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**EXAMINING KNOWLEDGE
MANAGEMENT IN THE ERA OF
THE FOURTH INDUSTRIAL
REVOLUTION**

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EXAMINING KNOWLEDGE MANAGEMENT IN THE ERA OF THE FOURTH INDUSTRIAL REVOLUTION

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Abstract

This study investigates how knowledge management (KM) is evolving during the Fourth Industrial Revolution (IR 4.0). Emphasis is placed on the interaction between human expertise and machine intelligence, with particular attention to how knowledge can be managed in a reciprocal manner between humans and machines. Qualitative research design was utilised, guided by an interpretivist approach, to capture various experiences from twelve professionals across academia, corporate, and research institutions. Semi-structured interviews provided rich, practical insights which were analysed using thematic analysis in ATLAS.ti software. There are four themes generated by this analysis: (1) the definitions and foundations of KM, (2) organisational enablers for effective KM, (3) knowledge continuity, and (4) the reciprocal KM relationship between human and machine. Automation and artificial intelligence can enhance efficiency and productivity, while tacit knowledge, creativity, and ethical oversight remain mainly human domains. The study introduces the FEED model (Feedback, Ethics, Enticement, and Data) as a framework for human–machine collaboration. The paper concludes that effective KM in IR 4.0 requires balance between humans and machines, where machines should complement rather than replace human judgment. The recommendations emphasise ethical governance, importance of training, data quality, and the continuous adaptation of KM during technology advancement.

Keywords: Knowledge Management (KM), Industry Revolution 4.0 (IR 4.0), Artificial Intelligence (AI), Human–Machine Collaboration, FEED Model (Feedback, Ethics, Enticement, Data).

Introduction

The IR 4.0 significantly impacted the way organisations deal with knowledge management. On the one hand, artificial intelligence and automation have introduced new capabilities. On the other hand, they also raise concerns regarding validity, ethics, and sustainability. Therefore, knowledge management must adapt to these changes and challenges by striking a balance between machine efficiency and human creativity, as well as ethical decision-making. Despite a growing body of literature on knowledge management and technology, there is a limited elaboration on the reciprocal nature of knowledge exchange between humans and machines. This gap forms the basis of this study. This research focuses mainly on Saudi Arabia and the Middle East, while also incorporating insights from global participants for comparison. The study examines insights by professional across academia, corporates, and research sectors. The goal is to evaluate knowledge management during the IR 4.0. The study generates both conceptual and practical insights, resulting in a framework that provides recommendations to organisations for building resilient and evolving KM systems.

Literature Review

The literature on knowledge management covers multiple disciplines, including data management, information science, and organisational learning. Classical KM publications highlight the distinction between tacit and explicit knowledge, where authors highlighted the importance of capturing both to maintain continuity, competitive edge, and innovation. With the IR 4.0, authors increasingly explore how AI and automation influence KM processes. Studies elaborated the impact of technology on enhancing knowledge management. However, human touch, creativity and ethical dimensions are associated with humans.

Recent literature elaborated on the complementarity between humans and machines, but cautions against over-reliance on automation, which would decrease contextual understanding. Sustainability and governance are recurring themes in the literature, as organisations face challenges in ensuring the responsible use of technology and the long-term preservation of institutional memory. However, a clear gap remains in the literature: there is a limited focus on reciprocity - how humans and machines exchange, refine, and co-develop knowledge. This study highlights and investigates this gap by building on qualitative evidence and proposing a practical model for reciprocal KM along with a few propositions.

Methodology

This study adopted a qualitative and interpretivist approach, chosen for its ability to capture human – machine interactions in the evolving field of knowledge management. Rather than relying on pre-established theories, the research aimed to understand current experiences and contextual practices, making an inductive strategy more appropriate than a deductive one.

Data were gathered through semi-structured interviews with twelve participants who were deliberately chosen for their expertise. A purposive sampling approach made it possible to include individuals from academia, corporates, and research organisations, ensuring a mix of viewpoints rather than a single institutional lens. The intention was to capture how knowledge management is understood and applied in different settings and environments during the Fourth Industrial Revolution.

Interviews were arranged either virtual or in-person, depending on what was most practical for each participant, and on average lasted about 45 minutes. While a guiding set of questions was prepared to maintain consistency, the format left room for follow-up questions and deeper exploration as needed. This balance of structure and openness allowed rich, contextual insights to emerge that would not have been achievable through a rigid questionnaire.

Results

In this study, twelve semi-structured interviews were conducted and resulted in 52,000 words. All interviews were analysed using ATLAS.ti software. The process began with the identification of initial codes, merging similar codes, grouping related codes into sub-groups and ultimately the development of themes. This analytical path ensured that findings remained closely connected to the participants' voices while also building higher-level patterns and insights (see table 1).

The first theme covered the definition, types, and pillars of knowledge management. Participants highlighted knowledge management as a critical enabler of organisational success, documentation, preservation, leadership, innovation, and decision-making. Both tacit and explicit knowledge were discussed. Overall, tacit knowledge, creativity, intuition, and ethical judgment was considered irreplaceable by machines.

The second theme identified enablers of knowledge management in new environments including strong leadership, effective infrastructure, continuous training, sustainability practices, and the adoption of emerging technologies. Respondents stressed that successful KM requires an integrated approach that combines technical systems with human engagement and cultural alignment.

The third theme addressed knowledge continuity, focusing on sustainability and the role of AI in knowledge management. Interviewees emphasised the importance of maintaining organisational memory, embedding practices for knowledge transfer, and reinforcing sustainability measures to secure knowledge assets.

The fourth theme explored reciprocal knowledge management between humans and machines. In this theme, the focus was on the challenges of knowledge management during the IR 4.0 along with the mutual benefits between humans and machines and the ethical dimension as well. This theme highlighted complementarity rather than substitution, where human and machine contributions create a balanced knowledge management environment.

Themes	Sub-Groups	Codes
Main knowledge management definition, types and pillars	Knowledge Management	Knowledge management
		Understanding
		Experience
		Expertise
	Preservation	Documentation
		Preservation
Enablers of knowledge management in new environments	Strategic knowledge management leadership	Leadership
		Decision Making
		Problem Solving
	People's Skills	Education
		Self-Empowerment
		Professional Experience
	Infrastructure	Systems
		Technology
		Innovation
Knowledge continuity	Sustainability	Sustainability
		Training
		Publication
		Data Collection
		Teaching
	Improvement	Scientific Research
		Research and Development
		Achievement
		Professional Development

Reciprocal knowledge management	Humans and Machines	AI Capabilities
		Challenges
		Complementarity
	Mutual Communication and Collaboration	Reciprocity
		Feedback

Table 1: Relationship between identified codes, subgroups and themes.

Conclusion

This study evaluated knowledge management during the era of the Fourth Industrial Revolution. The evidence gathered from professionals across academia, industry, and research shows that while technology now plays an essential role in managing knowledge, the human contribution remains irreplaceable. Machines excel at efficiency and repetitive tasks, but they cannot replicate the depth of tacit knowledge, the ethical judgments, or the creative insights that people bring to organisations.

The findings point to the need for balance. Rather than viewing machines as replacements, organisations should treat them as complementary partners that extend human capacity. The proposed FEED model - Feedback, Ethics, Enticement, and Data - offers one way to bring this partnership to life (figure 1). It is important to refine knowledge management practices through feedback, protecting them through ethical oversight, motivating people to remain active and engaged, and ensuring accessibility to quality and reliable data and information.

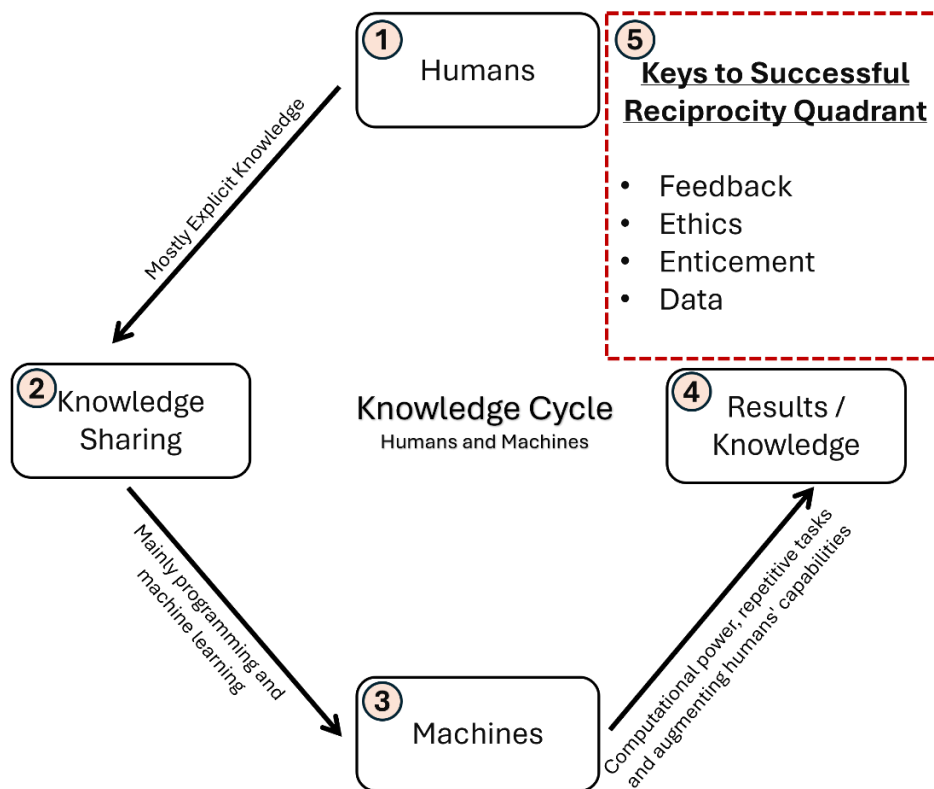


Figure 1: FEED (Feedback, Ethics, Enticement & Data) is the proposed process model of knowledge reciprocity between humans and machines.

Recommendations

The study highlighted several recommendations that organisations can follow to strengthen their knowledge management practices during the era of IR 4.0. A central step is the establishment of clear governance structures that embed ethical considerations into decision-making and clarify accountability in human-machine collaboration. Without such measures, trust in knowledge systems can easily erode.

Another important recommendation is the continuous investment in people training and awareness. Organisations should focus on utilising AI and machines' capabilities to elevate efficiency. At the same time, it is crucial to recognize the importance of human ensure ethical and reasoned decisions.

The research also pointed to the critical role of access to reliable data. Machines depend on accurate and abundance of relevant inputs. Any organisation therefore needs to invest heavily in infrastructures that support data and information integrity and availability.

Finally, the FEED framework - Feedback, Ethics, Enticement, and Data - offers a practical way forward. Organisation can use it to guide and facilitate the knowledge management protocol and practices between humans and machines.

References

The study has appendices with supporting materials, and other related documentation to the research process. Appendices also include anonymised demographic details of the twelve interviewees and the detailed thematic analysis processes along with the progress through the study. The study has a wide range for references and sources. A short list is included below as a glimpse of the full list (total 57 references) in the original dissertation.

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