and found that while technological support may be required for effective knowledge management, implementation success is driven by factors such as organizational culture, motivation, and leadership. Dynamic capability theory, as described by Teece (2018), provides a theoretical basis for explaining how knowledge management systems can enable organizational agility and innovation capacity by developing sensing, seizing, and reconfiguring capabilities amid rapid change.

Recent scholarship has increasingly questioned the universal applicability of Western-developed KM frameworks in transitional economies (Ahmed & Al-Roubaie, 2012; Chen & Huang, 2009). Shetty and Panda (2020) demonstrated positive CKMS outcomes in Indian SMEs; their findings may not translate to post-conflict environments characterized by institutional voids and infrastructure fragmentation. Similarly, Rodriguez and Trainor (2016) found that cultural dimensions significantly moderate technology-innovation relationships. Building on this, Chatterjee et al. (2022) demonstrated that leadership support and microfoundational capabilities are critical for successful digital transformation, particularly in AI-enabled systems, providing a framework for understanding how individual-level competencies aggregate to organizational-level innovation. Drawing on the resource-based view (RBV) and knowledge-based view (KBV) of the firm, Hussinki et al. (2017) examined how different configurations of intellectual capital and knowledge management practices relate to firm performance in Finnish companies. Recent studies by Kumar (2023) suggest that dynamic capabilities theory better explains innovation outcomes in uncertain environments, as it emphasizes sensing, seizing, and reconfiguring capabilities rather than static resource accumulation. Gold et al. (2001) proposed that effective knowledge management depends on both knowledge infrastructure (comprising technology, organizational structure, and culture) and knowledge process architecture (encompassing acquisition, conversion, application, and protection). This perspective is particularly relevant for transitional economies, as it emphasizes that technological infrastructure alone is insufficient without corresponding organizational processes to capture, store, share, and apply knowledge systematically throughout the organization.

Recent research has expanded the scope of CKMS to emphasize organizational resilience. Al-Omoush et al. (2020) demonstrated that during periods of extreme environmental turbulence—akin to those in transitional economies—KM capabilities enabled by social technologies are vital for maintaining organizational agility. Similarly, Soto-Acosta (2020) argues that digital transformation through cloud technologies is not merely a technical shift but a strategic imperative that allows SMEs to overcome resource limitations by accessing global knowledge networks. Furthermore, Scuotto et al. (2020) highlight that the "Knowledge-Cloud" enables a recursive relationship between external knowledge acquisition and internal R&D, which is critical for firms in emerging markets attempting to leapfrog technological cycles.

The intersection of cloud computing and knowledge management (KM) has also been explored through the lens of "Agile KM." Centobelli et al. (2022) identified that the misalignment between technology and business strategy can result in "knowledge leakage." This is particularly pertinent to the Iraqi context, where institutional voids necessitate a system that can secure intellectual capital while maintaining the flexibility of cloud deployment. These recent works underscore the necessity of moving beyond "one-size-fits-all" cloud solutions toward context-sensitive artifacts that account for local infrastructure and cultural norms.

Seminal contributions by Alavi and Leidner (2001) established the conceptual bedrock for contemporary KMS research by distinguishing between knowledge as a state of mind, an object, a process, a condition of access, and a capability. Their integrative framework clarified that KMS aren't simply technological repositories but socio-technical structures designed to guide the introduction, switch, and application of knowledge across organizational boundaries. This foundational perspective is immediately applicable to the existing study's emphasis on designing CKMS that accommodate both explicit documentation and tacit know-how within a culturally complex post-conflict context.

Building on this foundation, Nonaka (1994) developed a dynamic principle of organizational experience, centered on the SECI model, socialization, extrinsic expression, integration, and assimilation, which describes the continuous spiral process by which implicit information is transformed into explicit understanding and vice versa. This theoretical lens is especially relevant in the Iraqi context, where cultural norms favor the direct exchange of oral experiences, and cognitive knowledge management systems (CKMS) should be intentionally designed to bridge the gap between implicit and explicit knowledge through collaborative digital workspaces, discussion forums, and multimedia knowledge repositories.

Zack et al. (2009) conducted an exploratory empirical evaluation examining the relationship between KM practices and overall organizational performance, demonstrating that companies with more mature knowledge

management (KM) practices consistently outperform those without formalized KM processes. Their multi-enterprise findings highlight that an expertise approach, defined as the alignment between an agency's information needs and its knowledge resources, mediates the link between KM infrastructure and performance. For the existing examination, this underscores the imperative that CKMS deployment in Iraq be accompanied by a coherent organizational information method, rather than serving simply as a technological intervention.

Obeidat et al. (2016) conducted an in-depth empirical study in a developing Arab economy, examining the impact of knowledge management on the innovation performance of Jordanian consulting firms. Their findings revealed that the acquisition, transfer, application, and security of knowledge collectively contribute significantly to both incremental and radical innovation. This study is particularly relevant to the current research because it demonstrates the validity of the relationship between knowledge management and innovation in an Arab cultural environment that is structurally similar to that of Iraq. Furthermore, it reinforces the argument that knowledge management frameworks, originally developed in Western economies, require appropriate recalibration when applied to transitional and developing economies in the Middle East and North Africa (MENA) region.

Wang and Wang (2012) provided strong evidence that knowledge-sharing behavior, especially when mediated by information technology platforms, directly improves both product and process innovation performance. Their structural model confirmed that IT-enabled knowledge sharing reduces redundancies, accelerates problem-solving cycles, and promotes a more innovative organizational climate. This finding aligns well with the current study's conceptualization of CKMS as a real-time collaboration infrastructure designed to overcome the knowledge fragmentation prevalent in post-conflict Iraqi organizations, which are characterized by siloed departmental structures and underdeveloped interfunctional communication channels (Chen & Huang, 2009). The study explored the impact of strategic human resource management (HRM) practices on innovation performance, mediated by knowledge management capability (MMC). It concluded that organizations investing in systematic mechanisms to acquire and disseminate expertise achieve better innovation outcomes. A widely applied Taiwanese model confirmed that the concept of knowledge management capability, defined as an organization's ability to strategically collect, acquire, share, and apply information, completely influences the relationship between HR and innovation. This relationship is consistent with the structural model employed in the recent study, in which knowledge management system skills serve as the mechanism by which an organization's investments in cloud infrastructure translate into measurable innovation outcomes.

Table 1 summarizes the key findings of the pioneering and recent studies observed above, identifies the methodological approaches and theoretical frameworks adopted in each study, and clearly highlights the distinctive contributions of this research compared to existing literature. This comparative analysis aims to identify the specific gaps the current study addresses and to highlight the new theoretical and empirical developments it offers in the field of cloud knowledge management in transition economies.

Tab. 1. Summary of key literature and comparison with the proposed research

Author(s) / Year	Theoretical framework	Context/ setting	Key finding(s)	Gap / How the present study advances
Shujahat et al. (2018)	KM-Innovation linkage	Developed economies	KM initiatives enhance innovation; knowledge-worker satisfaction mediates the relationship	Does not address cloud-based KMS or post-conflict transitional economy contexts; the present study fills this gap empirically
Inkinen (2016)	KM Practices Review	Developed/stable economies	Culture, leadership, and motivation are primary success determinants for KM	Does not test cloud-based solutions; the present study empirically validates these factors as moderators in CKMS adoption
Teece (2018)	Dynamic Capabilities	Large established firms	Dynamic capabilities (sensing, seizing, reconfiguring) enable agility and innovation	Does not extend to resource-scarce or post-conflict environments; the present study extends the framework to transitional economies via CKMS

Tab. 1. Summary of key literature and comparison with the proposed research, continued

Author(s) / Year	Theoretical framework	Context/ setting	Key finding(s)	Gap / How the present study advances
Shetty & Panda (2020)	Cloud Adoption (SMEs)	Indian SMEs	Positive CKMS outcomes in emerging economy SMEs; infrastructure readiness is key	Findings limited to stable emerging markets; the present study addresses post-conflict institutional voids and offline infrastructure constraints
Soto-Acosta (2020)	Digital Transformation	Global SMEs (post-pandemic)	Digital transformation is a strategic imperative for SMEs to overcome resource limits and build resilience.	Focuses on global digital shifts; this study extends the context to post-conflict institutional voids.
Gold et al. (2001)	KM Infrastructure & Process	US firms	KM depends on both technological infrastructure and process architecture (acquisition, conversion, application, protection)	Pre-cloud era; present study operationalizes and extends these dimensions within a cloud-based architecture in a non-Western context
Alavi & Leidner (2001)	KMS Conceptual Foundations	Conceptual / multi-economy	Supporting knowledge creation, transfer, and application, KMS are socio-technical systems; it sets five epistemological perspectives of knowledge apart.	Pre-cloud era; does not tackle cloud architecture or transitional economy restrictions; the present study operationalizes these bases within a context-adaptive CKMS for post-conflict Iraq.
Nonaka (1994)	SECI Model / Organizational Knowledge Creation Theory	Theoretical / Japanese firms	The dynamic spiral model (SECI) describes the conversion between tacit and explicit knowledge as the engine of organizational innovation	Does not address digital or cloud-based enablement of the SECI process; the present study extends this model by embedding SECI-aligned features (forums, multimedia repositories) into CKMS design for tacit-rich cultural environments
Zack et al. (2009)	Knowledge Strategy & KM Practices	Multi-industry (Canada & US)	Knowledge strategy maturity mediates the KM-performance relationship; firms with aligned knowledge strategy outperform peers	Does not examine cloud-based systems or non-Western transitional contexts; the present study complements this by empirically testing CKMS as a strategic knowledge platform in Iraq's resource-scarce environment
Obeidat et al. (2016)	KM Capabilities & Innovation	Developing the Arab economy (Jordan)	KM acquisition, conversion, application, and protection capabilities significantly enhance both incremental and radical innovation in Arab-context organizations	Concentrating on the consulting industry without cloud-based solutions, the current research broadens to include post-conflict manufacturing and service sectors and examines CKMS as the enabling infrastructure for these KM capacities.
Wang & Wang (2012)	IT-Enabled Knowledge Sharing & Innovation	Chinese manufacturing firms	IT-mediated knowledge sharing significantly drives product and process innovation, reduces redundancy, and accelerates problem-solving	Limited to a stable emerging economy manufacturing context, the present study extends this evidence to cloud-based architectures in post-conflict service and industrial sectors and formally tests moderation effects

Tab. 1. Summary of key literature and comparison with the proposed research, continued

Author(s) / Year	Theoretical framework	Context/ setting	Key finding(s)	Gap / How the present study advances
Chen & Huang (2009)	HRM Practices, KM Capacity, & Innovation	Cross-industry (Taiwan)	KM capacity totally mediates the strategic HRM–innovation relationship; mechanisms for knowledge acquisition and distribution propel greater innovation.	Does not discuss cloud enablement or transitional economies; the current study builds on this mediating logic by placing CKMS capabilities as the means of converting cloud infrastructure expenditure into innovation results in Iraq.
Present Study (2025)	RBV + Dynamic Capabilities + DSR	Post-conflict Iraq (transitional economy)	Context-adapted CKMS significantly enhances all four KM capabilities and drives three innovation types; leadership and culture are critical moderators	First empirical CKMS study in post-conflict context; integrates DSR artifact development with PLS-SEM; extends RBV & Dynamic Capabilities to resource-scarce environments

3. RESEARCH METHODOLOGY

3.1. Research design and approach

This study adopts a Design Science Research (DSR) methodology combined with an explanatory sequential mixed-methods approach. This integrated design was chosen to address the complex socio-technical challenges facing Iraqi organizations and to develop a contextually relevant Cloud-based Knowledge Management System (CKMS). The research process began with a quantitative phase, during which survey data were collected from 350 knowledge workers across 10 industrial and service firms in Iraq. The survey instrument, adapted from, measured CKMS capabilities, organizational innovation, and moderating organizational factors, including culture, leadership, and absorptive capacity. It was supplemented by a qualitative stage comprising semi-structured focus groups and interviews with IT managers, knowledge management specialists, and CKMS users to provide detailed feedback on the quantitative findings.

3.1.1. Assumptions and boundary conditions

This study is based on several assumptions that need to be clearly stated to ensure proper interpretation and to define the circumstances under which the results are applicable.

The first assumption is that the respondents provide honest and reflective responses to the survey instrument, and that the professional experience of the sampled knowledge workers qualifies them as informants regarding organizational knowledge management practices and innovation activities. The use of anonymized data collection methods and informed consent protocols supports this assumption, as they were developed to reduce the effects of social desirability bias (Chen & Huang, 2009).

Second, the research assumes that the constructs of CKMS capability, the dimensions of knowledge management (acquisition, storage, sharing, and application), and organizational innovation are sufficiently differentiated and measurable, as measured by validated scales developed in earlier research. Any violation of construct validity could affect the internal consistency of the structural model; however, the reported Cronbach's alpha, composite reliability, and AVE values in Section 3.4 provide strong empirical evidence of measurement adequacy.

Third, the study also presupposes that the relationships among the research variables will be largely linear and that the PLS-SEM methodology can effectively represent the directionality of the hypothesized relationships in the conceptual model. Although non-linear dynamics can be present in practice, the exploratory and predictive orientation of PLS-SEM is appropriate for the complex, multi-construct model under analysis.

Fourth, there is a critical contextual assumption regarding the representativeness of the Iraqi organizational setting. The ten sample organizations were used to reflect both the industry and service sectors in Iraq; however, the results should be viewed with caution for informal businesses, micro-firms, or regions with substantially different infrastructural characteristics.

Fifth, the six-week pilot deployment is assumed to be adequate for monitoring early CKMS adoption behaviors and innovation outcomes, yet long-term cultural and performance implications might warrant prolonging the observation period. All these assumptions are the boundaries of this study: the findings can best be generalized to medium-sized and large formal organizations in post-conflict transitional economies that have socio-technical features similar to those of the Iraqi setting. In instances where conditions differ greatly, replication and adaptation of the framework are recommended prior to generalization.

The DSR methodology enabled iterative development, demonstration, and testing of the CKMS artifact through a formal four-stage process. The first stage involved problem identification and solution objectives, and working with managers to establish knowledge management and innovation challenges specific to the Iraqi context. The second stage involved design and development, yielding a CKMS prototype optimized for offline use, multilingual support, and modular deployment. The third phase involved demonstration and evaluation, applying the prototype in a six-week pilot with participating companies, along with user feedback-driven system refinement and data collection. The final phase involved a holistic evaluation, assessing the impact of CKMS adoption on knowledge management capacity and innovation performance. As shown in Figure 3, the DSR framework structured the study into four main phases to enable systematic artifact development and rigorous empirical testing.

3.2. Theoretical framework and development of a hypothesis

Conceptual frameworks such as the Resource-Based View (RBV) and Dynamic Capabilities have been widely used to explain how organizations can create and sustain competitive advantage by developing and utilizing better knowledge and innovation management. The Resource-Based View postulates that organizational resources, particularly those that are valuable, rare, inimitable, and non-substitutable (VRIN), form the basis of sustainable competitive advantage. Knowledge has been recognized as a strategic resource, especially when organizations can formalize, integrate, and leverage intellectual capital. CKMS use supports these characteristics by making knowledge more accessible, enabling real-time sharing, and supporting tacit knowledge codification (Komakech et al., 2025).

The dynamic capabilities model expands the RBV by focusing on the organization's ability to sense opportunities and threats, exploit new opportunities, and reconfigure resources in turbulent environments. CKMS plays a crucial role in enabling dynamic capabilities by providing the technological platform for environmental scanning, shared learning, and adaptive decision-making. When using RBV and Dynamic Capabilities in post-conflict and transition economies such as Iraq, additional considerations include resource constraints, institutional shortcomings, and a culture-based reliance on informal knowledge transfer. CKMS, thus, needs to be adapted locally with features such as offline support and multilingualism to maximize its contribution to innovation support.

Although RBV and Dynamic Capabilities provide solid theoretical underpinnings for innovation-knowledge management linkages, less is known about how these can be applied pragmatically to the specific challenges and opportunities in economies in transition, such as Iraq. The current research seeks to fill this gap through an empirical study of how context-specific CKMS, based on these theories, may induce organizational innovation amid rising socio-technical complexity. Based on the reviewed literature and the study objectives, the conceptual model shown in Figure 1 was developed. The model illustrates how CKMS influences knowledge management capabilities (acquisition, storage, sharing, and application), which in turn drive different forms of organizational innovation. Moderating variables such as leadership support, organizational culture, and absorptive capacity are expected to shape these relationships.

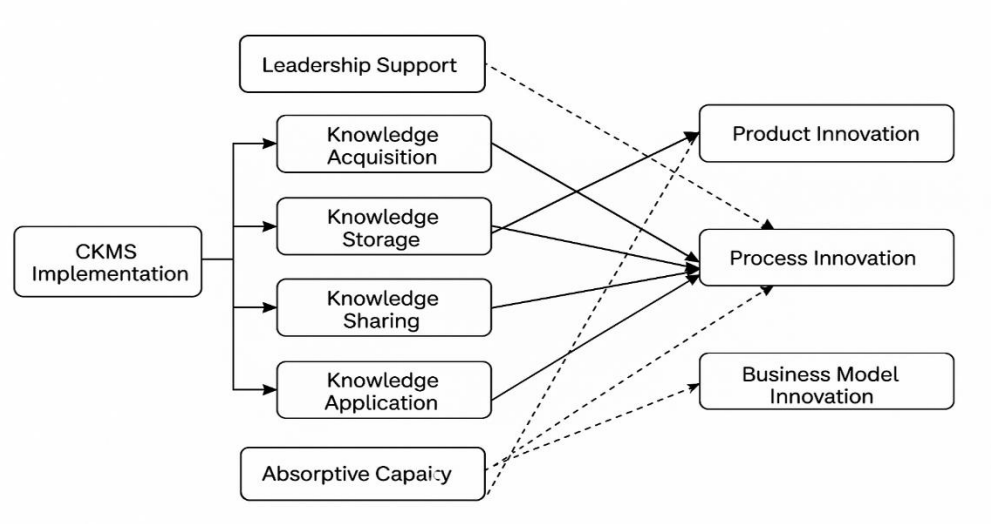

Fig. 1. Conceptual model of CKMS impact on innovation

Drawing on this model, the following hypotheses were formulated to guide the empirical testing of the relationships between CKMS and KM capabilities and innovation outcomes.

Tab. 2. Research hypotheses

Hypothesis Code	Statement	Relationship type
H1	CKMS implementation positively influences knowledge acquisition.	Direct
H2	CKMS implementation positively influences knowledge storage.	Direct
H3	CKMS implementation positively influences knowledge sharing.	Direct
H4	CKMS implementation positively influences knowledge application.	Direct
H5	Enhanced KM capabilities positively influence product innovation.	Indirect (via KM)
H6	Enhanced KM capabilities positively influence process innovation.	Indirect (via KM)
H7	Enhanced KM capabilities positively influence business model innovation.	Indirect (via KM)
H8	Leadership support positively moderates the relationship between CKMS implementation and innovation outcomes.	Moderation
H9	Organizational culture positively moderates the relationship between CKMS implementation and innovation outcomes.	Moderation
H10	Absorptive capacity positively moderates the relationship between CKMS implementation and innovation outcomes.	Moderation

3.3. Participants and sampling strategy

The quantitative sample comprised 350 knowledge workers from 10 industrial and service firms across Iraq, selected through stratified purposive sampling (International Monetary Fund, 2025) to ensure sectoral diversity. This sampling approach was chosen to ensure adequate representation of both industrial and service sectors while maintaining sufficient sample size for robust statistical analysis. For the qualitative phase, participants included IT managers, knowledge management specialists, and end-users involved in CKMS implementation and evaluation. The demographic profile of respondents demonstrates balanced representation across key organizational and individual characteristics.

Tab. 3. Demographic profile of respondents

Characteristic	Frequency	Percentage (%)
Gender (Male)	221	63.1%
Gender (Female)	129	36.9%
Age Group 20–30	102	29.1%
Age Group 31–40	163	46.6%
Age Group 41+	85	24.3%
Industry Sector (Service)	180	51.4%
Industry Sector (Industrial)	170	48.6%
Experience < 5 years	145	41.4%
Experience ≥ 5 years	205	58.6%

3.4. Instrumentation and measurement

The survey instrument was adapted from validated scales in prior literature (Hussinki et al., 2017), covering knowledge management capabilities including acquisition, storage, sharing, and application, organizational innovation encompassing product, process, and business model innovation, and moderating variables such as leadership, culture, and absorptive capacity. Each item was measured using a 5-point Likert scale, ranging from strongly disagree to strongly agree. Reliability and validity were assessed using Cronbach's alpha (Cronbach, 1951), composite reliability (CR), and average variance extracted (AVE) to ensure measurement quality and construct validity (Hair, 2014).

Tab. 4. Construct items and sources used in the questionnaire

Construct	Item example	Source
Knowledge Acquisition	Our firm effectively captures external knowledge.	(Hussinki et al., 2017)
Knowledge Storage	We systematically store important knowledge.	(Hussinki et al., 2017)
Knowledge Sharing	Employees are encouraged to share knowledge with colleagues.	(Hussinki et al., 2017)
Knowledge Application	Stored knowledge is regularly applied in decision-making.	(Hussinki et al., 2017)
Leadership	Top management supports knowledge initiatives.	(Teece, 2018)
Culture	Our organizational culture values knowledge sharing.	(Teece, 2018)
Absorptive Capacity	We recognize the value of new external knowledge.	(Kareem et al., 2021)

3.5. CKMS artifact development and expert evaluation

To ensure contextual relevance and usability, an expert panel of 12 professionals evaluated the core components of the CKMS prototype. Components were rated on a 5-point Likert scale for usability, contextual fit, and design quality. The expert evaluation process provided crucial validation for design decisions made during CKMS development, particularly highlighting the importance of offline and multilingual features for usability in the Iraqi context.

Tab. 5. Expert evaluation scores for key CKMS architectural components

Component	Mean score	SD	Contextual fit rating
Knowledge Repository	4.5	0.52	Excellent
Multilingual Interface	4.4	0.67	Excellent
Offline Functionality	4.3	0.65	Excellent
Mobile Optimization	4.1	0.74	Very Good
Security Framework	3.9	0.83	Very Good
Analytics Capabilities	3.8	0.87	Very Good
Integration Framework	3.7	0.89	Good
Governance Structure	3.6	0.94	Good

This feedback highlights the importance of offline and multilingual features for usability in the Iraqi context and validates the design decisions made during CKMS development. As shown in Figure 2, the Knowledge Repository, Multilingual Interface, and Offline Functionality were rated most highly by experts, reflecting

their critical importance in the Iraqi context. Lower ratings for Governance Structure and Integration Framework suggest areas for future refinement.

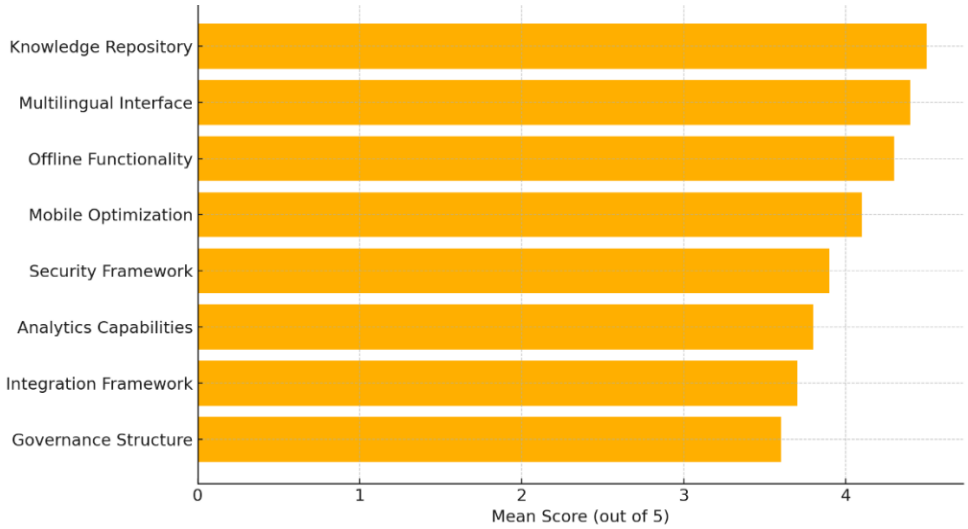

Fig. 2. Expert evaluation of CKMS components by mean score

The prototype deployment involved a six-week pilot across participating firms, followed by data collection and system refinement based on user feedback. This test and demonstration period was necessary to ascertain the practicality of applying the CKMS design and to identify areas that needed correction before final assessment.

3.6. CKMS technical architecture and design features

The CKMS prototype utilized a multi-layered architecture customized to address the specific challenges of Iraqi organizations, including infrastructure limitations, multilingual demands, and security needs. The system architecture consisted of four layers interwoven with one another: front-end user interfaces, back-end storage and processing, middleware services, and cloud infrastructure, as illustrated in Figure 3.

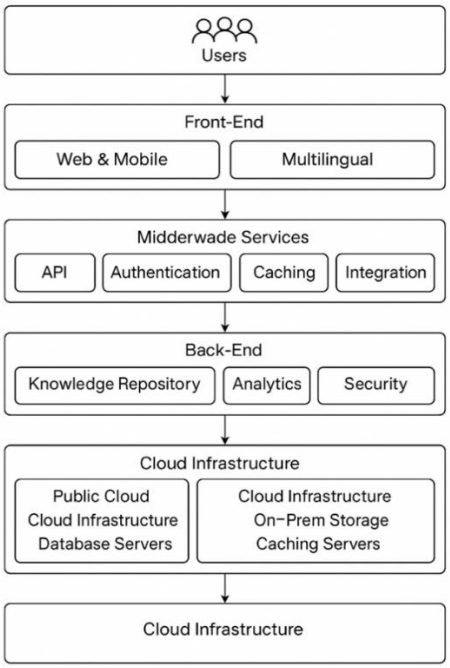

Fig. 3. CKMS system architecture diagram

The architecture's design demonstrates the hierarchical structure of system components, ranging from user interfaces to cloud infrastructure and middleware services, to facilitate knowledge management operations in resource-poor environments.

The front-end layer employed responsive web portals with support for Progressive Web Application (PWA) (World Wide Web Consortium, 2018), WCAG compliance for accessibility (Web Accessibility Initiative, 2008), and end-to-end browser support. Both iOS and Android operating systems support mobile applications with offline synchronization, push notification, and biometric verification. Multilingual support was done using Arabic-English interfaces with right-to-left (RTL) layout, contextual search capabilities, and domain-specific term management for technical and business domains.

The back-end layer supported robust knowledge processing through a massive knowledge repository with version management, multimedia support, Arabic metadata management, and full-text search. A built-in analytics engine provided usage reports, contribution metrics, and knowledge gap identification to support continuous improvement. Security services implemented role-based access control (RBAC) (Sandhu et al., 1996), end-to-end encryption, comprehensive audit logging, ISO compliance standards, and automatic security updates.

Middleware services offered seamless integration and optimal performance through an API Gateway that supported REST (Fielding, 2000) and GraphQL protocols, with rate limiting and versioned APIs. Authentication services offered Single Sign-On (SSO), LDAP support (Howes et al., 1997), Multi-Factor Authentication (MFA), and compatibility with OAuth 2.0/OpenID Connect. Data integration capabilities included ETL pipelines, webhook support, and message queues for real-time processing. Caching and synchronization services offered distributed caching, conflict resolution algorithms, and incremental synchronization to enable offline capabilities.

The cloud infrastructure maintained a hybrid design (Khajeh-Hosseini et al., 2010) with public cloud services (AWS/Azure) for elastic scalability, Content Delivery Network (CDN), and automated backup, in addition to private cloud components like on-premises storage, local cache servers, and edge nodes to facilitate local access. Connectivity optimization features included bandwidth optimization, adaptive content delivery, and timed synchronization to enable the unreliability of internet connectivity common in transitional economies.

3.7. Data collection and analysis procedures

Quantitative data from survey responses and CKMS system usage logs were analyzed using descriptive statistics, reliability and validity tests (including Cronbach's alpha, AVE, and composite reliability), and Partial Least Squares Structural Equation Modeling (PLS-SEM) to test hypothesized relationships (Hair, 2014). The choice of PLS-SEM was justified by the study's exploratory nature, the complex model with multiple constructs, and the need to predict relationships rather than confirm theory. Qualitative data from interviews and focus group transcripts were analyzed thematically (Kareem et al., 2021) using NVivo 14 to identify key themes, contextual barriers, and explanatory mechanisms. The qualitative analysis followed a systematic process of initial coding, theme generation, and pattern recognition across participant groups and organizational contexts.

A mixed-methods approach was facilitated by co-presentation and explanation construction to offer an in-depth portrayal of Iraqi firms' use of CKMS. Integration on this premise allowed for triangulation of findings, deeper explication of quantitative findings through qualitative feedback, and the development of more detailed conclusions about the effectiveness of CKMS in transition economies. The last evaluation phase mirrored CKMS's impacts on knowledge management capacity and innovation outcomes, with empirical evidence validating the conceptual model's theoretical relationships.

3.8. Ethical considerations

Informed consent was also obtained from all participants in the study, and ethical clearance was obtained from the University Research Ethics Committee. Confidentiality and data protection were ensured through anonymization and end-to-end encryption (Nijkamp et al., 2025; Kareem et al., 2021). Additional precautions were taken because the setting in Iraq involved political and economic sensitivities, including secure data transfer protocols and compliance with local data protection legislation. Such rigorous methodology ensures

that the study's findings are empirically grounded and of tangible value, in response to the unique challenges faced by transitional economies like Iraq.

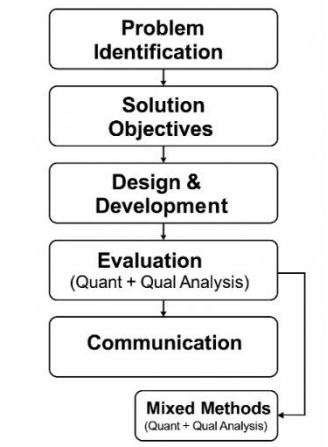

Fig. 4. Flowchart of the design science research (DSR) methodology and mixed methods integration used in this study

4. RESULTS

4.1. Quantitative analysis and structural model assessment

The quantitative phase of the study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the impact of Cloud-based Knowledge Management Systems (CKMS) on various aspects of organizational innovation in Iraqi firms. The data were collected from 350 knowledge workers across 10 organizations, thereby providing a solid basis for statistical analysis. The results revealed that the implementation of CKMS had a positive and statistically significant effect on all four of the most important knowledge management capabilities, viz., knowledge acquisition, storage, sharing, and application. The structural model showed a good overall fit, as shown in Table 6, with fit indices corroborating the adequacy of PLS-SEM for the analysis.

Tab. 6. Model fit statistics for the structural equation model

Fit index	Value	Threshold	Interpretation
Chi-square/df	2.37	<3.0	Good fit
SRMR	0.062	<0.08	Good fit
NFI	0.91	>0.90	Good fit
CFI	0.94	>0.90	Good fit
TLI	0.93	>0.90	Good fit
RMSEA	0.057	<0.06	Good fit
GoF	0.68	>0.36	Large effect size

These fit indices, i.e., SRMR = 0.062 and RMSEA = 0.057, support the use of PLS-SEM as the analytical method and indicate that the proposed model accurately represents the relationships among the constructs. The enhanced knowledge management skills, however, were instrumental in driving three types of organizational innovation: product, process, and business model.

4.2. CKMS impact on knowledge management capabilities and innovation outcomes

The primary findings demonstrate substantial positive effects of CKMS adoption on all knowledge management dimensions. CKMS positively influenced knowledge acquisition ($\beta = 0.65$, $p < 0.001$), storage ($\beta = 0.72$, $p < 0.001$), sharing ($\beta = 0.68$, $p < 0.001$), and application ($\beta = 0.70$, $p < 0.001$). The high correlations indicate the effectiveness of cloud-based systems in supporting the fundamental processes of organizational knowledge management in transitional economy contexts. For innovation outcomes, product innovation was positively affected ($\beta = 0.42$, $p < 0.001$), and process innovation was more strongly affected ($\beta = 0.56$, $p <$

0.001), with business model innovation also being significantly increased (β = 0.38, p < 0.001). The extremely strong effect on process innovation suggests that CKMS delivers immediate operational benefits that are highly valued in turbulent business environments characteristic of transitional economies.

4.3. Moderating effects analysis

To gain a deeper understanding of the impact of organizational factors on the CKMS-innovation relationship, hierarchical regression analysis was conducted to test the moderating influences of leadership, organizational culture, and absorptive capacity. The results, presented in Table 7, reveal a significant moderating influence of leadership and culture on the relationship between CKMS and innovation.

Tab. 7. Hierarchical regression analysis for moderating effects on innovation performance

Variable	Model 1	Model 2	Model 3
Organization Size	0.14	0.11	0.09
Organization Age	0.08	0.06	0.05
Industry Sector	0.17	0.15	0.13
Prior IT Infrastructure	0.21	0.16	0.14
KMS Implementation	---	0.43	0.39
Organizational Culture	---	0.27	0.24
Leadership Support	---	0.31	0.28
Absorptive Capacity	---	0.22	0.19
CKMS × Org. Culture	---	---	0.23
CKMS × Leadership	---	---	0.27
CKMS × Absorptive Capacity	---	---	0.18
R^2	0.12	0.48	0.57
ΔR^2	---	0.36	0.09

Note: Standardized regression coefficients reported. Dependent variable: Overall Innovation Performance. p < 0.05, p < 0.01, p < 0.001.

The CKMS × Leadership interaction term (β = 0.27) indicates that organizations with supportive leadership structures enjoy a more favorable relationship between CKMS utilization and innovation performance. This finding aligns with recent research by Chatterjee et al. (2022), who demonstrated that leadership support is a critical enabler of digital transformation by fostering microfoundational capabilities at the individual and team levels, which subsequently drive organizational-level innovation outcomes. Similarly, the organizational culture interaction effect (β = 0.23) indicates that businesses with knowledge-sharing cultures derive more innovation benefits from CKMS implementation. These findings demonstrate the critical function of organizational enablers in realizing the technological potential of cloud-based knowledge management systems.

4.4. Sectoral variations in CKMS impacts

Multi-group analysis revealed notable sectoral variations in CKMS's influence on innovation results. Industrial firms demonstrated superior process innovation impacts (β = 0.59 vs. 0.52, p < 0.05) compared to service firms, whereas service firms exhibited slightly higher business model innovation, although the difference was not statistically significant (β = 0.35 vs. 0.42, p = 0.063).

Tab. 8. Multi-group analysis of CKMS effects by sector (Industrial vs. Service)

Relationship	β (Industrial)	β (Service)	p-value	Difference
CKMS → Process Innovation	0.59	0.52	0.041	Significant
CKMS → Business Model Innovation	0.35	0.42	0.063	Not significant

p-values represent the significance of the difference between groups.

These sectoral disparities likely reflect the differing operational priorities and areas of innovation emphasis typical for industrial versus service companies, with industrial firms focusing on process efficiency and service firms having greater opportunities for business model innovativeness.

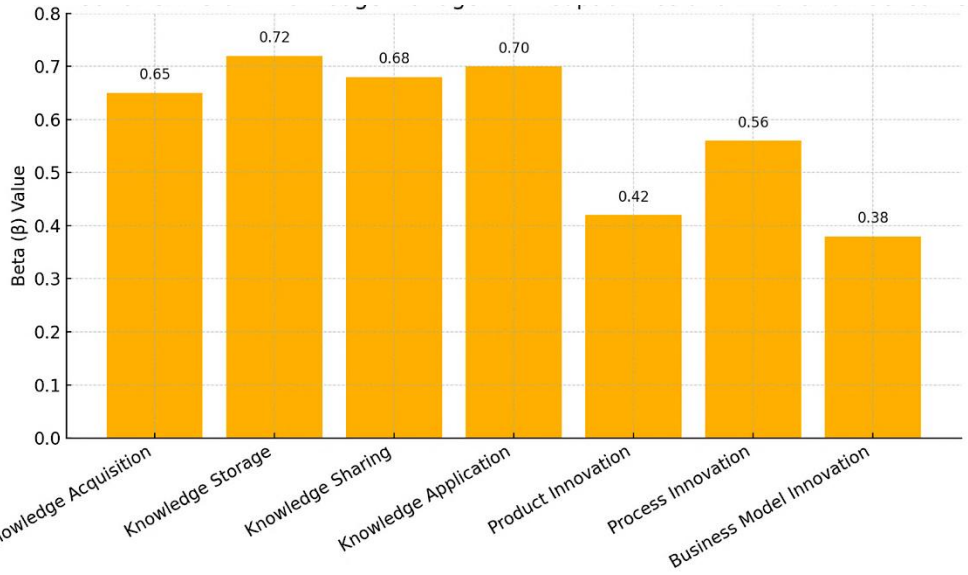

Fig. 5. The impact of CKMS implementation on knowledge management capabilities and innovation outcomes (PLS-SEM Beta Values)

4.5. Analytical rigor and methodological approach

To ensure analytic discipline, several validation strategies were pursued. Inter-rater reliability was approximated from two independent coders coding 30% of transcripts with Cohen's $\kappa = 0.84$, indicating substantial agreement. Member checking was conducted by 15 participants to assess the completeness and accuracy of the initial findings, and an entire audit trail of coding decisions and theme emergence was maintained in NVivo 14. Cumulatively, the measures ensured the validity and reliability of the qualitative findings.

4.6. Significant thematic discoveries with ample supporting evidence

The thematic analysis, extended to the themes and subthemes, revealed three significant themes that provide deep insights into the mechanisms underlying the effectiveness of CKMS in Iraqi organizations. The first theme, Cultural Transformation Through Technology, showed that, aside from initial resistance, CKMS was characterized by participants as a force behind cultural change. As one of the firm's old guard engineers put it, "We were apprehensive about sharing knowledge on the Internet initially. But seeing how it sped up the resolution of customer problems, even our most traditional managers joined. This was also corroborated by a services business knowledge manager who swore, "The system broke down departmental silos. Procurement knows what engineering is doing, and we don't duplicate effort."

The second grand theme, Leadership as Digital Champions, illustrated how successful implementations required leaders to have digital knowledge and behaviors. This was emphasized by an IT director in a manufacturing firm: "Our CEO puts his weekly thoughts onto the system, so when leadership is using it, naturally the employees will follow." This finding aligns well with the quantitative results, indicating strong moderating effects of leadership support on CKMS effectiveness.

The third theme, Infrastructure Adaptation Strategies, highlighted how organizations developed innovative solutions for connectivity problems characteristic of transitional economies. One systems administrator of a multi-branch organization described their solution: "We established offline sync stations in each branch. When there is no internet, employees can still access and contribute knowledge locally." These adaptation strategies were crucial to the ongoing use of CKMS despite infrastructural limitations.

4.7. Cross-case pattern analysis and performance differentiation

Cross-case pattern analysis revealed systematic differences between high-performing and low-performing organizations in their CKMS implementation approaches. High-performing organizations (n=4) shared three distinctive features: specialized change management teams, incentive systems that link knowledge contribution

to performance appraisals, and regular training programs. Low-performing organizations (n=2) lacked these systematic features and instead employed ad hoc implementation approaches without structured support mechanisms.

The qualitative results provided in-depth explanations of the statistically significant effects identified in the quantitative analysis, developing a comprehensive picture of CKMS implementation processes. For example, the strong moderating influence of organizational leadership and culture on CKMS effectiveness, as evidenced by the statistical models, was consistently reflected in participant narratives. Cultural problems and infrastructure limitations explained variations in CKMS adoption and impact between sectors and organizations, introducing contextual depth to the numerical results.

Tab. 9. Key qualitative themes arising from interviews and focus groups

Theme	Description	Supporting quote
Cultural barriers to knowledge sharing	Informal, trust-based communication preference; resistance to formal CKMS adoption	"Knowledge is kept within trusted circles."
Leadership as a catalyst for change	Leadership support critical for user uptake and system adoption	"When leaders themselves use and promote the system."
Infrastructure and connectivity issues	Unreliable internet and technical limitations impede CKMS use; offline/multilingual features help.	"Internet issues make access irregular in rural areas."
Perceived value from CKMS	Improved knowledge access, faster collaboration, improved problem-solving efficiency	"Now we can get the needed information quickly and solve problems."
Firm performance differentiation	High-performing firms invest in training and culture; low-performing firms experience challenges in adoption	"Continuous training made everyone comfortable using the system."

The qualitative findings have directly validated and expanded on the research objectives by identifying leadership and cultural variables that explain how CKMS can be effectively designed and implemented to address socio-technical problems in Iraq. The recognition of infrastructure and connectivity obstacles, along with the end-user perceived value of CKMS, offers pragmatic advice for aligning system features and deployment strategies. In addition, the powerful impact of leadership and organizational culture in high-performing companies demonstrates the moderating effect of these variables on the association between CKMS and innovation results. Finally, the real-life narratives derived from focus groups and interviews yield valuable insights for applying theoretical frameworks such as RBV and Dynamic Capabilities in the context of the transitional economy.

5. DISCUSSION

5.1. Theoretical contributions and framework extensions

This study makes three significant theoretical contributions to the body of knowledge on innovation and knowledge management, enhancing our understanding of digitalization in transitional economies. The first is that it extends the Dynamic Capabilities theory by demonstrating that CKMS is a meta-capability that reconstitutes the sensing (knowledge acquisition), seizing (knowledge application), and reconfiguring (knowledge sharing and storage) capabilities in transitional economies. In contrast to previous applications of Dynamic Capabilities theory to manage stable contexts (Teece, 2018; Cristofaro et al., 2025), our findings demonstrate that the success of CKMS in post-conflict contexts depends most importantly on context-dependent adaptations such as offline capability and multilingualism. This extension is theoretically significant in that it demonstrates dynamic capabilities are technologically enabled even in low-resource settings, provided the technology is appropriately designed to suit local constraints.

Secondly, we build on the resource-based view theory by presenting empirical evidence that cloud-based knowledge assets can meet the VRIN criteria (Valuable, Rare, Inimitable, Non-substitutable) even in resource-scarce environments. Our findings contradict the traditional RBV assumption that valuable resources require substantial monetary investment, showing instead that context-sensitive design can cultivate strategic value through usability and accessibility rather than sophistication. This is particularly useful for transitional

economies, where resource constraints often prevent organizations from investing in sophisticated technological solutions.

Third, this research adds to the emerging literature on digital transformation in transitional economies by theoretically conceptualizing organizational culture and leadership as critical moderating mechanisms rather than mere control variables. While previous research utilized these variables as control variables, e.g., Rodriguez and Trainor (2016), the hierarchical regression shows that leadership support enhances CKMS effectiveness ($\beta = 0.27$, $p < 0.001$), demonstrating human factors are as vital as technological factors for shaping innovation outcomes.

5.2. Comparison with current research and new findings

Our evidence replicates and builds on previous findings in several significant ways, thereby enhancing CKMS performance across various contexts. The positive relationship of KM capabilities with innovation outcomes (product innovation $\beta = 0.42$, process innovation $\beta = 0.56$, business model innovation $\beta = 0.38$) is in line with meta-analytic findings by Chen & Huang (2009), although our effect sizes are considerably larger than evidence recorded in advanced economies. This implies that CKMS can deliver disproportionate benefits in situations where knowledge infrastructure is weaker to begin with, suggesting the possibility of technological leapfrogging in transition economies.

However, our results are at odds with research on Indian firms by Kumar (2023), which found greater effects on product innovation than on process innovation. The reversed order in our study (process innovation > product innovation) is likely due to the industrial composition of our sample and the immediate operational benefits that CKMS provides in turbulent environments, where process efficiency is more important than product innovation. The finding suggests that the innovation priorities of transition economies may differ from those of more stable emerging economies.

The organizational culture in its moderating capacity ($\beta = 0.23$, $p < 0.01$) is consistent with cross-cultural KM studies, but our qualitative findings illustrate culture-specific mechanisms not previously reported. Unlike individualistic cultures, where knowledge sharing is motivated by individual accolades, our interviews indicated that the collectivistic nature of Iraqi companies facilitates knowledge sharing if framed as communal good rather than individual achievement. This finding has important implications for CKMS positioning and communication in different cultural settings.

5.3. Practical implications for organizations and policymakers

For organizations in transitional economies, this research provides evidence-based guidelines for CKMS implementation that go beyond general technology adoption frameworks. The overriding importance of offline capability (expert rating: 4.3/5.0) and multilingual support (expert rating: 4.4/5.0) suggests that technological adaptation to local constraints is a success factor. Organizations should prioritize these features over AI-enabled or higher analytics features that would be less relevant in resource-poor settings. The finding challenges the conventional assumption that organizations must adopt the most sophisticated available technology, suggesting instead that contextual fit is more important than technological sophistication.

The strong moderating effect of leadership support indicates that CKMS implementation should be framed as organizational change rather than IT implementation. Leaders have to become actively involved in knowledge sharing, model desired behaviors, and explain how CKMS facilitates organizational mission rather than imposing externally derived efficiency metrics. This necessitates a radical shift in how technology projects are designed and managed, with change management and cultural change taking center stage alongside technical deployment.

For policymakers in post-conflict settings, our study suggests that facilitating CKMS uptake could be an appropriate strategy for economic diversification and building innovation capacity. Policy efforts should focus on building digital infrastructure (reliable internet connection), providing CKMS adoption grants to SMEs, and establishing public-private partnerships that enable knowledge transfer across organizational boundaries. The inter-sectoral difference that we identified suggests that policy support must be differentiated by sector, with manufacturing firms prioritized for process-focused CKMS implementations and service firms supported for business model innovation initiatives.

5.4. Correlation analysis and descriptive statistics

Correlation analysis revealed strong positive correlations among all study variables, providing initial support for the hypothesized relationships. Based on Table 10, implementation of CKMS had high correlations with all capabilities of knowledge management: knowledge acquisition ($r = 0.72$, $p < 0.01$), knowledge storage ($r = 0.68$, $p < 0.01$), knowledge sharing ($r = 0.74$, $p < 0.01$), and knowledge application ($r = 0.69$, $p < 0.01$). These significant correlations imply that the implementation of CKMS is closely related to knowledge management processes across all dimensions.

The correlation matrix also showed strong positive correlations between knowledge management capacity and innovation outcomes. Knowledge application ranked highest among the correlations with innovation measures: product innovation ($r = 0.61$, $p < 0.01$), process innovation ($r = 0.67$, $p < 0.01$), and business model innovation ($r = 0.64$, $p < 0.01$). Among innovation types, composite innovation performance correlated most strongly with process innovation ($r = 0.81$, $p < 0.01$), followed by product innovation ($r = 0.78$, $p < 0.01$) and business model innovation ($r = 0.76$, $p < 0.01$).

Tab. 10. Correlation matrix for key study variables

Variable	1	2	3	4	5	6	7	8	9
1. Implementation of CKMS	1.00								
2. Acquisition of Knowledge	0.72	1.00							
3. Storage of Knowledge	0.68	0.59	1.00						
4. Sharing of Knowledge	0.74	0.62	0.57	1.00					
5. Application of Knowledge	0.69	0.58	0.61	0.73	1.00				
6. Product Innovation	0.54	0.57	0.49	0.53	0.61	1.00			
7. Process Innovation	0.61	0.48	0.63	0.58	0.67	0.54	1.00		
8. Business Model Innovation	0.52	0.51	0.47	0.59	0.64	0.56	0.49	1.00	
9. General Innovation Performance	0.63	0.58	0.56	0.62	0.69	0.78	0.81	0.76	1.00

Note: $p < 0.01$. Correlation coefficients between CKMS implementation, KM processes, and innovation outcomes (n=350)

These correlation pattern sets are quality early evidence for the conceptual model hypothesized relationships, as they are all positive and statistically significant. Correlation magnitudes indicate substantial relationships but remain below the multicollinearity threshold ($r < 0.85$), thereby validating the structural equation modeling approach used in the main analysis.

The correlation patterns are pictorially presented in the heatmap of the correlation matrix, which indicates the strength of relationships among all research variables. The intensity of correlation is represented through the color intensity, where darker blue indicates stronger positive relationships. It is evident from the visualization that there are strong relationships between knowledge management capabilities and CKMS implementation, as well as among innovation outcomes and their interconnectivity.

The strong bivariate results observed in the correlation matrix have several substantive implications beyond statistical significance. Notably, the significantly high correlation between CKMS implementation and knowledge sharing ($r= 0.74$), compared to the correlation between CKMS implementation and knowledge storage ($r= 0.68$), is theoretically important. This trend follows that, in the Iraqi organizational environment, the collaborative and social aspects of cloud-based systems, including the ability to communicate across functions and in real time, are triggered more immediately and with greater strength than the archival and retrieval capabilities. The result is consistent with the collectivistic cultural orientation established from the qualitative data, as employees described an increased willingness to share their knowledge when they viewed it as a communal rather than a transactional action. This cultural tendency seems to be exacerbated by the natural availability and portability of the cloud architecture, hence creating an equally significant effect on knowledge-sharing practices.

Second, the comparatively stronger correlation between knowledge application and process innovation ($r = 0.67$) is stronger than the one between knowledge application and product innovation ($r = 0.61$), which is consistent with the findings of the wider structural equation model, as well as provides further inferential support to the hypothesis that CKMS-enabled knowledge application provides more immediate and quantifiable operational dividend within firms operating in a transitional economy. Organizations tend to focus

on the efficiency and reliability of processes rather than on exploratory product development in situations characterized by the instability of infrastructure and institutions that are being rebuilt after conflicts. The resulting correlation data therefore triangulate and strengthen the path coefficients of the structural model, thus providing greater confidence in the directionality of the innovation effects.

Thirdly, the composite innovation performance variable shows the highest correlation with process innovation ($r = 0.81$) and the lowest with business model innovation ($r = 0.76$), reflecting both the measurement composition of the composite index and its relation to the relative maturity of individual innovation capabilities among the Iraqi firms studied. When considered alongside regression and path analysis, these descriptive trends provide a more nuanced understanding of how the CKMS translates knowledge into organizational value in resource-constrained post-conflict settings.

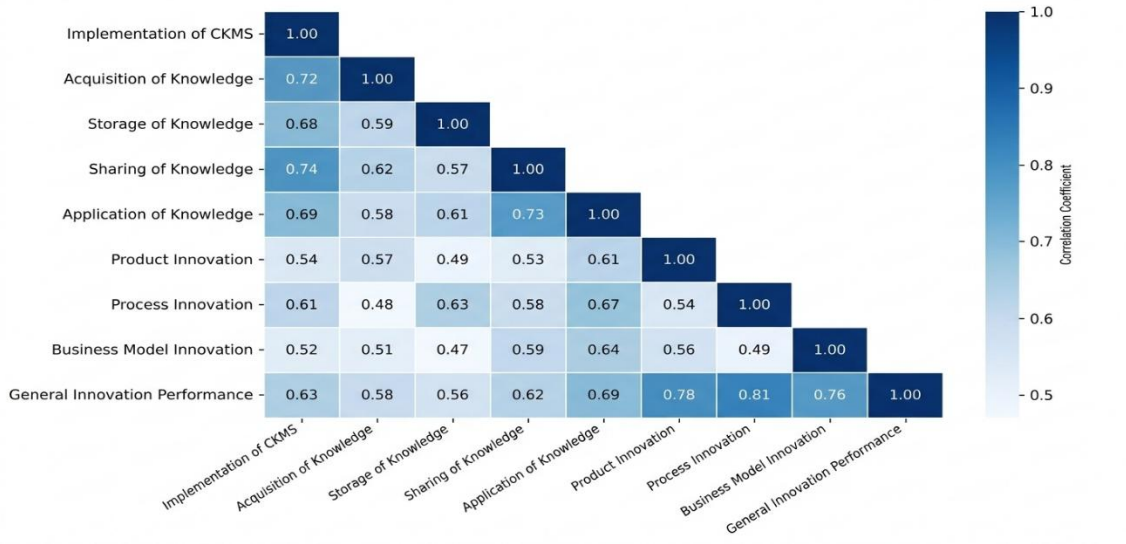

Fig. 6. The correlation heatmap

5.5. Limitations and future research directions

While this study makes significant contributions, several limitations must be acknowledged, offering directions for future research. The focus on large formal organizations limits the generality of the findings to SMEs and the informal sector, which together account for a vast share of Iraq's economy. Future research must broaden the sample to include these organizations, as they may face distinct challenges and opportunities in CKMS implementation given their size, structure, and resource constraints.

In addition, the 12-month assessment period may not capture the full range of shifts in long-term innovation performance or cultural transformation following CKMS adoption. Longitudinal studies spanning longer time frames need to ascertain the sustainability and emergence of CKMS benefits, particularly as firms mature their knowledge management initiatives and the technological infrastructure continues to advance.

The sole emphasis on the Iraqi context may restrict the applicability of findings to other post-conflict or transitional economies with different institutional or cultural contexts. Comparative cross-country research is recommended to examine and extend these findings across different transitional economy contexts, thereby delineating universal from context-specific determinants of CKMS implementation success.

Finally, while this research explored internal knowledge management, future research should consider CKMS's brokerage of open innovation, cross-organizational knowledge sharing, and the adoption of frontier technologies such as artificial intelligence and blockchain to further boost knowledge-led innovation. These are the frontiers of knowledge management research in emerging economies and could provide insights into how companies can leverage external knowledge networks and frontier technologies to boost their innovation capacity.

Regarding the generalization abilities of the proposed techniques and the results, the following aspects should warrant direct attention. The Design Science Research paradigm used in the current study is also iterative and context-sensitive, which contributes to both ecological validity in the Iraqi context and the need to take care when extending the artifacts and the guidelines thereof to environments that cluster differently. However, the principles of design, namely the focus on offline resilience, multilingualism, modularity, and

culturally suitable systems of governance, are theoretically applicable to any organization operating in an infrastructure-vulnerable environment, a multilingual one, or an institution in the process of transition after a conflict. Countries such as Libya, Yemen, Syria, Afghanistan, and certain Sub-Saharan African countries share socio-technical characteristics similar to those of Iraq, suggesting that the CKMS framework can be meaningfully transferred to them with local modifications. The selected approach, PLS-SEM, given its robustness, is equally good at replicating in similar contexts where it is hard to obtain large probability samples. Moreover, the theoretical extensions to the Resource-Based View and Dynamic Capabilities theory advanced in this article are framework-level contributions, and their applicability is not limited to the Iraqi context, thereby providing a deeper, vocabulary-based conceptualization of how context-specific digital artifacts produce strategic value under resource-constrained conditions. Researchers interested in extending the generalizability of these results are encouraged to replicate the study across multiple post-conflict economies using comparable sampling methods, thereby enabling cross-national comparative research and identifying both universally relevant and particular CKMS implementation factors of success.

6. CONCLUSION

This study addresses a significant gap in knowledge management scholarship by demonstrating that Cloud-based Knowledge Management Systems can indeed be implemented in post-conflict transitional economies. Using a rigorous mixed-methods approach that combines Design Science Research with empirical support, this study presents the first end-to-end CKMS deployment framework for resource-limited settings. The research extends Dynamic Capabilities theory beyond its typical application in stable economies to reveal how context-appropriate technological innovations create strategic value through access and cultural fit rather than bleeding-edge features.

The theoretical contributions of this research lie in redefining CKMS as a meta-capability that enhances organizational sensing, seizing, and reconfiguring under uncertainty. In practice, the confirmed framework offers actionable recommendations for organizations and policymakers to leverage digital knowledge infrastructure to drive innovation-driven economic development. The emphasis on cultural adaptability, leadership engagement, and infrastructural flexibility presents a replicable template for other similar transitional economies.

Future research must examine the long-term sustainability of these interventions, as well as the applicability of the framework across a broad range of post-conflict environments. This study ultimately demonstrates that thoughtful technological design and organizational readiness, combined with cultural responsiveness, can propel knowledge management capabilities even in the most challenging socio-economic environments toward improved economic recovery and sustainable development goals.

Conflicts of Interest

The authors declare no conflict of interest.

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