Leveraging Artificial Intelligence to Enhance the Use of the Knowledge Repository: An Engineering Consulting View

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ABSTRACT

This study explores how the artificial intelligence (AI) functionalities of interaction, automation, search and retrieval, pattern recognition, and reason and decision-making could address the barriers that hinder the use of the knowledge repository transfer mechanism in knowledge management. The research finds that AI technologies could directly improve the repository's usefulness, accessibility, and interface while also indirectly boosting awareness of the repository and the motivation to use the repository. The study also highlights the need for a collaborative human—AI approach to optimise the use of the knowledge repository and to guide future knowledge management strategies.

OPSOMMING

Hierdie studie ondersoek hoe die kunsmatige intelligensie funksionaliteite, vir interaksie, outomatisering, soek en herwinning, patroonherkenning, en redenasie en besluitneming die hindernisse kan aanspreek wat die gebruik van die kennisbergingsplek as kennisoordragmeganisme kan belemmer. Die navorsing het bevind dat kunsmatige intelligensie-tegnologieë die bruikbaarheid, toeganklikheid en koppelvlak van die kennisbergingsplek aansienlik kan verbeter, terwyl dit ook indirek die bewustheid van die kennisbergingsplek en die motivering om dit te gebruik, kan verhoog. Die studie beklemtoon ook dat die menslike intervlak met kunsmatige intelligensie noodsaaklik is om die benutting van die kennisbergingsplek te optimeer en toekomstige kennisbestuurstrategieë te help rig.

1. INTRODUCTION

Knowledge management is essential for achieving business excellence and competitive advantage, since it enhances strategic foresight, productivity, and customer service [1], [2]. The knowledge repository is a key mechanism in this process, linking various stages of knowledge management [3]–[5]. However, despite its importance, organisations often underuse knowledge repositories [6], [7]. Understanding the barriers that hinder the use of the knowledge repository is essential for enhancing that use, and consequently for organisational performance.

Various authors [8]–[10] have found that technology facilitates knowledge management. Sher and Lee [1] suggest that organisations should facilitate the use of advanced technologies for knowledge management. Pai *et al*. [11] suggest that, although emerging AI technologies cannot completely replace the human intelligence that is required for knowledge management, organisations could benefit from investing in AI technologies to assist with knowledge management.

The aim of this study is to determine whether the use of AI technologies could assist in improving the use of an underused knowledge resource such as the knowledge repository, and whether applicable AI functionalities could increase the effectiveness and use of the knowledge repository.

1.1. Unpacking the knowledge repository

A knowledge repository enables the systematic capture, organisation, and categorisation of large volumes of content in a computerised system, and facilitates knowledge transfer by enabling users to search and access knowledge [3]–[5], [7], [9], [12]. Typically, 58% of organisational knowledge is in explicit formats (e.g., reports and guidelines), while 42% remains tacit (e.g., experiences and lessons learnt) [2]. This research focuses on digital repositories that store explicit knowledge as well as tacit knowledge that is converted into explicit forms. A knowledge repository is often referred to as a digital library, digital database, knowledge database, knowledge base, the intranet, or content management system; therefore, these terms are considered synonymous for the purpose of this research study.

An ideal knowledge repository is a central system that stores valuable and relevant knowledge that is accessible to all users [7], [13] and consists of the following elements;

- Users: The holders and consumers of knowledge, and their willingness to share, contribute, and obtain knowledge, have an impact on the effectiveness of knowledge management [5], [7].
- Content: Includes data, information, and both explicit and tacit (converted into explicit forms) knowledge. Content must be well-organised, accurate, complete, dynamic, and relevant to ensure its usability [4], [5], [7], [13]–[15].
- Platform and interface: Should be user-friendly and intuitive, meet user needs, and be aligned with the content [13], [14], [16], [17].
- Access: Should be controlled and secure with document-level security and backup systems [5], [14], and should allow easy searching, retrieving, and contributing of content [7], [14].

1.2. The key concepts and capabilities of artificial intelligence

AI is a rapidly advancing field that is central to the fourth industrial revolution [18], [19], and is focused on creating systems that mimic human intelligence to perform tasks that typically require human input [4], [18]. These systems use algorithms, data, natural language processing, and machine learning to analyse information, make decisions, and adapt over time [18]. Recent technological advancements, such as larger datasets, improved computing power, and enhanced machine-learning algorithms, have expanded AI's practical applications [20], [21]. AI can generate text from data, transcribe and re-format speech, understand sentence structure, context, and intention, interpret data, interact with humans, process graphics, and automate tasks [4], [11], [21], [22]. Its capabilities range from answering basic questions to providing strategic advice based on comprehensive analysis, advancing through five levels of maturity: answer, recommend, combine, infer, and advise [5]. AI technologies, however, are limited by the data to which they have access, and currently they cannot innovate or significantly alter task approaches [19]. Despite AI's potential, its emerging nature means that there is limited research on its impact on business and knowledge management, which makes organisations hesitant to invest fully [11].

1.3. Research problem and research objectives

Theoretically, the knowledge repository is an effective knowledge transfer mechanism [23]. However, in practice, the knowledge repository is often underused. With the rise of AI technologies and their application in business processes, there may be potential for using AI technologies to address the barriers that hinder the use of a knowledge repository. The objectives of this research study are, therefore:

i. to identify and categorise the barriers that hinder the use of the knowledge repository; and
ii. to investigate potential areas where AI technologies could be embraced to enhance the use of the knowledge repository.

In the next section, a brief literature review is provided that forms the basis for developing a conceptual model.

2. LITERATURE REVIEW

This section addresses the relevant literature on the knowledge repository and on its relationship with the knowledge management process. It also addresses factors that have an impact on using the knowledge repository, from which barriers are identified, and how technologies could be used to offset those barriers. Specific functionalities and considerations of the use of AI technologies are also discussed briefly.

2.1. The knowledge repository and its relationships

The process of knowledge management ensures that knowledge is available and accessible to users for application [14]. Various models, such as the one proposed by Abdullah *et al.* [3], describes its stages as:

- Knowledge creation/acquisition: Identifying, collecting, and codifying new knowledge;
- Knowledge organisation/storage: Organising and storing knowledge in a repository;
- Knowledge distribution: Accessing and transferring knowledge;
- Knowledge application: Contextualising and applying knowledge.

Dalkir [4] reviewed historical models, and introduced an integrated cycle with the following stages:

- Knowledge capture and creation: Identifying, collecting, codifying, and updating knowledge;
- Knowledge sharing and dissemination: Accessing, exchanging, and distributing knowledge;
- Knowledge acquisition and application: Contextualising and applying knowledge.

While Dalkir [4] highlights the knowledge repository as a crucial but not explicitly included component of the knowledge management cycle, Abdullah *et al.* [3] illustrated its role in linking the creation, storage, and distribution stages of knowledge management.

Successful implementation of knowledge management relies on integrating people, processes, content, culture, and technology [5], [16], [17]. While knowledge management has existed without advanced technology, the strategic application of technology could significantly enhance its impact [22]. Since the knowledge repository links stages of knowledge management [3], [4], and since each stage of knowledge management could be enhanced through the application of technology [22], there is a relationship between the knowledge repository and technology.

2.2. Factors having an impact on the use of the knowledge repository

Several key factors affect the use of knowledge repositories, with a consensus in the literature about the major contributing factors, which are discussed below.

i. Awareness: Awareness is linked to user beliefs and mindset, with research showing that increasing awareness of the knowledge repository's existence, importance, and benefits could enhance its use [2], [4], [9], [24].

ii. Interface: A user-friendly, seamless interface improves interaction with the knowledge repository, while a poor interface design and a lack of standardisation can hinder its use [4], [17], [22], [25].

iii. Accessibility: This includes the ability to access content in the knowledge repository and to contribute to it. Issues such as an inadequate search functionality and access limitations can impede its use, and the effort required to capture valuable content often discourages contributions [2], [4], [7], [25], [26],

iv. Usefulness: The usability of the knowledge repository is influenced by the quality, relevance, accuracy, consistency, and completeness of its contents. Ongoing management and updates are necessary to maintain content usefulness [2], [4], [5], [7], [9], [14], [17], [24].

v. Motivation: Lack of reasons and of an incentive to contribute and to access content, and a lack of managerial support, can reduce the use of the knowledge repository [4], [9], [11], [24], [27].

Based on these factors, the barriers that hinder the use of the knowledge repository are depicted in Table 1.

2.3. The use of technology

Increasing the use of the knowledge repository enhances knowledge management, which in turn contributes to business excellence and competitive advantage [1], [2]. Alavi and Leidner [8] suggest enhancing repository use through advanced technological support, aligning with Kankanhalli *et al.* [9] and Keskin [10], who advocate for technologies that connect users to needed knowledge and reduce the effort of contributing knowledge. Similarly, Hajric [14] and Uriarte [2] highlight the importance of technology in organising and communicating knowledge, and Bergeron [22] notes that technology could improve each stage of knowledge management. However, BenMoussa [24] warns against assuming that technology alone would increase repository use, and Maier [7] emphasises that technology's presence alone does not

guarantee success. Uriarte [2] argues that knowledge management decisions should prioritise people, knowledge, and business objectives, with technology serving as support. BenMoussa [24] has found that cultural factors, clear communication, and user involvement are more effective than technology alone in overcoming barriers. Emerging AI technologies offer potential benefits for knowledge management, although they cannot fully replace human intelligence [11]. Eboigbe *et al*. [28] have found that AI technologies improve business intelligence by enhancing effectiveness, precision, and forecasting capabilities. Although the arguments against the focus on technology are noted, owing to the latest developments in AI technologies, there may be merit in applying them to address the barriers that hinder the use of the knowledge repository.

Table 1: Barriers to the use of the knowledge repository

Factor	Barrier
Awareness	B1: Lack of awareness of the existence, contents, functioning, and benefits of the knowledge repository.
Interface	B2: Lack of user-friendliness and ease of navigation of the knowledge repository.
Accessibility	B3: Lack of ease to contribute content to the knowledge repository.
	B4: Lack of efficient searching, filtering, and retrieval functionality of the knowledge repository.
Usefulness	B5: Lack of quality and applicability of content retrieved from the knowledge repository.
Motivation	B6: Lack of reasons and incentives to use the knowledge repository.
	B7: Lack of management support to drive the use of the knowledge repository.

2.4. An overview of the characteristics of AI technologies

AI technologies encompass a range of interrelated sub-fields and characteristics, with algorithms forming their foundation. Algorithms such as linear regression and decision tree learning are the essential building blocks for natural language processing and machine learning [29].

Natural language processing enables computers to understand and generate human language, with applications in automation, text summarisation, speech recognition, and sentiment analysis [30]. However, natural language processing faces difficulties such as dealing with misspellings, accents, context, and ambiguity [30].

Machine learning allows computers to learn from data without direct programming, thus supporting predictive analytics, automation, and context-aware responses. Its effectiveness can be hindered by poor data quality and algorithm limitations. Machine learning includes learning techniques, expert systems, neural networks, and deep learning [21], [29], [31]–[38].

Generative AI uses machine learning and deep learning models to create new content. These models learn patterns and structures from existing datasets, and use this information to generate usable knowledge content using tools such as ChatGPT, Copilot, and Deepseek.

2.5. Functionalities of AI technologies that can be applied to the knowledge repository

The above-mentioned sub-fields and characteristics of AI technologies enable them to interact with humans, automate processes, search for and retrieve information, recognise patterns, and reason and make decisions. Each of these functionalities is discussed below.

i. Interaction: AI technologies can recognise speech and understand sentence structure, context, and intent, so enhancing user interaction through conversational interfaces [21]. Natural language processing performed by AI technologies can enhance the user-friendliness of interfaces, and can be applied to allow users to interact with knowledge repositories using conversational language [22], [39]. AI can act as virtual agents, performing tasks and providing conversational support [4], [21].

ii. Automation: AI technologies can automate processes such as content selection, classification, and summarisation [4]. It can analyse large data sets to identify gaps, duplicates, and the most up-to-date content, and streamline writing by converting fragmented information into comprehensive articles [39].

iii. Search and retrieval: AI technologies enhance search-and-retrieval functionality [7], [40]. Advanced natural language processing features in modern AI technologies can better match searcher intent with responses [39]. AI technologies can also perform the coding, organising, and extraction of content, and perform confidentiality checks during searches [11], [41]. Intelligent agents can manage content overload [4], [22], and case-based reasoning improves content retrieval efficiency [7], [42].

iv. Pattern recognition: AI technologies, through machine learning, enable pattern recognition, pattern matching, and the classification of applications [21], [22]. AI technologies can categorise and relate data by understanding its context and relationships [41], [42].

v. Reason and decision-making: AI technologies can reason and provide expert-level advice, functioning as a decision-support tool [4], [40]. It is also capable of performing automated decision-making [4], [21].

2.6. Key considerations for the application of AI technologies

Implementing AI technologies effectively demands mature knowledge-management practices, technical maturity, strategic foresight, and a readiness to engage with advanced technologies [5]. The improper or unplanned application of AI technologies could have a negative impact on the organisation [19]. AI technologies should not be implemented in isolation; a collaborative relationship between human and AI systems is essential for success [41].

For AI technologies to function effectively with the knowledge repository, the knowledge repository must:

- Be functional, with a simple user interface and accurate content catalogue [11], [43];
- Contain well-organised, properly managed and accessible content to avoid analysis issues [5];
- Contain clean and relevant content to ensure that AI extracts accurate and applicable content [5];
- Offer content in varied formats (i.e., it includes diagrams, photos, videos, etc.) to provide a comprehensive data pool for AI [5];
- Be integrated and standardised for effective content retrieval and prioritisation [5].

Users need training to navigate AI technologies, and incentives may be necessary to encourage AI adoption [11]. A change in mindset and work processes to integrate AI technologies is required [22], [41], [43]. Decision-making logic should be documented and integrated into AI technologies, and users must understand the AI learning curve and the potential for initial mistakes [5], [43]. Securing the support of the organisation's senior leadership is paramount, since the benefits of AI technologies may only become evident up to a year later [11], [43].

In the next section, a conceptual model is developed that is based on the identified AI functionalities and barriers.

3. CONCEPTUAL MODEL

From the literature, the identified functionalities of AI technologies were plotted against the five main barriers listed in Table 1. The expected use of each AI functionality was then mapped against applicable barriers, where it was envisaged that the AI functionality might assist in addressing or overcoming those barriers. These elements and relationships are shown in Figure 1, and form the basis of this study. Each relationship between AI functionality and the appropriate barrier(s) was thereafter stated as a proposition, as shown in Table 2. Figure 1 and Table 2 institute the conceptual model of the study.

If it were discovered that AI technologies could be applied to address the primary (more prominent) barriers, then it could be concluded that AI could be leveraged to enhance the use of the knowledge repository. If not, then it could be concluded that AI cannot be leveraged to enhance the use of the knowledge repository.

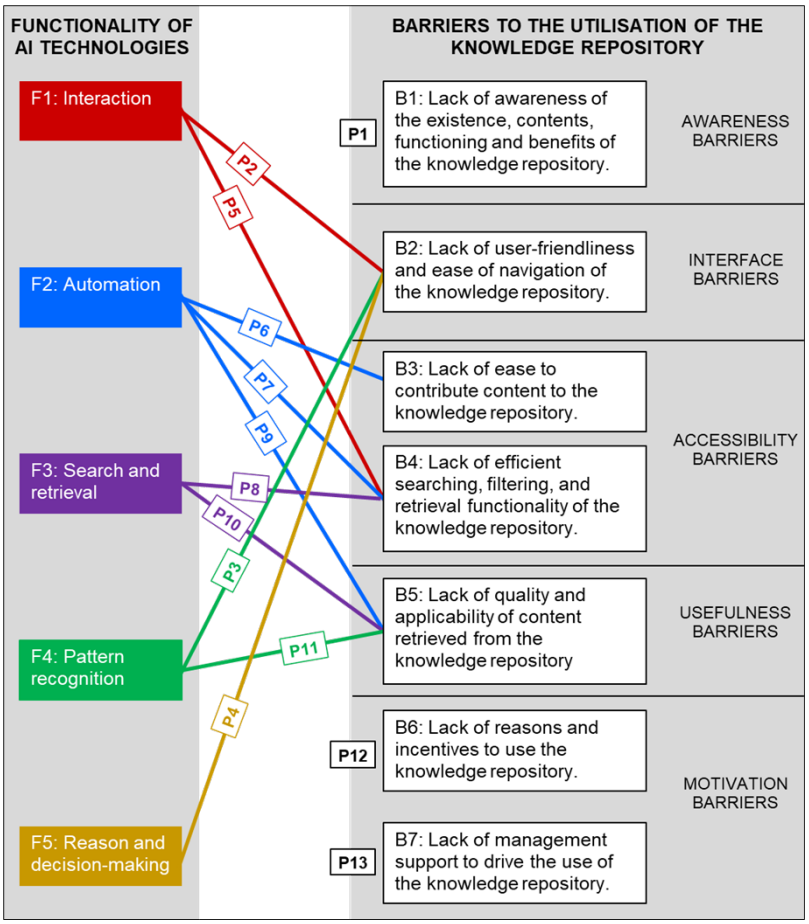

Figure 1: Proposed conceptual model

Table 2: Research propositions

Proposition	*Description*
P1	AI technologies cannot be used to address the lack of awareness of the existence, contents, functioning, and benefits of the knowledge repository.
P2	The interaction functionality of AI technologies can be used to enhance the user-friendliness and ease of navigation of the knowledge repository.
P3	The pattern-recognition functionality of AI technologies can be used to enhance the user-friendliness and ease of navigation of the knowledge repository.
P4	The reason-and-decision-making functionality of AI technologies can be used to enhance the user-friendliness and ease of navigation of the knowledge repository.
P5	The interaction functionality of AI technologies can be used to improve the searching, filtering, and retrieval functionality of the knowledge repository.
P6	The automation functionality of AI technologies can make it easier to contribute content to the knowledge repository.
P7	The automation functionality of AI technologies can be used to improve the searching, filtering, and retrieval functionality of the knowledge repository.
P8	The search-and-retrieval functionality of AI technologies can be used to improve the searching, filtering, and retrieval functionality of the knowledge repository.

Table 2: Research propositions (cont.)

Proposition	*Description*
P9	The automation functionality of AI technologies can improve the quality and applicability of content retrieved from the knowledge repository.
P10	The search-and-retrieval functionality of AI technologies can improve the quality and applicability of content retrieved from the knowledge repository.
P11	The patten-recognition functionality of AI technologies can improve the quality and applicability of content retrieved from the knowledge repository.
P12	AI technologies cannot be used to address the lack of reasons and incentives to use the knowledge repository.
P13	AI technologies cannot be used to address the lack of management support to drive the use of the knowledge repository.

The next section briefly discusses the research method that was followed in order to prove or disprove the propositions and to reveal deeper insights into AI functionality and the barrier relationships.

4. RESEARCH METHOD

An empirical type of research design approach was adopted that focused on a single South African civil engineering consulting organisation. This organisation was chosen because it had an active, functioning digital knowledge repository that was accessible to all employees, and it employed personnel who were involved in the digital delivery and data science sectors — criteria that were essential to meeting the research objectives and addressing the research problem.

The study population comprised employees from the organisation's data science and digital delivery sectors who were exposed to AI technologies and digital processes in the civil engineering industry. Out of the twenty-seven potential participants, an initial sample (using ad hoc sampling) of twelve was selected, as recommended by Guest *et al*. [44], since data saturation typically occurs within this number for homogeneous groups.

Data was collected through one-on-one semi-structured interviews via Microsoft Teams. This method was chosen for its flexibility and its ability to gather in-depth understanding despite the potential limitations such interviewer bias and a lack of standardisation [45]–[47]. These limitations were addressed through consistent question phrasing and by structuring the interviews to ensure the collection of relevant data. The interview protocol had three parts: general demographic questions, questions on the use of the knowledge repository, and questions on the application of AI technologies to address barriers to the knowledge repository's use. Except for the questions on demographics and on using the knowledge repository, all the questions were open-ended and focused on the know-how and know-why of the AI functionalities and their effect on overcoming the barriers.

The participants were informed of their rights, including the voluntary nature of their participation, confidentiality, and the anonymity of their responses. Validity and reliability were ensured by addressing potential errors from the researcher, the participants, the context, and the data collection methods. The collected data was recorded, transcribed, and quality-checked. The responses were categorised into themes using coding, with the codes being defined during the data analysis and derived from the data. The responses to the different questions were compared to uncover patterns or relationships. A discussion of the participants and of their responses is provided in the next section.

5. RESULTS AND DISCUSSION

5.1. Participant profiles

The sample consisted of 75% participants from the digital delivery sector and 25% from the data science sector; this distribution accurately represented the broader population. The participants' industry experience ranged from just over one year to 33 years, with most (75%) having had 10 to 15 years' work

experience, indicating that it was a well-experienced group; this added credibility and depth to the research findings. The participants rated their knowledge and use of a knowledge repository and of AI technologies on a scale from 1 (not knowledgeable at all) to 10 (extremely knowledgeable). While many participants were proficient in using the knowledge repository, their depth of understanding varied. Forty-two per cent of the participants demonstrated high or very high proficiency in AI technologies, indicating a solid core of AI expertise that offered advanced insights to this study.

5.2. Use and perceptions of the knowledge repository

The participants showed varied levels of engagement with the organisation's knowledge repository. While 36% rarely used it because of content unavailability or accessibility issues, when the knowledge repository was used it was for commercial, project, and personal purposes. Overall, the participants were satisfied with the knowledge repository, acknowledging its effectiveness as a solid foundation for future enhancements and appreciating its current automation, diverse content, and effective structure. However, the participants also highlighted several factors that affected its use. These are explored in further detail below.

5.3. Factors affecting the use of the knowledge repository

The literature review identified the factors and barriers affecting the use of the knowledge repository, which were then confirmed by the research investigation. No additional barriers were discovered. A comparative analysis (based on the frequency with which each barrier was mentioned by the participants and on the frequency of improvement measures related to each barrier that were mentioned by the participants) categorised the barriers into primary (more prominent) and secondary (less significant) barriers.

5.3.1. Primary barriers

Barrier B5: Lack of quality and applicability of content retrieved from the knowledge repository (usefulness barrier)

Although almost all the participants (92%) were generally satisfied with the type of content in the knowledge repository, all of them cited issues with the quality and applicability of the content. Key issues included incorrect, inconsistent, misrepresented, non-standardised, outdated, obsolete and scattered content, the type and applicability of content, and an overwhelming volume of content. To resolve these issues, the participants suggested standardising, cleaning up, and structuring the content before upload, capturing tacit knowledge, and using AI technologies to manage the content, check for errors, identify gaps, and track trends. One participant noted: *"[AI] will pick up straight away and say error and then either automatically correct it on its own, otherwise it [AI] will tell the user there's an error in this field and this is what you need to fix. It [AI] is definitely good at picking up errors and formatting in a way that you want it before it is even gone [uploaded] into the database [knowledge repository]"*.

Barrier B4: Lack of efficient searching, filtering, and retrieval functionality of the knowledge repository (accessibility barrier)

Despite finding the required content, 83% of participants expressed concerns about the search-and-retrieval functionality of the knowledge repository for the majority of the time, with Participant 10 explaining: "Finding all the information and where it's all sitting, that was the hard part". To address this, 75% of the participants suggested enhancing the search, filtering, and retrieval capabilities, with one participant advocating structured filtering options and others recommending using AI, which could "very quickly sift through billions of data points" to deliver more precise results.

Barrier B2: Lack of user-friendliness and ease of navigation of the knowledge repository (interface barrier)

Sixty-seven per cent of the participants expressed concerns about the knowledge repository's interface, noting that "the front end is not that easy to use" and that inputting content was "not super easy". Some found it "quite difficult to navigate", and one participant added that content was scattered, making it "not intuitive" to find. Eighty-three per cent of the participants suggested interface improvements, with several stressing the need for a simplified interface. One participant suggested: "If the knowledge repository is

similar to social media... people would become more familiar [with it] and prone to use it". Others proposed adding links, cross-linking content, and using chatbots, with one participant noting: "a chatbot will motivate anybody to use it... it is much faster for searching".

5.3.2. Secondary barriers

B3: Lack of ease in contributing content to the knowledge repository (accessibility barrier)

Only 17% of the participants reported problems with contributing content to the knowledge repository. This low percentage could be because most users consume content rather than contributing it. Participant 6 noted the issue of incomplete content, saying: "We only have 1,100 project data sheets out of the 12,000 projects we've done", and cited the lack of an automated process for capturing content as the reason for this. Other concerns included a disorganised filing system and difficulty motivating users to contribute. Fifty per cent of the participants made suggestions to improve the content contribution process. Participant 6 noted: "If I'm contributing content, I need to know there's some sort of benefit for me". Participants 7, 8, and 11 proposed using AI technologies to streamline contributions, with one stating: "AI can monitor data and update the system much faster than we can appoint people".

B1: Lack of awareness of the existence, contents, functioning, and benefits of the knowledge repository (awareness barrier)

Participants 3, 4, 7, and 12 believed that a greater awareness of the knowledge repository would be beneficial. Participant 2 suggested: "If we get pop-up notifications or something on our [Microsoft] Teams as a notification, then it might encourage people to actually go into the platform [the knowledge repository] and look and see what is available", and Participant 3 suggested: "Email notifications could potentially assist in trying to drive more traffic to that [knowledge repository] location".

B6: Lack of reasons and incentives to use the knowledge repository (motivation barrier)

Most participants felt that the improved efficiency and benefits of using the knowledge repository would naturally incentivise users to adopt it. Participant 8 stated: "As it gets better, people are going to become more and more accustomed to its value and then utilisation will probably increase". Only one suggestion was made to implement a rewards system based on usage.

B7: Lack of management support to drive the use of the knowledge repository (motivation barrier)

While no participants explicitly mentioned management support as a driver for repository use, they acknowledged that any technology that improved efficiency would likely gain managerial backing. As one participant noted: "If management sees what the tool does, then that will motivate them [management] to drive the use of the tool". Another added: "Any process that saves a manager time is something they [management] will probably end up supporting".

5.4. Use, development, and perceptions of AI technologies

The results indicated that 75% of the participants either frequently or consistently used AI technologies, primarily for quick search and coding; this reflected a strong adoption of and familiarity with AI technologies. This was confirmed by Participant 8, who stated: *"Half the time we don't even know we're using AI"*. All the participants were aware of the organisation's in-house AI system development, with 33% being heavily involved in a team working on 20 AI proof-of-concept projects. This indicated a highly engaged and AI-literate participant group, which was favourable for this research study.

All the participants had a balanced view of AI technologies, recognising both their transformative potential and the significant difficulties they represent. Many believed that AI technologies could optimise processes, reduce human error, and enhance business competitiveness. Participant 3 noted: *"I don't think we still understand probably half of what it [AI technologies] can offer us, but... we have to try and stay current... else we risk being left behind"*. Concerns about a blind reliance on AI, ethical issues, and data privacy were raised, with Participant 4 warning: *"AI has huge potential if used right and devastating potential if used wrong"*. The participants emphasised the importance of verifying AI's outputs, understanding the technology, and educating users to ensure responsible use. While AI could enhance human capabilities, most participants agreed that it would not replace human decision-making. Participant 5 remarked: *"I don't*

think it's going to be replacing any of our jobs... but it will definitely change the way we do our jobs". There was consensus that AI should handle mundane tasks, thus freeing professionals for complex work; but caution was advised to avoid hindering critical thinking. Clear governance and guidelines were regarded as essential to ensure ethical AI use in the organisation.

5.5. Using AI technologies to address barriers to the knowledge repository

The participants were asked how AI technologies could address barriers to the knowledge repository. Although all the participants were actively using AI technologies, and some participants were developing AI technologies, many lacked an understanding of the first principles behind them. To overcome this, the participants were asked to provide examples, which were then linked to the particular AI functionalities during the data analysis.

5.5.1. AI's interaction functionality

Sixty-seven per cent of the participants suggested using interactive AI-driven chat interfaces to enhance user experience by providing interactive, intuitive, personalised responses. Participant 3 emphasised the benefit of engaging with AI by stating: *"What makes AI great is the ability to be able to engage with somebody in simple English and then instantaneously or near instantaneously respond to you and do all that heavy lifting and everything in the background while making it look easy"*. The AI-driven chat interface could identify user attributes, such as location or position, to offer tailored responses, thus improving navigation and search efficiency. It would allow users to interact naturally, to ask questions, and to receive personalised suggestions, thus simplifying content retrieval. In addition, participants proposed using the AI-driven chat interface to capture user contributions automatically and to collect feedback and recommendations for improvements. Therefore, there appeared to be direct and positive links between the interaction functionality of AI technologies and the following:

- User-friendliness and ease of navigation;
- The ease of contributing content;
- The searching, filtering, and retrieval functionality; and
- The quality and applicability of the content retrieved.

5.5.2. AI's automation functionality

Forty-two per cent of the participants believed that AI's automation functionality could streamline contributing and managing content in the knowledge repository by reducing manual processes and keeping the content up to date. In addition, 33% of the participants noted that AI's ability to summarise content and to use keywords to search enhanced the search, filtering, and retrieval functionality; as Participant 11 explained: *"You can train an AI model... [and] it will be able to get you all the information [content] you need based on the keywords you type in"*. AI also improves the accuracy of content by automating updates and by tagging and cleaning data. Participant 7 shared an example in which AI categorised project-specific emails, providing quick summaries based on specific road names; the participant also expressed interest in using AI technologies to pull meeting discussions into the knowledge repository. The ability of AI to automate diverse content collection and summarisation enriches the repository, making it easier to access comprehensive content. In addition, AI technologies reduce human errors in tasks such as copying and pasting, thereby improving content quality. Therefore, there appear to be direct and positive links between the automation functionality of AI technologies and the following:

- The ease of contributing content;
- The searching, filtering, and retrieval functionality; and
- The quality and applicability of retrieved content.

5.5.3. AI's search-and-retrieve functionality

Sixty-seven per cent of the participants explicitly mentioned AI technologies' ability efficiently to search and retrieve content from databases, with Participant 6 noting: *"The heart of the knowledge base is to be able to retrieve"*. AI can quickly sift through large volumes of content, based on specific criteria, thus reducing users' time and effort. One participant mentioned Copilot as an example of AI technologies aiding content retrieval and emailing relevant findings. AI's search-and-retrieve functionality also includes semantic searching, which improves the precision and relevance of the results for both structured and

unstructured content. Therefore, there appears to be a direct and positive link between the search-and-retrieve functionality of AI technologies and the following:

- The searching, filtering, and retrieval functionality of the knowledge repository.

5.5.4. AI's pattern recognition functionality

Seventeen per cent of the participants suggested using AI's pattern recognition functionality to tailor the knowledge repository's interface, based on individual user access patterns and search behaviours in order to improve user-friendliness and navigation. Thirty-three per cent noted that AI's ability to identify trends and to predict user needs enhanced searching, filtering, and retrieving. One participant explained that AI technologies can reduce manual search times by offering tailored content suggestions and personalised results that are based on past behaviour. In addition, AI's predictive abilities allow it to anticipate user needs by delivering specific and related search results. Seventeen per cent of the participants mentioned that AI can improve content quality by tracking usage patterns and flagging incomplete or outdated content. Participant 3 explained that AI *"can make suggestions, provide feedback, reports or statistics to those that can then make decisions on the feedback received"*, enabling targeted improvements to the knowledge repository and ensuring that users can access up-to-date information. Therefore, there appear to be direct and positive links between the pattern recognition functionality of AI technologies and the following:

- User-friendliness and ease of navigation;
- The searching, filtering, and retrieving functionality; and
- The quality and applicability of retrieved content.

5.5.5. AI's reasoning and decision-making functionality

Participant 4 highlighted AI's ability to interpret user queries accurately and to provide relevant responses, stating that "the value sits in being able to pull out the ten most profitable projects and give me the top five reasons why these projects succeeded". This revealed AI's reasoning and decision-making capabilities in finding trends in order to provide meaningful answers. Another participant emphasised that AI could process queries, 'connect the dots', and offer meaningful insights that are based on past interactions. Another participant emphasised the importance of framing questions accurately in order to improve AI's responses, thus showing how reasoning and decision-making enhance AI-driven chat interfaces. In addition, participants called for protocols for how AI manages user-contributed content, suggesting that AI's reasoning and decision-making functionalities are essential to govern the integration and handling of user contributions in the repository. Therefore, there appear to be direct and positive links between the reasoning and decision-making functionality of AI technologies and the following:

- User-friendliness and ease of navigation;
- The ease of contributing content; and
- The searching, filtering, and retrieving functionality.

5.5.6. AI's ability to assist with awareness

Seventeen per cent of the participants believed that AI technologies could enhance the visibility of the knowledge repository, and they suggested using interactive AI-driven chatbots to engage users and to answer queries and provide information about the repository's content and benefits. This would enhance user engagement and awareness. One participant proposed using AI's automation functionality to personalise communications and to deliver relevant updates about the repository directly to users' emails, thus driving awareness. Therefore, there appears to be an indirect and positive link between the functionalities of AI technologies and the following:

- Awareness of the existence, contents, functioning, and benefits of the knowledge repository.

5.5.7. AI's ability to assist with motivation

Ninety-two per cent of the participants believed that experiencing the efficiency and improved quality of results from AI technologies would motivate users to use the knowledge repository. Participant 10 emphasised this connection, stating: *"If you know that you've got these AI systems that are going to make it easier for you, then you're definitely not going to be afraid to use it [the knowledge repository] or worry that you need to bug somebody else to help you. It will make it [the knowledge repository] a lot*

more user-friendly". Therefore, there appears to be an indirect positive link between the functionalities of AI technologies and the following:

- Reasons and incentives to use the knowledge repository.

While Participant 8 suggested that *"the adoption of AI [integrated with the knowledge repository] is going to be driven from the bottom for me rather than from the top"*, 42% of the participants believed that AI technologies could address a lack of management support for the repository by using its pattern recognition functionality to track content access and to provide statistics to management to show the repository's value. In addition, AI's interaction and its automation of the searching, filtering, and retrieving functionalities enhance efficiency, which could help to garner managerial support and drive the repository's use. Therefore, there appears to be an indirect and positive link between the functionalities of AI technologies and the following:

- Management support in driving the use of the knowledge repository.

5.5.8. Human-AI integration

Fifty per cent of the participants emphasised the importance of human involvement alongside AI technologies to enhance the use of the knowledge repository. Human involvement would be crucial for oversight, verification, and decision-making that is based on AI outputs. Participant 7 suggested the continual improvement of AI responses through human review: *"Specialists in specific fields should review answers that are given by the AI … Whoever asked that question gets an updated answer … and then that answer is incorporated into any future questions asked on that topic"*. Another participant emphasised the need for human control to prevent data manipulation and to develop protocols for managing AI technologies.

5.6. Revised conceptual model

The proposed conceptual model presented in Figure 1 was developed to determine how AI technologies could be applied to address the barriers that hinder the use of the knowledge repository. The propositions that informed the conceptual model were based on evidence from the literature. However, during the research investigation, only some of the original propositions were found to be valid. In addition, some new insights were gained, and additional relationships between the AI functionalities and barriers were identified, as discussed in the results section above. This led to the revised model depicted in Figure 2, which indicates direct and indirect relationships between AI functionalities and their ability to overcome repository usage barriers.

Although AI technologies could enhance the functioning of the knowledge repository, most participants emphasised the necessity of human involvement in oversight, verification, critical reasoning, and ultimate decision-making. A collaborative approach between AI technologies and human involvement was proposed to optimise the use of the knowledge repository.

6. CONCLUSION

The literature review identified the key factors affecting the use of knowledge repositories as being awareness, interface, accessibility, usefulness, and motivation. The specific barriers that were identified were the lack of awareness, user-friendliness, and ease of navigation; difficulties with contributing content and with the searching, filtering, and retrieving functionality; problems with the quality and applicability of the content; and the lack of reasoning and incentive and management support. The literature review further identified the key AI functionalities as being interaction, automation, searching and retrieving, pattern recognition, and decision-making. The successful application of AI technologies was discovered to require a well-functioning repository, user training, incentives to adopt the technologies, and strong organisational leadership support and strategic alignment.

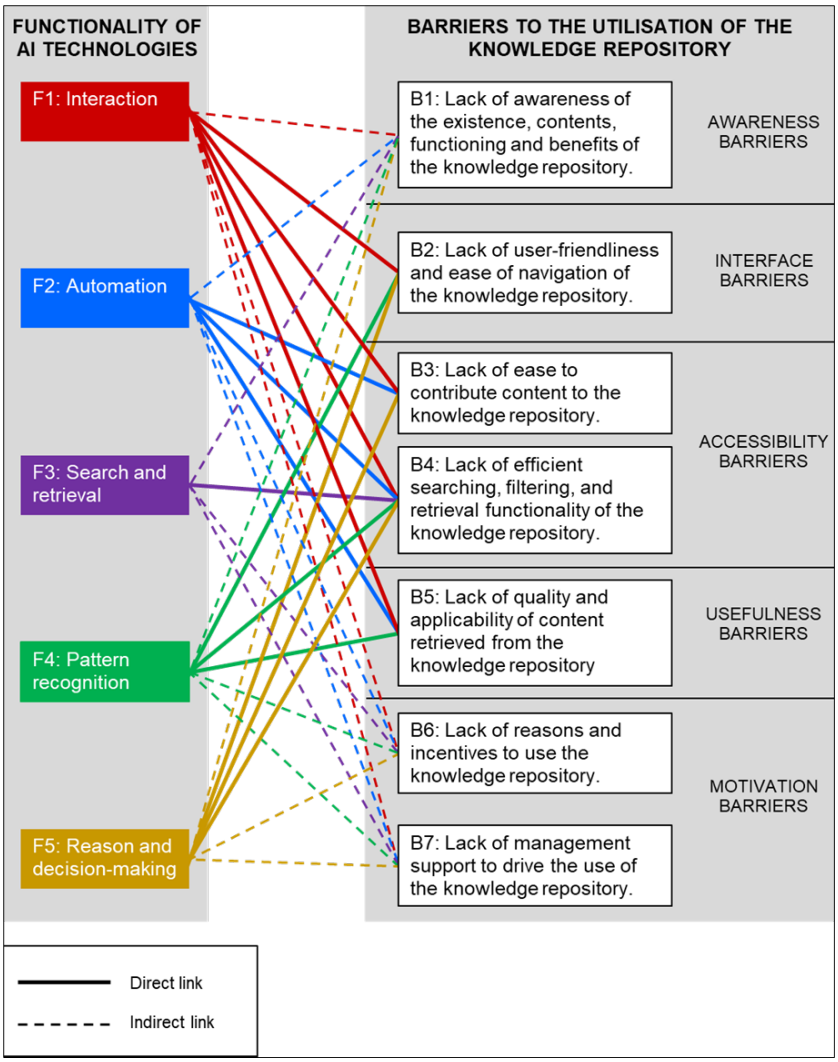

Figure 2: Revised conceptual model

A conceptual model of the propositions that were developed on the basis of the literature review was tested through qualitative data from 12 semi-structured, one-on-one interviews with employees from the data science and digital delivery sectors of a civil engineering consulting organisation. The investigation confirmed the barriers that had been identified in the literature, and also distinguished the more prominent primary barriers (usefulness, accessibility, and interface) from the less significant secondary barriers (awareness and motivation). AI technologies were found to address directly the primary barriers and indirectly to ease the secondary barriers. Both the literature review and the investigation emphasised that human oversight and human reasoning remained crucial, and recommended a collaborative human-AI approach to maximise the knowledge repository's effectiveness. It is therefore recommended that AI be leveraged to enhance the use of the knowledge repository.

The limitations of this study include not having investigated the magnitude of the impact of the various barriers on the use of the knowledge repository, or the magnitude of the effectiveness of each AI functionality in addressing these barriers. The study relied solely on qualitative data, and was confined to a single organisation — both factors that may have introduced biases and limited the study's comprehensiveness. In addition, the study focused on the knowledge repository transfer mechanism in isolation, and provided only a broad overview of current AI technologies. Despite these limitations, the study's findings are considered to be strong, and the gaps it has identified suggest areas for future research. Future studies could explore quantitative analysis, include multiple organisations across diverse industries, consider multiple data collection methods, explore integration of the knowledge repository transfer

mechanism with other transfer mechanisms, and investigate the practical impact of integrating AI technologies into the knowledge repository.

We stand at the cusp of a transformative era in knowledge management that is driven by the promising potential of AI. Integrating human expertise with AI would be crucial in unlocking new levels of efficiency and value in knowledge management. By striving to bridge the gaps and to drive meaningful change, we could pave the way for a more connected, informed, and dynamic future in which knowledge is not just managed but is truly optimised.

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