Integration of Conversational AI Capabilities in Knowledge Management Processes for Higher Education

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Abstract: This paper explores the application of knowledge management (KM) in higher education institutions (HEIs), focusing on the potential of artificial intelligence (AI) technologies, especially Conversational AI to transform knowledge processes. By examining conversational AI systems, this paper investigates how such technology can enhance knowledge creation, sharing, and application within educational contexts. The illustrative example of Georgia State University's "Pounce" chatbot show practical benefits of AI in administrative and educational support. The paper suggests that integrating AI into KM practices can address the evolving needs of HEIs, supporting their mission to provide high-quality education to society. The paper underscores the importance of adopting advanced technologies to augment institution's competitive advantage. Through a real-life example of Con-AI application in KM, this paper contributes to the understanding of how HEIs can leverage technology to enhance their core functions and sustain their competitive edge.

Keywords: Artificial Intelligence, Knowledge Management, Alavi's Typology, Conversational Agent, Chatbots

1. Introduction

Higher education institutions (HEIs) offer different knowledge to individuals through mental, physical, and ideological training so that they can contribute to society (Deem, Mok and Lucas, 2008). Phusavat et al. (2011) also believes these types of well-educated individuals can increase the overall performance of organizations, regions or even countries. There seems to be a linkage between "knowledge" and "competitive advantage" in organizations and a significant body of research also shows that knowledge management (KM) factors contribute (Cepeda-Carrión and Vera, 2007; Haas and Hansen, 2004; Hart and Rodgers, 2023). HEIs play a vital role in society (Blass and Hayward, 2014) by providing opportunities for advanced learning, carrying out research, and advancing the development of knowledge and skills. They have the mission of providing high-quality instruction, encouraging creativity, and preparing students for professions in a variety of fields (Blass and Hayward, 2014). To survive and be competitive is also crucial for any HEI. In terms of competitiveness there is a need to fight for better reputation and international and local rankings for the institutions (Edwards, 2007). Like other businesses, HEIs also face a multitude of changes and challenges, such as the disruption of innovation and new technology (Blass and Hayward, 2014) in terms of artificial intelligence (AI)

There has been a noticeable increase in scholarly papers about AI since 2019, with a growth rate that is higher than 50% when compared to 2018 as noted by Lee et al. (2023). This trend indicates a visible increase in scholarly attention to AI, resulting in a significant rise in similar publications by the year 2023. Despite the substantial volume of research on AI-related topics, Duan, Edwards, and Dwivedi (2019) identified a significant gap in existing literature. They noted a lack of a comprehensive theoretical framework aimed at systematically understanding the utilization of AI-based tools and their impact on organizations, especially for HEIs.

There are only a few Conversational artificial intelligence (Con-AI) review studies in the context of HEIs. Dempere et al. (2023) did a literature review to explore the usages and effects of ChatGPT within HEIs and concluded that there are notable benefits in research support, automated grading, and enhanced human-computer interaction. They also highlight the potential advantages of the usage of ChatGPT, such as streamlined enrollment, improved student services, teaching enhancements, research aid, and increased student retention. However, this study focused more on the predictive and generative nature instead of the benefits of being conversational and interactive of ChatGPT. Pereira et al. (2023) did a scoping review of chatbots in HEIs to investigate the purpose of chatbots usage, the feasibility of chatbots and to figure out the quality of different chatbots within HEIs. In the context of HEIs, there seems to be very limited research on Con-AI, competitive advantage and KM. Thus, this paper will try to build up the relationship between the three mentioned components based on the study of Alavi and Leidner (2001) about how technology and system can enhance KM processes (including knowledge creation, knowledge sharing, and knowledge application).

2. Literature Review

2.1 The Knowledge-Based View and Knowledge Management Processes

The "knowledge-based view" (KBV) emphasizes the value of knowledge as a strategic asset for organizations. It proposes that knowledge, in its various forms, such as explicit and tacit knowledge, plays an important role in creating competitive advantage and driving organizational performance (Grant, 1996). Some other studies of KBV also considers a firm as a system that creates, integrates, and disseminates knowledge through the activities of its workforce, generating value for the firm (Kianto, Sáenz and Aramburu, 2017; Felin and Hesterly, 2007). In essence, the KBV emphasizes the importance of effectively managing and utilizing knowledge to achieve long-term success in today's dynamic environment. In the past, there were different studies about how KM should be considered as processes (Davenport, Järvenpää and Beers, 1996; Teece, 1998; Alavi and Leidner, 2001). While all these studies had the perspective of confirming KM as processes, Alavi and Leidner (2001) concluded that there are four major KM processes which can be enhanced by technology and systems. The study defines KM as a systematic and organizationally specified process for acquiring, organizing, and communicating both tacit and explicit knowledge. It also suggested that technology can be used to manage organizational knowledge by supporting the creation, sharing, and application of knowledge in organizations.

2.1.1 Knowledge Creation

Knowledge creation is often the reconfiguration and recombination of pre-existing background knowledge, but also includes building up concepts and creating solutions from scratch. As a result, organizations can adjust to changing circumstances and environments (Bhatt, 2001). Furthermore, knowledge acquisition from outside sources is also a way in creating one's own knowledge (Alavi and Leidner, 2001). Consequently, obtaining knowledge through information sourcing or search may be a form of knowledge creation (Alavi and Leidner, 2001; Jarrahi et al., 2023). Besides, Nonaka (1994) identifies four modes of knowledge creation: socialization, externalization, internalization, and combination. Socialization is the process of converting tacit knowledge into new tacit knowledge via social interactions and shared experiences among organizational members, such as engaging in discussion and team projects. Combination is the process of creating new explicit knowledge by merging, categorizing, reclassifying, and synthesizing current explicit knowledge, such as through literature surveys. Externalization is the transformation of tacit knowledge into new explicit knowledge, such as articulating best practices or lessons learned. Internalization is the process of developing new tacit knowledge from explicit knowledge, such as through reading or discussion. Knowledge creation within academic settings is crucial for preserving valuable insights, documenting local knowledge, and fostering academic excellence.

2.1.2 Knowledge Sharing

Knowledge sharing is the intentional exchange, dissemination, and transfer of knowledge among individuals, groups, or organizations to promote learning, innovation, and problem solving. It is the process of identifying valuable knowledge assets, capturing them in usable formats, and disseminating them to others via various communication channels. Knowledge sharing promotes collaboration, improves organizational performance, and helps with collective learning and decision-making (Bock et al., 2005; Alavi and Leidner, 2001; Van Den Hooff et al., 2003). Within HEIs, knowledge sharing is essential for promoting teamwork, creativity, and academic success.

2.1.3 Knowledge Application

After sharing of knowledge, the next step will be to put knowledge into practice, and this is termed as “knowledge application”. It can involve the repackaging of best practices or other available knowledge resources into useful and suitable solutions within an organization (Bhatt, 2001). To apply knowledge, it also requires careful and skillful selection, analysis, and assimilation of the relevant external knowledge in order to satisfy the needs of the organization at a suitable timing (Jarrahi et al., 2023). In the context of HEIs, knowledge application can refer to academic teaching, research and expertise in practical ways that benefit society.

2.2 Competitive Advantages and Knowledge Management Processes of HEIs

As per Hart and Rodgers (2023), the concepts of “competitiveness” and “competitive advantages” are distinct. In their study, it stated that “competitiveness” of a HEIs is “the ability to engage in educational exports, withstand competition, attract resources, provide employment, and foster a knowledge-based culture” and “the

institution's capacity to combine resources and competencies in unique ways" (Hart and Rodgers, 2023). It focused more on the external environment. While for "competitive advantages" of a HEI, it is the major abilities of an institution to have better performance over industry's competitors by using its valuable, scarce, inimitable and irreplaceable resources (Lo and Tian, 2019).

Previous research found that KM processes and systems, that support the working of employees can enable the operation of institution to function efficiently and effectively, thus increasing the competitive advantage of HEIs Alavi and Leidner (2001). Istikhoroh and Ardhiani (2022) did a correlational study to examine the relationship between KM processes and competitive advantage in the context of HEIs by using a quantitative approach, and they found the competitive advantage of an institution can be better through KM processes. Mohammed, Abdul and Gururajan (2018) investigates knowledge management processes in Australian higher education, highlighting its role in competitive advantage, university rankings, and profits. Using brainstorming with six ICT managers at a Queensland Regional University, the study figured out that the KM processes of knowledge creation, knowledge sharing, and knowledge transfer are some of the key themes.

2.3 AI and Technologies

According to Alavi and Leidner (2001), KM processes can be augmented by technology which enhance communication, facilitate collaboration, improve access to information, and enable routine tasks automation. Thus, technology is a critical enabler for successful KM in an organization, leading to improved decision-making and competitive advantage. In the past decades, AI has been one of the groundbreaking technologies. AI is still evolving speedily and thus its definition is also changing with new extensions. For instance, Russell and Norvig (1995) believe AI can be defined as machines or systems that mimic human's cognitive function to learn, to solve problems and to interpreting and generating languages. In addition, the Institute of Electrical and Electronics Engineers (IEEE) Corporate Advisory Group refers to AI as "the combination of cognitive automation, machine learning (ML), reasoning, hypothesis generation and analysis, natural language processing (NLP) and intentional algorithm mutation producing insights and analytics at or above human capability". In the past decade, due to the advancement in technologies (such as deep learning and NLP), augmentation of computer power, as well as the explosion of available data for algorithms training, AI has accelerated its momentum with new application possibilities (Bornet, Barkin and Wirtz, 2021). For instance, some online interactive platforms or tools might extend the definition of AI which can interpret and give replies to users' queries or prompts and create an interactive communication experience that mimics humans in the form of text, voice, or both in a way (Dwivedi et al., 2023).

2.4 The Relationship Between AI and KM Processes

In the past two decades, with the advancement of technology and the launches of different systems, the interaction between technology and KM processes is essential (Alavi and Leidner, 2001). By heavily facilitating the generation, sharing/transfer, and using of knowledge inside organizations, technology is bettering competitive advantage of an organization through these KM processes (Singh and Singh, 2019). Almeshref and Khwanda's (2022) study emphasizes the role of information systems in enabling KM processes, indicating that technology can have a significant impact on knowledge sharing, acquisition, and application. In terms of KM in HEIs, universities use a multifaceted approach that includes structured processes as well as digital tools (Al-Kurdi, El-Haddadeh and Eldabi, 2018). It includes creating and maintaining document databases, using platforms for collaborations, and integrating learning management systems to efficiently organize and disseminate knowledge resources. Furthermore, since promoting a culture of knowledge sharing among faculty and students, facilitating work collaboration, and encouraging the creation and dissemination of scholarly work are often regarded as important for HEIs (Brewer and Brewer, 2010), thus any technologies or systems which can help with these aspects will be very useful. Those KM-relevant technologies, which can encourage experience sharing to help transform tacit knowledge into explicit knowledge, contribute to achieving KM success (Nonaka and Von Krogh, 2009).

This synergy between AI and KM can lead to more efficient knowledge sharing, learning, and innovation within the organization (Sundaresan and Zhang, 2021; Jarrahi et al., 2022). Therefore, AI serves as a catalyst that contributes to the development of competitive advantage through the enhancement of KM processes within organizations. Hence, the interplay between AI and KM processes is symbiotic, with each element reinforcing and complementing the others to propel competitive advantage of an organization in the face of rapid technological advancements and market changes.

2.5 Conversational AI in HEIs

Amongst different kinds of AI, Con-AI has aroused the interest of academic research in recent years, due to the advancement in NLP since 2010, with the launch of Siri by Apple which is the first and most widely accepted virtual assistant (Campbell, 2020). Con-AI is a type of communicative AI, and it can perform designated tasks as a communicator which mimics humans (Guzman and Lewis, 2020). Through computational algorithms of NLP, Con-AI learns to automatize communicative functions and thus can "talk" to humans in natural language (Ng, 2022). Some well-known examples are Google Assistant, Apple Siri and Amazon Alexa which can respond to human requests by text or by voice. People can communicate with these unsupervised human-like "virtual assistants" and this is trending because of the navigation of Con-AI in daily life (Guzman, 2019). Some of the Con-AI will even make use of "large language models'' (LLM), such as ChatGPT, and it can help its users in a broad range of tasks thus offering convenience and personalization to the users (Gieselmann and Sassenberg, 2022). While other Con-AI systems can also discuss different topics and reply to a large number of questions from users (Smutny and Schrei-berova, 2020). Moreover, study from Sahab, Haqbeen and Ito (2024) also found that Con-AI, usually incorporates with ML and deep learning, can take the role as a facilitator during online communication and discussions. The study concluded that with the help of Con-AI, participants' engagement and collaborative problem-solving can be enhanced.

Con-AI tools are becoming more common in HEIs, benefiting teaching and administration. With these online chatbots, students can have 24/7 access to information and knowledge and can get immediate feedback from a human-like mean. By storing all the previous conversations of students, chatbots can give personalized assistance. KM processes can then be facilitated by using these Con-AI tools while students are interacting with them (Al-Sharafi et al. (2022). In the literature review of Chen, Chen and Lin (2020), they stated that the web-based and online intelligent education systems working together with humanoid robots and online chatbots can improve the efficiency of the educator's works, e.g. reviewing and assessing assignments from students. This can free up their time for improving teaching quality. In addition, curriculum can also be personalized according to students' progress due to ML capabilities of the AI-supported interactive educational system, which would in turn improving drop-out rate by improving overall learning experience of the students (Chen, Chen and Lin, 2020). Hannan and Liu (2021) also gave examples of how AI applications help HEIs to improve their competitive advantage. For instance, the paper figured out that online chatbots, such as IBM's Jill Watson, can be used as teaching assistants to avoid disconnection between students and their study. Besides, Microsoft's Azure can support students in their native languages when they interact with this on-campus chatbot which consists of ML algorithms to assist in speech transcription and text translation. The AI-chatbot "Pounce" for the Georgia State University also help to increase the enrollment rates of students into courses (Hannan and Liu, 2021).

As mentioned previously, technology like Con-AI which can help with KM processes will be valuable to the HEIs and their competitive advantage., Most of the literature about Con-AI are from the commercial sector with limited of them within the context of HEIs (Al-Sharafi et al., 2022). For research relevant to KM processes and Con-AI, Al-Sharafi et al. (2022) makes use of a hybrid SEM-artificial neural network (SEM-ANN) approach and develops a theoretical model based on extracting constructs from the expectation confirmation model, combined with the KM processes (knowledge sharing, knowledge acquisition, and knowledge application) to understand the sustainable use of chatbots (as a kind of Con-AI) for educational purposes. This study has found that if a Con-AI system can facilitate the processes of knowledge creation, knowledge sharing and knowledge application, it will benefit students to learn and acquire new knowledge. In addition, Sumbal and Amber (2024) did qualitative research by interviewing researchers and faculty members who have teaching and researching responsibilities from a university in Hong Kong, and they figured out that Chatbot powered by LLM and with a large knowledge base can facilitate Nonaka's 4 modes of knowledge creation.

3. Illustrative Example: "Pounce" AI Chatbot at Georgia State University

Background: At the beginning, "Pounce" AI chatbot acted as an institutional tool to help new students to get familiar with knowledge and information about registration, finances etc., to get around the new campus life. Later, the chatbot started to integrate into course content in 2021. Since then, besides daily interactions with students, Pounce will also push direct reminder about assignments and exams to students, giving them a chance to text them questions through "PolsPounce" to their instructors. These reminders are personalized according to the study progress of students and Pounce will also give students short quizzes before exam. Students can also have interactive practices with Pounce and can get immediate feedback. Pounce will also direct students to

internal discussion forums or study groups where they can collaborate and share their understanding about course content (Mdavis, 2022).

Knowledge Creation: When students ask Pounce questions, it is just like sharing their difficulties and challenges with the chatbot. This can create a vast amount of data and the Con-AI system can later analyze them and sort out common issues amongst students. For instance, tactic knowledge, such as areas which students may need more support or gaps in curriculum, can be transformed to read-to-use explicit knowledge after analysis of student's conversations with the chatbot. In addition, the ability for Pounce to collect real time feedback from students after each class can better curriculum development, thus more targeted and effective learning materials can be formed earlier. These will further encourage ongoing learning and participation in inventions within HEIs, and ultimately contribute to sustained organizational competitive advantage (Yang, 2007).

Knowledge Sharing: Pounce can provide quick and real-time answers to students' questions, e.g. information about course content, assignments deadlines and university services. This makes it possible for the sharing of knowledge efficiently 24/7 from Pounce's knowledge base to students. Pounce can facilitate peer-to-peer knowledge sharing by diverting students to different online forums or study groups for collaboration and sharing their understanding about course content. This will can foster a learners' community that actively share knowledge thus enhancing the overall learning environment

Knowledge Application: Based on individual profiles and past conversations with students, Pounce can provide personalized questions, prompts, advice and reminders to help students in applying knowledge they have gained in a practical way. Besides, with a knowledge base being built up from different systems and resources, Pounce can also suggest study materials and tutoring services in a timely and accurate manner. Students can then have better informed decisions about their academic activities which also benefits the effectiveness of application of knowledge and skills.

Results of using Pounce: Pounce AI chatbot at Georgia State University is a powerful tool that enhances KM processes by providing efficient, personalized, and continuous support to students. Its ability to facilitate knowledge creation, sharing, and application. By engaging students proactively, there was an obvious jump in students' performance in the institution. Besides, for the benefit of the educators, Pounce also freed up their time and resources in assisting their students as the Con-AI learned about from students' questions and experiences and augmented their knowledge base for frequently asked questions. Pounce also facilitated communication between students and educators by directing students who needed help from a human on a timely basis. This could help to detect in-risk students and prevent drop-out from course (Mdavis, 2022).

4. Concluding Discussion

This paper aimed at figuring out how Con-AI tools can improve the major KM processes as proposed by Alavi and Leidner (2001) in HEIs and thus augmenting the competitive advantage. The KM processes of knowledge creation, knowledge sharing, and knowledge application as facilitated by AI-supported chatbots can increase efficiency for teaching and administrative tasks within HEIs. This will in turn reduce certain costs and improve the work quality of students, faculty members and staff in the institution. By using an illustrative example, KM processes of a particular HEI has been improved after deploying Pounce AI chatbot and thus the competitive advantage of the institution. As a result, a theoretical framework has been developed as per below:

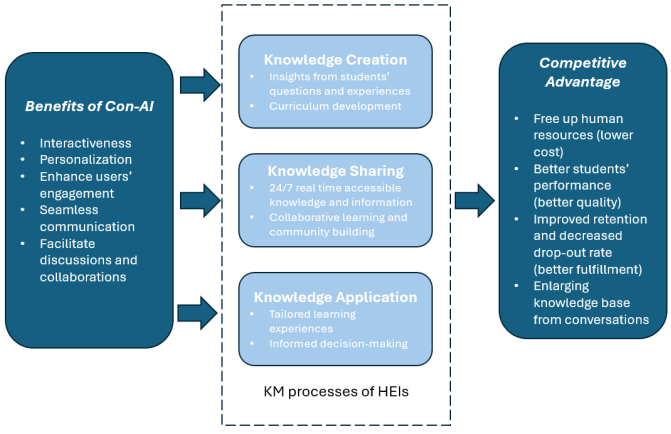

Figure 1: Con-AI enhanced KM processes and thus competitive advantage and competitiveness of HEIs

The KBV highlights knowledge, which is a strategic asset, is critical for organizational competitive advantage. By creating, integrating and disseminating knowledge, value can be generated by firms or organizations as a system. Besides, knowledge creation, sharing and application are effective KM processes which can be supported and enhanced by technology like AI. On the one hand, knowledge creation reconfigures existing knowledge, while knowledge sharing is more for collaboration and information dissemination. On the other hand, knowledge application means using knowledge to create practical solutions. All these 3 KM processes drive academic success and societal benefits.

Competitive advantage is about how an institution can have better performance over competitors by using its internal resources which are valuable, scare, inimitable and irreplaceable. In the context of HEIs, KM processes as supported by chatbots, such as Pounce, can be one of those unique resources. For Con-AI chatbots which are having advantages of allowing immediate access of knowledge for the users, as well as being communicative, conversational, and interactive, they can support students and enhance the operations and knowledge / information flow within different internal stakeholders of the institution. Communication and collaboration within the institution can also be better thus ultimately leading to better decision-making and augmented efficiency. For instance, studies confirmed Con-AI can enlarge the knowledge base and benefit the knowledge creation process. Both Nonaka and Krogh (2009) and Chen, Le and Florence (2021) stated that the ability for Con-AI to learn from past interactions from users and be equipped with relevant knowledge to answer different questions automatically, will enhance knowledge's connection and acquisition. Pounce functions similarly by acquiring tactic knowledge from different students when they interact with the chatbot. It can get insights to enrich the knowledge base for future enquiries and better curriculum development by transforming tactic to explicit knowledge. For knowledge sharing, Pounce can provide immediate access to information, answer enquiries from students and thus facilitating seamless communication across internal stakeholders of HEIs. Pounce can also help supporting individuals to apply and utilize knowledge possessed by others without learning or acquiring such knowledge, due to the knowledge base of Con-AI system is usually improved continuously with data from users' conversations. In addition, for knowledge application, Pounce can base on the students' profile and the past conversations and interactions to tailor-made quizzes to students. This can help students to apply their knowledge by facilitating brainstorming with also real-time feedback. Overall, AI chatbot Pounce have demonstrated tangible improvements in educational engagement and administrative efficiency for Georgia State University, providing the augmentation of the institution's competitive advantage.

In conclusion, HEI can largely improve their operational efficiency, educational outcomes and overall institutional performance with the support of Con-AI to optimize KM processes. The role of Con-AI and other AI technologies will continue to evolve and expand in KM processes which will probably transform the landscape of higher education.

5. Contribution and Future Research Opportunities

As AI tools are increasingly adopted in every industry in the past few decades, this paper contributes by bringing light to an under researched aspect of KM in the context of HEIs. It enriches the existing knowledge on the role Con-AI can play in HEIs in different means. First, this paper focuses on the communicative, interactive and conversational aspects of AI chatbot and discusses its role to strengthen the three major KM processes in HEIs. As an evolving technology, research on Con-AI by using the lenses of KM is not abundant, especially within the context of HEIs (Jarrahi et al., 2023). Second, by using an illustrative real-life example of Pounce at the Georgia State University, this paper explores the potential of how Con-AI can enhance the competitive advantage of HEIs through making sense of KM processes. It can help researchers to start diving deeper into the phenomenon of how Con-AI can help institutions in the future. This paper also gives valuable insight into how management of HEIs can make use of AI chatbot to better KM processes especially in teaching and administration thus augmenting institutional performance over industry's competitors. The benefits associated with Con-AI should encourage adoption by more HEIs and thus the need for resources allocation. This paper calls for future research to study the relationships between Con-AI, KM processes and competitive advantage of an institution within HEIs by using empirical research to have a more thoughtful understanding about the current happenings and future challenges. A suggestion for future research could be to conduct a multiple case study with data from stakeholders in different levels within different HEIs, such as private and public universities, HEIs in different regions, to understanding how Con-AI facilitate KM processes and the respective impact on the institution's performance. This can provide evidence-based practical insights which validate previous theories and contribute to a comprehensive understanding of such complex phenomena as Con-AI.

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