

Knowledge management models in higher education

Modelos de gestión del conocimiento en educación superior

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Summary

Knowledge management in higher education institutions involves the ability to identify, organize and distribute academic and research knowledge to improve teaching, learning and innovation. Evidence suggests that the implementation of effective knowledge management practices in educational environments contributes significantly to academic development, innovation, educational quality and the generation of competitive advantages. This review article aims to explore and analyze in depth the various knowledge management models implemented in higher education institutions. From traditional models to contemporary approaches will be examined, including participatory action research, knowledge co-construction and evolutionary models with a technological focus. The analysis will focus on how these models facilitate the effective transfer and application of knowledge in the educational and social context. In addition, the challenges and opportunities that these models present for educational institutions in the 21st century will be evaluated. In conclusion, this article aims to offer a comprehensive view that will not only benefit academics and educational administrators, but also policy makers and other actors involved in the education and research sector.

Keywords : Knowledge management; Higher education; Management models; Knowledge transfer; Academic development

Resumen

La gestión del conocimiento en instituciones de educación superior implica la habilidad de identificar, organizar y distribuir conocimientos académicos y de

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investigación para mejorar la enseñanza, el aprendizaje y la innovación. La evidencia sugiere que la implementación de prácticas efectivas de gestión del conocimiento en entornos educativos contribuye significativamente al desarrollo académico, la innovación, la calidad educativa y la generación de ventajas competitivas. Este artículo de revisión tiene como objetivo explorar y analizar en profundidad los diversos modelos de gestión del conocimiento implementados en instituciones de educación superior. Se examinarán desde modelos tradicionales hasta enfoques contemporáneos, incluyendo la investigación acción participativa, la co-construcción de conocimiento y los modelos evolutivos con un enfoque tecnológico. El análisis se centrará en cómo estos modelos facilitan la transferencia y aplicación efectiva del conocimiento en el contexto educativo y social. Además, se evaluarán los desafíos y oportunidades que estos modelos presentan para las instituciones educativas en el siglo XXI. Al finalizar, este artículo pretende ofrecer una visión comprensiva que no solo beneficie a los académicos y administradores educativos, sino también a los formuladores de políticas y otros actores involucrados en el sector educativo y de investigación.

Palabras clave: Gestión del conocimiento; educación superior; Modelos de gestión; Transferencia de conocimiento; Desarrollo académico

INTRODUCTION

The rapid evolution of knowledge and technology determines a scenario in which higher education institutions face unique challenges and opportunities. Effective knowledge management, an intangible but invaluable resource, has become a key element for educational institutions that seek not only to provide education but also to contribute to the advancement of knowledge. This scenario has led to the adoption of various knowledge management models, designed to optimize the creation, distribution and application of knowledge within and outside these institutions. Knowledge management in universities is not simply an administrative function; It is a strategic activity that drives innovation and continuous learning. Through effective knowledge management, higher education institutions can significantly improve their training and research contributions, increase their competitiveness and respond more effectively to the changing needs of students and society. Furthermore, by fostering collaboration and knowledge sharing among academics, students and professionals, these institutions can play a crucial role in social and economic development at local and global levels. For a higher education institution, it is of great importance to adequately manage the way in which knowledge circulates due to its impact on the generation, transfer and application of knowledge in educational institutions. The implementation of effective knowledge management practices in educational environments contributes significantly to academic development, innovation, educational quality and the generation of competitive advantages. Knowledge management in higher education

allows institutions to identify, capture, structure, share and use knowledge efficiently and effectively, which in turn promotes continuous improvement, pedagogical innovation and the development of research capabilities. Academic literature provides evidence of the importance of knowledge management in higher education. For example, Talanquer, 2018 highlights the relevance of knowledge in the organization and its impact on teaching work. Likewise, it highlights how the areas of knowledge influence the conceptions of university teachers about education for sustainable development, evidencing the relevance of knowledge management in teacher training (Sánchez et al., 2022). Furthermore, they reflect theoretically on knowledge management in higher education institutions, underlining the need to understand and characterize knowledge management in this context (Guzmán & Arrieta, 2020). Knowledge management in higher education is also related to the generation and dissemination of knowledge in society, being fundamental for academic development and research in higher education institutions (Sánchez-Rodríguez et al., 2021). Furthermore, knowledge management in this area is associated with the capacity for innovation, educational quality and the generation of competitive advantages (Rodríguez et al., 2020). The implementation of effective knowledge management practices in higher education institutions contributes to the generation of intellectual capital, the improvement of educational quality and the promotion of research (Mas et al., 2021). In this way, knowledge management in higher education becomes very relevant for integrated academic development, innovation, educational quality, the generation of competitive advantages and continuous improvement in educational institutions (Suazo, 2023 a). The implementation of effective knowledge management practices in educational environments contributes significantly to academic development, innovation, educational quality and the generation of competitive advantages.

This review article aims to explore and analyze in depth the various knowledge management models implemented in higher education institutions. From traditional models to contemporary approaches will be examined, including participatory action research, knowledge co-construction and evolutionary models with a technological focus. The analysis will focus on how these models facilitate the effective transfer and application of knowledge in the educational and social context. In addition, the challenges and opportunities that these models present for educational institutions in the 21st century will be evaluated. In conclusion, this article aims to offer a comprehensive view that will not only benefit academics and educational administrators, but also policy makers and other actors involved in the education and research sector.

Fundamental Concepts of Knowledge Management

Knowledge management is defined as the process of capturing, developing, sharing and effectively using knowledge in an organization. In the context of higher education institutions, this involves the ability to identify, organize and distribute academic and research knowledge to improve teaching, learning and innovation. Davenport and Prusak (1998) describe knowledge management as a process of transforming information and intellectual experience into a valuable and accessible resource (Davenport & Prusak, 1998).

Knowledge management has evolved significantly in the educational field over the years. Originally focused on the conservation and transmission of knowledge, it has evolved to include the generation of new knowledge and innovation. Drucker (1993) was one of the first to identify knowledge as the most important resource of modern organizations, highlighting the transition from a capital-based economy to a knowledge-based economy (Drucker, 1993). In universities, this has manifested itself in a greater emphasis on applied research, interdisciplinary collaboration and lifelong learning. In short, knowledge management is a set of processes and strategies that allow the generation, transmission and application of knowledge in an organization. In the field of higher education, it focuses on creating and disseminating quality knowledge to contribute to social, economic and cultural development. The relationship between knowledge management and higher education is intrinsic and bidirectional. On the one hand, universities generate knowledge through research and teaching, and on the other, they apply knowledge management practices to improve these processes. Nonaka and Takeuchi (1995) argued that knowledge creation is a continuous spiral of conversion between tacit and explicit knowledge, a fundamental concept in higher education institutions (Nonaka & Takeuchi, 1995). Furthermore, universities play a crucial role in the distribution and transfer of knowledge to society, thus contributing to economic and social development.

In the field of higher education, knowledge management has adopted various models, each with unique characteristics and approaches. One of the prominent models is the one proposed by Acevedo-Correa et al. (2019), which focuses on structures of knowledge management models in higher education institutions, aimed at managing knowledge as an intangible asset that generates competitive advantages. This model emphasizes the incorporation of new technological platforms and techniques to improve the articulation of the actors involved in the knowledge management process (Acevedo-Correa et al., 2019). Another approach is the four-phase model proposed by Escorcía Guzmán and Barros Arrieta (2020), which includes identification, creation, distribution and measurement, and is especially adapted to the needs and operation of higher education institutions.

Another form of classification is based on the way in which the production and circulation of knowledge is understood, either as a linear progress that advances in complexity or as a circular and iterative model, in which knowledge is shaped by the interaction with the

around. Linear knowledge management models, such as those used in traditional teaching, tend to follow a sequential and structured approach. On the other hand, circular models, such as the Nonaka and Takeuchi (1995) model, stand out for their focus on the continuous creation of knowledge through the interaction and exchange between tacit and explicit knowledge. This approach is particularly relevant in higher education institutions, where innovation and the generation of new knowledge are essential (Demuner Flores & Rogel, 2018)

The relevance of these models in the educational context lies in their ability to adapt to the changing needs of the academic and research environment. Knowledge management models allow higher education institutions to effectively organize their intellectual capital, promoting innovation and continuous learning. An example of practical application is the knowledge management maturity model proposed by De Freitas (2017), which helps institutions identify their progress and the necessary improvements in knowledge management. In this way, knowledge management models in higher education are diverse and must adapt to different needs and contexts. From linear and circular models to more contemporary approaches, all contribute significantly to the advancement of educational institutions and their ability to generate and distribute knowledge effectively.

Knowledge management models

Evolutionary Models with a Technological Approach : These models have evolved towards the incorporation of new technological and technical platforms. They seek to better articulate the actors involved in the knowledge management process, focusing on sharing and appropriating knowledge as an intangible asset that generates competitive advantages (Acevedo-Correa et al., 2019). Technology has had a significant impact on knowledge management in the educational field. Tools such as learning management systems (LMS), online collaboration platforms and digital databases have revolutionized the way knowledge is accessed, shared and used. Technology facilitates remote collaboration, access to global educational resources, and personalization of learning, resulting in a more dynamic and accessible learning environment. Evolutionary Models with a Technological Approach in knowledge management aim at greater integration of technology in educational processes, focusing on collaboration, accessibility and efficiency to improve the quality and competitiveness of higher education institutions (Acevedo-Correa et al., 2019).

Evolutionary Models with a Technological Approach in knowledge management in higher education institutions represent an evolution towards the integration of advanced technologies and new techniques to improve the management, distribution and use of knowledge. According to Acevedo-Correa et al. (2019), these models seek to optimize the interaction between the different actors involved in the educational process, facilitating a collaborative and effective environment for knowledge management.

Main Features

- 1. Incorporation of Advanced Technologies** : These models make intensive use of information and communication technologies, online platforms, learning management systems and other digital tools. Technology acts as a key enabler for storing, accessing and sharing knowledge.
- 2. Articulation of Actors** : The effectiveness of these models depends on the ability to effectively link students, academics, researchers and administrators. Technology allows for more fluid and efficient collaboration between these groups, breaking down physical and temporal barriers.
- 3. Knowledge Management as an Intangible Asset** : In these models, knowledge is seen as a valuable resource and a source of competitive advantage. Effective knowledge management involves not only its accumulation and distribution, but also its use to innovate and improve educational quality.
- 4. Focus on Knowledge Sharing and Appropriation** : A special emphasis is placed on sharing knowledge in an open and accessible manner, as well as ensuring that users can appropriate this knowledge, that is, understand it, apply it and benefit from it.

Practical Implications

- **Professional and Academic Development** : These models allow greater flexibility and accessibility in professional learning and training, providing platforms for continuous learning and updating of knowledge.
- **Research and Collaboration** : They facilitate research collaboration, allowing academics to work together on projects, share data and publications more efficiently.
- **Administration and Management** : The management of administrative and academic processes is optimized through the use of integrated systems that facilitate planning, monitoring and evaluation.

Challenges and Considerations

- **Technology Adoption** : The successful implementation of these models requires a significant investment in technology and in user training for its effective use.
- **Data Security and Privacy** : It is crucial to ensure the protection of users' personal and academic information.
- **Accessibility and Equity** : It must be guaranteed that all actors have equitable access to technological tools and resources.

One of the practical examples of the application of evolutionary models with a technological focus is the use of e-learning platforms and MOOCs (Massive Open Online Courses) in universities. These platforms allow students to access high-quality educational content from anywhere in the world, facilitating autonomous and distance learning. Additionally, tools like learning analytics allow educators to monitor student progress and adapt teaching methods to better meet their needs. Another example is the implementation of digital repositories in universities, which allow academics and students to access and share research and publications. These repositories not only increase the visibility of academic works but also encourage interdisciplinary collaboration and innovation. Evolutionary models with a technological focus are fundamental in knowledge management in higher education. They offer an adaptable framework that leverages emerging technologies to improve the access, distribution and application of knowledge, preparing educational institutions to meet the challenges of an increasingly digitalized world.

Phase-Based Models : Proposed to overcome difficulties in the implementation of knowledge management, these models include identification, creation, distribution and measurement phases, appropriately adapting to the functioning of higher education institutions (Escorcia Guzmán & Barros Arrieta, 2020). Phase-Based Models offer a structured framework for effective knowledge management in higher education institutions, facilitating the creation, distribution and evaluation of knowledge in a systematic and adaptive manner (Escorcia Guzmán & Barros Arrieta, 2020).

Phase-Based Models in knowledge management in higher education institutions, according to Escorcia Guzmán & Barros Arrieta (2020), focus on structuring the knowledge management process in different stages or phases. These models are proposed to address and overcome the difficulties that often arise in the implementation of effective knowledge management practices. Typical phases include knowledge identification, creation, distribution, and measurement.

Model Phases

- 1. Identification:** This phase involves recognizing and mapping existing knowledge within the organization. It includes the identification of sources of knowledge, both internal and external, and understanding the knowledge needs of the institution. In the context of a university, this could mean identifying areas of specialization, teaching competencies, and research resources.
- 2. Creation:** In this stage, the generation of new knowledge is encouraged. This can occur through research, collaboration and the exchange of ideas within the academic community. Knowledge creation also involves the development of new pedagogical approaches, academic programs, and research methods.

3. **Distribution:** This phase deals with sharing and disseminating knowledge. In a higher education institution, this may take the form of academic publications, conferences, workshops, online courses and other forms of knowledge exchange between academics, students and the wider community.
4. **Measurement:** The last phase involves evaluating and measuring the effectiveness of knowledge management. This includes analyzing the impact of distributed knowledge on academic performance, innovation and decision making within the institution. Measurement helps identify areas of improvement and validate the effectiveness of the knowledge management strategies implemented.

Importance and Benefits

- **Systematic Approach** : By breaking down knowledge management into distinct phases, these strategies offer a systematic and structured approach that can facilitate more effective implementation.
- **Adaptability and Flexibility** : Phase-based models can adapt to different institutional contexts, allowing universities to address their specific needs and challenges in knowledge management.
- **Continuous Improvement** : By including a measurement phase, these models encourage continuous evaluation and improvement of knowledge management practices.

Challenges and Considerations

- **Integration and Coordination** : It is crucial to effectively integrate and coordinate all phases to ensure fluid and coherent knowledge management.
- **Institutional Commitment** : The successful implementation of these models requires a firm commitment from management and all actors involved in the institution.
- **Resources and Training** : Adopting a phase-based model can require significant resources, including staff training and investment in infrastructure and technology.

Nonaka and Takeuchi Models : This approach focuses on socializing, externalizing, combining and internalizing knowledge, especially in the context of full-time teaching. It is a procedure designed to manage the teacher's knowledge and experiences, contributing to the management of institutional knowledge (Demuner Flores & Rogel, 2018). The Nonaka and Takeuchi Model provides a valuable framework for knowledge management in the academic environment, helping teachers to capture, share and apply their knowledge and experiences more effectively, which contributes significantly to the wealth of institutional knowledge (Demuner Flores & Rogel, 2018).

The Nonaka and Takeuchi Model, also known as the Knowledge Conversion Model, is a comprehensive approach in knowledge management that focuses on the transformation of tacit knowledge into explicit knowledge and vice versa. This model is particularly relevant in the context of higher education and has been applied specifically to full-time faculty, as noted by Demuner Flores & Rogel (2018). Nonaka and Takeuchi's model is based on the premise that knowledge creation is a dynamic process that transforms tacit knowledge into explicit knowledge. This model describes how knowledge is transmitted and transformed within an organization. Socialization involves sharing experiences and tacit knowledge, externalization refers to the conversion of tacit knowledge into explicit, blending involves the integration of different types of explicit knowledge, and internalization is the process of converting explicit knowledge into tacit again (Demuner Flores & Rogel, 2018). This model adapts very well to higher education institutions that have a stable supply of professors who generate knowledge full-time. Teachers use this model to socialize and share experiences, convert their tacit knowledge into explicit materials and resources, combine their knowledge with that of others to develop new approaches and programs, and internalize acquired knowledge to improve their teaching and research practice. In this way, Nonaka and Takeuchi's model offers a comprehensive framework for knowledge management in higher education institutions, promoting innovation, professional development and continuous improvement in the academic field.

The model is structured in four phases: socialization, externalization, combination and internalization.

Model Phases

- 1. Socialization (From Tacitus to Tacitus)** : This phase involves sharing tacit experiences and knowledge through direct and personal interaction. In the university context, this can occur in informal meetings, hallway discussions, or even in mentoring sessions, where professors share experiences and knowledge that are not formally documented.
- 2. Externalization (Tacit to Explicit)** : In this stage, tacit knowledge becomes explicit. This involves articulating intuitions, insights and experiences in an understandable and communicable form, such as documents, manuals or articles. For teachers, this may include developing course materials, research publications, or creating case studies based on their experiences.
- 3. Combination (From Explicit to Explicit)** : Combination involves the fusion of different types of explicit knowledge. In academia, this may include integrating different theories or research findings to develop new concepts, courses, or teaching methodologies. It may also involve curating content and educational resources.

4. **Internalization (Explicit to Tacit)** : In internalization, explicit knowledge is absorbed and becomes part of the individual's tacit knowledge. For teachers, this may mean applying what they learn from literature or research into their teaching or research practice, integrating new concepts and techniques into their intuitive knowledge.

Importance and Applications

- **Teacher Professional Development** : Allows teachers to efficiently capture and share their knowledge and experiences, improving their teaching and research practices.
- **Educational Innovation** : Fosters innovation by allowing tacit knowledge, often difficult to capture, to become explicit and accessible to the entire academic community.
- **Continuous Improvement** : Facilitates continuous improvement in teaching and research by promoting reflection and critical analysis of existing knowledge and its practical application.

Challenges and Considerations

- **Organizational Culture** : Effective implementation of the model requires an organizational culture that values and supports knowledge sharing and collaboration.
- **Training and Tools** : Training is needed to help teachers articulate and share their tacit knowledge, as well as appropriate tools to document and manage explicit knowledge.
- **Time and Resources** : Knowledge conversion can be a time- and resource-consuming process, so careful consideration must be given to its planning and execution.

Knowledge Management Maturity Models : These models help organizations identify progress and improvements needed in knowledge management. They are based on evaluating the level of maturity achieved and propose recommendations to improve efficiency and effectiveness in this field (De Freitas, 2017).

Knowledge Management Maturity Models are tools designed to evaluate and improve the effectiveness of knowledge management practices in an organization. As De Freitas (2017) points out, these models offer a framework to identify the current level of maturity in knowledge management and suggest paths to advance towards stages of greater efficiency and effectiveness.

Key Components of Maturity Models

1. **Assessment of Maturity Levels** : Models generally divide knowledge management maturity into several levels, each representing a degree of sophistication and effectiveness

in knowledge management. These levels can range from initial, unstructured knowledge management to highly integrated and optimized processes.

2. **Evaluation Criteria** : These models establish specific criteria to evaluate maturity at each level. This may include the quality of technological infrastructure, knowledge sharing practices, organizational culture, and knowledge creation and application processes.
3. **Diagnostic Tools and Techniques** : Models provide tools to diagnose an organization's current level of knowledge management maturity. This may involve surveys, interviews, and process analysis.

Maturity Phases in Knowledge Management

1. **Initial Level** : At this level, knowledge management is ad hoc and unstructured. The organization may recognize the importance of knowledge, but lacks formalized processes and systems to manage it.
2. **Developed Level** : Here, the organization begins to implement knowledge management processes, although these may be inconsistent and are not fully integrated into organizational practice.
3. **Defined Level** : At this level, the organization has well-defined and documented knowledge management processes. Knowledge is managed more systematically, but there may still be room for improvement in terms of integration and optimization.
4. **Managed Level** : The organization not only has defined processes, but also regularly monitors and evaluates their effectiveness. Knowledge management is integrated into the organizational strategy and its impact is measured.
5. **Optimized Level** : At the highest level of maturity, the organization continually refines and improves its knowledge management processes. There is a focus on constant innovation and maximizing the value of knowledge.

Practical Applications and Benefits

- **Identification of Gaps and Areas of Improvement** : Allows organizations to identify where they need to improve in terms of knowledge management.
- **Strategic Planning** : Provides a framework for planning strategic improvements in knowledge management.
- **Benchmarking and Continuous Improvement** : Facilitates benchmarking with other organizations and promotes a culture of continuous improvement.

Challenges and Considerations

- **Resource Investment** : Transitioning to higher levels of maturity may require significant investments in time, personnel, and technology.
- **Cultural Change** : Often the biggest challenge is fostering a cultural change that values and supports knowledge management.
- **Customization of the Model** : It is important to adapt the model to the specific needs and context of the organization.

Knowledge Management Maturity Models are valuable tools for institutions seeking to evaluate and improve their knowledge management practices. They offer a clear path for progress, from the first steps in knowledge management to the advanced integration and optimization of these processes (De Freitas, 2017).

Models for Formulation and Adaptation : These models propose a methodological approach for the formulation of knowledge management systems that are flexible and adaptable to the reality and mission of each higher educational institution (Acevedo-Correa et al., 2020).

The Models for the Formulation and Adaptation of knowledge management systems in higher education institutions, as proposed by Acevedo-Correa et al. (2020), represent a methodological approach that emphasizes flexibility and adaptability to meet the specific needs and missions of each institution. These models are crucial to develop and implement knowledge management strategies that are consistent with the culture, structure and objectives of each university.

Key Aspects of Models for Formulation and Adaptation

1. **Initial Diagnosis** : Before formulating the model, a diagnosis is carried out to understand the current context of the institution in terms of knowledge management. This includes evaluating the organizational culture, existing capabilities, and specific needs.
2. **Custom Design** : Based on the diagnosis, the model is designed to address the particularities of the institution. This may involve customizing processes, selecting appropriate technological tools, and defining roles and responsibilities.
3. **Strategic Implementation** : The implementation of the model is carried out strategically, taking into account available resources, staff capabilities and existing infrastructure. A balance is sought between long-term goals and immediate needs.
4. **Validation and Continuous Improvement** : Once the model is implemented, a validation and feedback process is carried out to ensure that the knowledge management

objectives are being met. Continuous improvement is a fundamental component, allowing for adjustments and adaptations as necessary.

Practical Applications and Benefits

- **Adaptability to Changes** : The flexibility of these models allows institutions to quickly adapt to changes in the educational, technological and social environment.
- **Efficiency in Knowledge Management** : By being adapted to the specific needs of the institution, these models can improve efficiency in the creation, sharing and application of knowledge.
- **Promotion of Innovation** : They facilitate educational innovation and research by aligning knowledge management with the strategic goals of the institution.

Challenges and Considerations

- **Senior Management Commitment** : The commitment and support of senior management is crucial for the successful implementation of these models.
- **Training and Awareness** : Staff training and awareness of the importance of knowledge management are essential to ensure adoption and effective use of the model.
- **Continuous Evaluation and Adjustment** : Models require constant evaluation and the ability to adjust to new circumstances or challenges.

The Models for Formulation and Adaptation offer a flexible and adaptable methodological framework for knowledge management in higher education institutions, allowing each institution to develop and implement knowledge management strategies that align with their specific objectives and contexts (Acevedo-Correa et al., 2020).

DISCUSSION

Aligning knowledge management systems with the specific needs and mission of each higher education institution is essential to optimize their effectiveness and relevance. Selecting the most appropriate knowledge management model should take into account the unique characteristics, objectives and challenges of the institution. The study carried out by Simanca et al. (2016) on the development of a knowledge management model for virtual learning programs highlights the importance of adapting knowledge management strategies to specific educational modalities, emphasizing the need for models that adapt to virtual learning environments. Furthermore, Núñez et al. (2016) emphasizes modern tools for knowledge management in educational institutions, highlighting the need for adaptive and technologically advanced knowledge management systems that address the

specific requirements of educational environments. Rincón (2017) discusses the integral relationship between knowledge management and organizational learning, highlighting the importance of aligning knowledge management models with the educational mission of institutions to foster a culture of learning and continuous improvement. Lopez et al. (2015) proposes a measurement model for knowledge management in small and medium-sized companies, emphasizing the need for adapted metrics that fit the specific characteristics and objectives of organizations, which can be extended to educational institutions to evaluate the knowledge management effectively. Maya et al. (2019) explore the impact of leadership on educational quality, highlighting the need for knowledge management models that support leadership initiatives aimed at improving educational quality and outcomes.

The implementation of knowledge management models in phases seems to be useful in improving the transfer and application of knowledge in universities (Saleh et al., 2018). These authors highlighted the importance of knowledge sharing and stakeholder acceptance in the effective implementation of knowledge management in higher education institutions (Saleh et al., 2018). This underlines the relevance of stakeholder engagement in the successful deployment of knowledge management models. Furthermore, a growing interest in knowledge management models has been observed within academic institutions internationally, indicating their relevance and growing adoption in the higher education sector (Abad-Segura & González-Zamar, 2021). (Acosta et al., 2017). The latter demonstrated the positive impact of implementing a Strategic Information System for University Management in improving university management processes, emphasizing the automation of planning and institutional evaluation processes (Acosta et al., 2017). This suggests that the phased implementation of knowledge management systems can contribute to improving the transfer and application of knowledge within universities. In this regard, Coral (2019) emphasized the need for profound changes in the research management structure in national universities, highlighting the importance of implementing models based on measurable results and continuous improvement (Coral, 2019). This underlines the importance of structured knowledge management models to facilitate the effective transfer and application of knowledge. As an example, Chuquiruna (2022) highlighted that the implementation of a proposed IT governance model can significantly improve the management of engineering faculties in public universities, indicating the positive impact of structured governance models on IT management processes. knowledge (Chuquiruna, 2022). Similarly, Durán et al. (2017) proposed a knowledge management implementation model for software testing projects, focusing on processes such as knowledge identification, preservation, and utilization, demonstrating the potential of phased knowledge management models to improve specific application areas. of knowledge. Cornejo (2019) emphasized the importance of collaboration between universities and government entities in knowledge transfer processes, highlighting the role of standardized procedures in guaranteeing effective knowledge transfer (Cornejo, 2019). In this way, the implementation of phased knowledge

management models significantly improves the transfer and application of knowledge in universities by enhancing stakeholder engagement, automating processes, emphasizing measurable results, and facilitating collaboration (Suazo, 2023 b). These models provide a structured framework for knowledge management and transfer, ultimately contributing to the effective application of knowledge within educational institutions.

Regarding the impact of evolutionary technological models on the effectiveness of knowledge management in higher education institutions, it is relevant to consider the interaction between technology, knowledge management and educational practices (Adeinat & Abdulfatah, 2019). These authors explored the use of technology in knowledge management at a public university, highlighting the relevance of technology in knowledge management processes. Likewise, they provided empirical evidence of the impacts of knowledge management on innovation in higher education institutions, emphasizing the importance of knowledge management to foster innovation (Ngoc -Tan & Gregar, 2018). Additionally, Noor et al. (2019) conducted a review on cloud-based knowledge management in higher education institutions, shedding light on the potential of cloud-based technologies to improve knowledge management processes (Noor et al., 2019). Morais et al. (2020) examined the effectiveness of management in public higher education using the Baldrige excellence program, emphasizing the role of effective management models in higher education institutions (Morais et al., 2020). Pinto (2014) proposed a framework to improve collaboration through knowledge management in higher education institutions, highlighting the importance of collaborative knowledge management frameworks. These studies highlight the importance of technology and effective management models in knowledge management within higher education institutions. Furthermore, the study by Rivers et al. (2019) on competency-based education as an evolutionary higher education business model provides insights into innovative educational models and their impact on institutional practices, illuminating the evolutionary nature of educational models and their influence on knowledge management (Rivers et al., 2019). This aligns with the findings of (Grunspan et al., 2018), who explored a cultural evolutionary model of pedagogy in higher education, emphasizing the need to understand and adapt to evolving pedagogical practices (Grunspan et al., 2018). In this way, the integration of evolutionary technological models in higher education institutions has a substantial impact on the effectiveness of knowledge management. By leveraging technology, fostering innovation, and adopting evolving educational models, institutions can improve their knowledge management processes, ultimately contributing to improved educational outcomes and institutional effectiveness.

On the other hand, when analyzing the effect of knowledge management strategies, such as the Nonaka and Takeuchi model, on the professional development and educational innovation of full-time teachers, it is essential to consider the interaction between knowledge management, professional development and educational innovation. The study carried out

by Franco et al., 2023 offers a vision of contextual analysis of knowledge management practices in educational environments and its comparison with the Nonaka and Takeuchi model, demonstrating the potential impact of this model on educational practices. Briones & Dávila (2017) delved into the application of the Nonaka and Takeuchi model in knowledge management, emphasizing its role in the generation of ideas for organizations and human development, which could be extended to educational contexts (Briones & Dávila, 2017). Aguirre & Andrade-Abarca (2021) highlighted the importance of formal strategies to evaluate the quality and applicability of professional development programs, emphasizing the significance of measuring the transfer of training and analyzing its cost-benefit relationship (Aguirre & Andrade-Abarca- Abarca, 2021). This underscores the need for structured approaches, such as Nonaka and Takeuchi's model, to evaluate the effectiveness of professional development initiatives. Padilla-Hernández et al. (2020) explored the evolution of digital competence among university teaching staff, indicating the dynamic nature of professional development, which could be influenced by knowledge management strategies such as the Nonaka and Takeuchi model (Padilla-Hernández et al., 2020).. Polaino et al. (2020) discussed the integrated educational-pedagogical model at the University of Otavalo, emphasizing its contribution to qualitative transformations and development, aligning with the principles of the Nonaka and Takeuchi model in promoting the creation of knowledge and innovation (Polaino et al., 2020). Tobón & Rojas (2006) emphasized the ethical commitment to human development through knowledge management from a complex thinking perspective, highlighting the need to avoid reductionist approaches, which agrees with the holistic nature of Nonaka and Takeuchi's model (Tobón & Rojas, 2006). In this way, Nonaka and Takeuchi's model, as a knowledge management strategy, has the potential to positively impact the professional development and educational innovation of full-time professors in higher education institutions. By encouraging knowledge creation, ethical commitment, and dynamic evaluation of professional development, this model can contribute to a comprehensive approach to teacher development and educational innovation.

Regarding knowledge management maturity models, the literature suggests that their implementation can be of great help to educational institutions in identifying and improving their knowledge management practices. These models provide a structured framework to assess the current state of knowledge management at an institution and guide its progress toward higher levels of maturity. The study carried out by Pérez et al. (2016) on building a knowledge management maturity model for a multinational food company in an emerging economy demonstrates the applicability of such models in organizational contexts. Similarly, Carlos-Guzmán (2021) emphasizes the role of good teaching practices in improving the educational culture of institutions, aligning with the concept of knowledge management maturity. Similarly, Morales et al. (2015) provide insights into comparative maturity models in business intelligence, highlighting the relevance of

maturity assessment in knowledge-related domains. Acevedo-Correa et al. (2019) propose alternatives for knowledge management models in higher education institutions, indicating the importance of adapted approaches for the maturity of knowledge management in educational environments. Knowledge management maturity models allow institutions to evaluate their current knowledge management practices, identify areas for improvement, and establish a plan to improve knowledge-related processes. By assessing knowledge management maturity, institutions can systematically address gaps, leverage best practices, and align their knowledge management strategies with organizational objectives. These models also facilitate the establishment of benchmarks, allowing institutions to track their progress and continually improve their knowledge management practices. In summary, the implementation of knowledge management maturity models provides a systematic and strategic approach for educational institutions to improve their knowledge management practices and foster a culture of continuous improvement.

FUTURE CHALLENGES AND OPPORTUNITIES IN KNOWLEDGE MANAGEMENT

One of the main challenges in knowledge management in higher education institutions is the rapid evolution of technology and the need to keep up to date with the latest tools and platforms. Another significant challenge is resistance to change within organizations, which can make it difficult to implement new knowledge management models and strategies. Furthermore, effectively managing the vast volumes of information and ensuring its quality and relevance are constant challenges. Emerging opportunities in knowledge management include the use of artificial intelligence and machine learning to analyze and process large data sets, which can improve decision making and personalization of learning (Gazquez et al., 2023). The increasing importance of interdisciplinary collaboration and knowledge co-creation with industry and other institutions also presents new opportunities. Furthermore, the growing trend towards online learning and open educational resources offers new avenues for the distribution and access of knowledge.

To address these challenges and take advantage of emerging opportunities, higher education institutions must:

1. **Adopt Advanced Technologies:** Integrate advanced technological tools such as artificial intelligence and data analysis to manage and process information more efficiently.
2. **Foster a Culture of Change and Continuous Learning:** Create an organizational culture that values continuous learning and is open to change, promoting adaptability and innovation.

3. Encourage Collaboration and Co-Creation: Establish alliances with other institutions, the industry and the community to enrich the knowledge creation process and ensure its practical relevance.
4. Train and Develop Competencies: Provide training and continuous development to academic and administrative staff in new technologies and knowledge management practices.
5. Optimize the Use of Open Educational Resources and Online Learning: Explore and take advantage of the opportunities offered by online learning and open educational resources to expand access and distribution of knowledge.

Addressing these challenges and taking advantage of emerging opportunities will require a proactive and adaptive approach from higher education institutions. Being aware of future trends and being prepared to integrate new technologies and methodologies will be key to success in knowledge management.

CONCLUSIONS

This analysis of knowledge management models in higher education reveals several key findings. First, the importance of adapting knowledge management to the specific needs of each institution is indisputable. Phase-based models, evolutionary approaches with a technological focus, and maturity models all play a relevant role in improving the effectiveness and efficiency of educational institutions. Second, the integration of technology into these models is essential to maintaining relevance in an increasingly digitalized world. Third, knowledge management models have a significant impact on higher education as they facilitate innovation, knowledge sharing and collaboration, essential elements for academic development and research. The adoption of these models not only improves the quality of education and research, but also prepares institutions to face future challenges and respond to the changing needs of students and society.

Looking ahead, it is essential that higher education institutions continue to explore and adopt innovative knowledge management models. Future research should focus on how emerging technologies, such as artificial intelligence and machine learning, can be further integrated into these models to improve data analysis and personalization of learning. Furthermore, it is crucial to examine how knowledge management can facilitate greater inclusion and diversity in higher education. Finally, institutions should consider how knowledge management models can be used to address global challenges, such as sustainability and climate change, preparing students to contribute meaningfully to society.

Knowledge management models in higher education are, therefore, more than administrative tools; They are catalysts for change, innovation and development in a world

increasingly focused on knowledge. Its continued evolution and adaptation will be key to the long-term success and relevance of educational institutions.

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Recibido: 14 de noviembre 2023

Aceptado: 30 de diciembre 2023