

19th International Forum on Knowledge Asset Dynamics

PROCEEDINGS

Translating Knowledge into
Innovation Dynamics

IFKAD 2024



12-14 June 2024
UPM - Madrid, Spain

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Proceedings IFKAD: Translating Knowledge into Innovation Dynamics

Distribution: IFKAD 2024 – Madrid, Spain 12-14 June 2024

Polytechnic University of Madrid

Arts for Business Institute

LUM University

ISBN 978-88-96687-17-8

ISSN 2280-787X

Edited by: Gustavo Morales-Alonso, Giovanni Schiuma

Published by: Institute of Knowledge Asset Management (IKAM)

Realized by: Gabriela Jaroš

IFKAD 2024 FOREWORD

Translating Knowledge into Innovation Dynamics

As the chairpersons of the International Forum of Knowledge Assets Dynamics (IFKAD) in 2024, we are delighted to welcome scholars, practitioners, policymakers, and innovators to our 19th annual conference. This year, we are gathering in Madrid's historic and lively city, hosted by the esteemed Polytechnic University of Madrid, from June 12th to June 14th. We aim to engage in a critical discourse on "Translating Knowledge into Innovation Dynamics".

IFKAD 2024 in Madrid follows the successful 18th session held in the inspiring city of Matera, Italy, where we celebrated the event's rich history and its significant role as a driver of innovation, performance improvement, and value creation across individual, organisational, and territorial levels. Building on the accomplishments and insights of previous years, we continue to advance our mission to enhance the quality of content and increase engagement across our growing international community.

The current focus of IFKAD highlights the ever-growing importance of knowledge management as a critical factor for maintaining competitive advantage. As we have seen, integrating sustainability into business models has become essential for addressing environmental, economic, and social challenges. At IFKAD 2024, we focus on how innovative knowledge management can integrate these sustainable practices to spur new products, operations, and digital transformations.

In the contemporary global economy, organisations across all sectors must generate or access knowledge and effectively translate it into innovations that drive sustainable growth and competitive advantage. IFKAD2024 delves into the multifaceted processes by which knowledge, a pivotal organisational asset, is transformed into concrete, innovative outcomes that redefine markets and societal norms.

Since its inception, IFKAD has been a pivotal platform for advancing our understanding of how knowledge forms the cornerstone of value creation within firms. Our discussions are enriched by contributions from a diverse international community of thinkers and doers who bring their unique perspectives and empirical insights into the intricate dynamics of knowledge and innovation.

We seek to extend and improve our theories and practices around how knowledge-driven innovation can meet the complex demands of modern economies and societies. This includes discussing how digital technologies can be harnessed to support knowledge translation and drive organisational transformation and value creation. This year, as we convene under the theme of translating knowledge into innovation, we are particularly focused on enhancing the theoretical frameworks that support knowledge management practices, including dynamic capabilities, organisational learning, and resource-based views of the firm.

Our conference is designed to bridge the theoretical and practical realms, fostering a synergistic understanding of how knowledge can be leveraged for significant technological and organisational advancements. We examine how entrepreneurs and managers

implement knowledge-driven strategies amidst expanding access to data and digital technologies to support growth and create wealth.

This year's proceeding covers many topics pivotal to understanding and leveraging knowledge assets. These include innovative product development, integrating new knowledge into existing systems, and the roles of digital technologies in managing and enhancing knowledge dissemination and application. We explore how these processes contribute to organisational resilience, adaptability, and continuous innovation.

During the conference, we will tackle several critical questions vital to academic study and the practical application of knowledge management. Among them are:

- How can organisations manage their knowledge to spur the development of groundbreaking products and technologies?
- How does acquiring new knowledge impact organisational behaviour and governance across diverse sectors such as manufacturing and ecology?
- What factors within organisations facilitate or hinder knowledge conversion into practical and scalable innovations?
- How can the growing complexity of available knowledge be harnessed to drive more sophisticated and customer-centric product innovations?
- How do digital technologies enhance the capabilities of organisations to capture, store, and utilise knowledge for strategic gains?

The proceedings of IFKAD 2024 will reflect the current state of academic research and practical implementations in knowledge management and catalyse future innovations and strategic practices. We aim to provide our attendees with actionable insights that will empower them to view their organisations through the lens of knowledge-intensive systems, where every piece of information has the potential to spark transformative change.

As we gather in Madrid, we are confident that the dialogues and exchanges will inspire all attendees to think deeply about the challenges and envision and enact practical solutions that drive their organisations forward in these complex times. With over 200 speakers from more than 30 countries, our conference promises a rich blend of academic insights and practical applications to foster a deeper understanding of knowledge dynamics and innovation.

We invite each participant to engage fully with the sessions and discussions, contributing to and drawing from the collective expertise and experiences that IFKAD has always stood for. Together, let us shape the future of how knowledge is transformed into tangible, impactful innovations that drive organisational success and contribute to societal well-being.

Welcome to Madrid, and welcome to IFKAD 2024.

IFKAD 2024 CHAIRMAN

Prof. Gustavo Morales-Alonso - *Polytechnic University of Madrid, Spain*

IFKAD PRESIDENT

Prof. Giovanni Schiuma - *LUM University, Italy*

Gamification and its Relevance to Knowledge Management: A Systematic Literature Review

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Abstract

The emergence of digital platforms has brought about a transformation in the landscape of learning and skills enhancement, with gamification playing a crucial role in facilitating the exchange of knowledge. Although the potential of gamification for motivating individuals to share their knowledge has been recognised in recent research, there is a significant gap in the literature. This gap relates to the extensive application and influence of gamification, particularly in the fields of business and higher education. To address it, a

comprehensive review of existing literature was undertaken. It aims to explore the use of gamification in the field of Knowledge Management (KM) and to identify the areas that have benefited from gamification. It also sought to scrutinise the specific industries and academic fields that have integrated gamification into their knowledge management sub-fields. In addition, the study aimed to compare the similarities and differences in the use of gamification and its impact on KM in the business and higher education sectors. The study involved an in-depth examination of 244 academic articles listed in international citation databases. This literature review provided invaluable insights into the implementation of gamification in various KM sub-fields and its patterns and importance. The results of this study enrich the existing body of knowledge on the intersection of gamification and knowledge management. They provide a solid foundation for subsequent empirical research and also serve as a guide for organisations and institutions to make informed decisions about incorporating gamification into their knowledge management sub-fields. Looking ahead, possible avenues for future research could be to investigate less researched sub-fields of knowledge management, such as knowledge management systems and knowledge workers. Future research could also investigate the lasting effects of gamification on knowledge retention and sharing. Furthermore, it could include the formulation of best practices for the design and execution of gamification strategies for different sub-fields of knowledge management.

Keywords – Gamification, knowledge management, higher education, business, literature review

Paper type – Academic research paper

1 Introduction

The rapid pace of technological advancements and the proliferation of information sources can make it challenging to stay abreast of the dynamics of knowledge and the appropriate knowledge management (KM) approaches that can be adopted for this (Wang, et al., 2023, Arnold, et al., 2023, Handzic et al., 2017). Gamification, the application of game design elements, can enhance KM by fostering employee engagement and facilitating knowledge creation, transfer, and sharing (Sampaio, et al., 2019, Bahadoran, et al., 2023). This approach is increasingly important as traditional paper-based learning struggles to keep up with the dynamic knowledge landscape and the new teaching/learning styles (Wang, et al., 2023, Faizah, et al., 2024). The concept of gamification has been investigated and applied in a multitude of areas. These include, but are not limited to, health and education (Cordero-Brito & Mena, 2020, Krath, et al., 2023), e-commerce (Husenynov, 2020, Behl, et al., 2020), human resource development (Kalafatoğlu, 2020, Thomas, et al., 2022), and marketing (Sheetal & Singh, 2023). In academia, gamification facilitates active, collaborative learning, problem-solving, and the development of analytical and strategic thinking skills (Guerrero-

Alced, et al., 2022). Gamification techniques have been utilised in various contexts of teaching and learning, both in business training and education in general, to enhance learners' motivation (Friedrich, et al., 2020).

For all these reasons, gamification is expected to have potential effects on the ways knowledge is processed by people. For example, a growing body of research recognizes the potential of gamification to motivate knowledge sharing (Almujally & Joy, 2020). Recent studies have also examined the interplay between gamified learning and knowledge acquisition (Camilleri, 2023), knowledge transfer (Giraldo, et al., 2023), knowledge retention (Pruyn, 2023), and learning and training (Costa, 2023) in higher education (HE). In the business sector, the correlation between gamification and KM has been explored across various industries. For instance, studies have been conducted on knowledge creation (Veerasamy, et al., 2023) and knowledge retention (Brady & M'manga, 2022) in the cybersecurity section. Similarly, research has been conducted on knowledge contribution (Suh & Wagner, 2017), and knowledge management systems (KMSs) (Malingkas & Ce, 2020) in the context of consulting firms.

However, despite the potential for gamification to be utilised in a variety of knowledge management sub-fields (Bahadoran, et al., 2023), there is a scarcity of research that systematically explores the actual role that gamification could play in KM (Shpakova, et al., 2016, Jalili, 2020). While the advantages of gamification in the context of KM have been discussed, it has not been comprehensively explored (Bahadoran, et al., 2023). Although gamification is increasingly recognized as a powerful tool for enhancing learning and knowledge sharing, its widespread application and impacts are not adequately documented in the existing literature that intersects with KM. In particular, there is an absence of systematic exploration into the specific sub-fields of KM that have reaped benefits from gamification and those that remain unexplored. It is therefore crucial to investigate the broad application and impact (Cai, et al., 2023) to fill this research gap.

The objective of this review is to explore in-depth the use and potential impact of gamification in KM. It aims to investigate the areas of KM where gamification has been employed, identify industries and areas of study that have integrated gamification into their operations, and analyse the similarities and differences in the use of gamification across both the business and HE sectors. Therefore, this review aims to evaluate the importance and trend of gamification for KM and to investigate the sub-fields that both business and HE organisations utilise, as indicated in the literature.

2 Review Methodology

A literature review is an evaluation of research works available on a specific academic theme, topic, or subject under investigation by a researcher. It involves a process of investigating published works to achieve specific research objectives other than those already achieved by the works under investigation (Chigbu, et al., 2023). Among them, a systematic literature review (SLR) is a valuable approach to research as it allows scholars to collect and condense all the accessible information on a specific subject (Khodabandelou, et al., 2023; Sultan, et al., 2023). Although there are some variations, the typical steps followed for this type of study include formulation of the research questions, locating studies (searching for studies using defined keywords and selecting databases), selecting and evaluating studies based on inclusion/exclusion criteria, analysing and synthesising them, also reporting and utilising results for further action. This step-by-step approach is particularly useful for a comprehensive literature review, especially when numerous studies have been published, yet the overall picture remains fragmented (Kassaneh, et al., 2020, Chigbu, et al., 2023). A total of 244 papers, indexed in international citation databases such as Scopus and Web of Science, have been meticulously selected and systematically categorised based on their content.

2.1 Research Questions

Based on the objectives and gaps presented in Section 1, this study addresses the following questions.

RQ1: In which sub-fields of KM has gamification already been implemented?

RQ2: Which industries and fields in higher education have embraced gamification in their KM sub-fields?

RQ3: What are the similarities and differences between the use of gamification in knowledge management in business and higher education?

2.2 Search and Selection Process

By selecting specific keywords, search strings, and databases, papers were restricted to research focusing on gamification and KM topics. Accordingly, the selected keywords include 8 terms from the gamification research field combined with 22 keywords related to "knowledge management," as illustrated in Table 1.

In addition to the exclusion criteria outlined in Table 1, the following inclusion criteria are also applied.

- SCI and SSCI indexed articles in peer-reviewed journals (document and source type)
- Articles from the following research areas are selected: business and economics, management, operations research and management sciences, industrial engineering, manufacturing engineering, information systems and related fields.
- Articles written in the English language
- Articles published from January 2004 to December 2023 (to analyse the research trend over the past 20 years)

After applying the above-listed refinement criteria, a total of 244 papers underwent the evaluation process, and the procedures and results are shown in Table 1.

Table 1: Search and Evaluation Process and Results

Search and evaluation processes	Results	Remarks
SCOPUS search with refinement	199	Search string: (TITLE-ABS-KEY "gamification" OR "game element" OR "game mechanics" OR "game dynamics" OR "Game components" OR "Gamify*" OR "gamified*" OR "Gameful") AND TITLE-ABS-KEY ("knowledge management" OR "knowledge creation" OR "knowledge acquisition" OR "knowledge storage" OR "knowledge sharing" OR "knowledge transfer" OR "knowledge application" OR "knowledge protection" OR "knowledge process" OR "intellectual capital" OR "knowledge engineering" OR "knowledge representation" OR "knowledge mapping" OR "knowledge extraction" OR "knowledge discovery" OR "knowledge retention" OR "knowledge utilisation" OR "knowledge audit" OR "knowledge-based systems" OR "knowledge economy" OR "KM practices" OR "knowledge management practices")
Web of Science search with refinement	45	The same keywords are used to search on the Scopus database.
Total papers found	244	
Duplicates	30	Using Microsoft Excel software some papers have been identified and excluded.
Papers after duplicates	214	
Excluded papers by article title and/or purpose reading	49	The title and/or declared purpose of a paper which is not related to the objective is excluded.
Papers for full abstract reading	165	
Excluded papers by abstract reading	54	A paper whose abstract does not focus on both gamification and KM is excluded
Papers for full content reading	111	

Excluded papers by full content reading	40	Papers that do not show clearly either gamification-related practices or factors for gamification in KM are excluded
Papers after a full reading	71	
Extra papers added	1	Added from reference lists
Total papers considered for analysis	72	

2.3 Analysis and Synthesis of Selected Papers

Descriptive and content analyses were conducted on the selected papers. In the descriptive analysis, five perspectives were used to categorise the papers and provide a summary overview to demonstrate the significance and trends of gamification in KM.

- Publication year
- Research approach and research method
- Authors' keywords (to identify important topics covered)
- KM processes and other sub-fields.
- Comparisons between business and higher education

In the content analysis section, papers were reviewed and studied in detail, and important points were extracted and analysed. The main issues in this part include the focus of reviewed papers on the perspective of gamification contributions in KM, the classification of the parts of knowledge management where gamification was a significant contributor, and the identification of businesses and academic study fields that utilised gamification.

3. Analysis of Selected Papers, Results, and Discussion

3.1 Descriptive Analysis and Results

3.1.1 Analysis of Papers by Publication Year

Based on Figure 1, it is clear that from 2004 to 2012, there was hardly any discussion of gamification in KM in the academic literature. Over time, the quantity of articles has generally increased since 2013, however there have been occasional swings. The maximum frequency is shown in the years 2020, 2022 and 2023, suggesting that interest in and attention to this topic have grown over time but especially in the last few years. Therefore the trend indicates that gamification is becoming more popular as a field of study in KM.

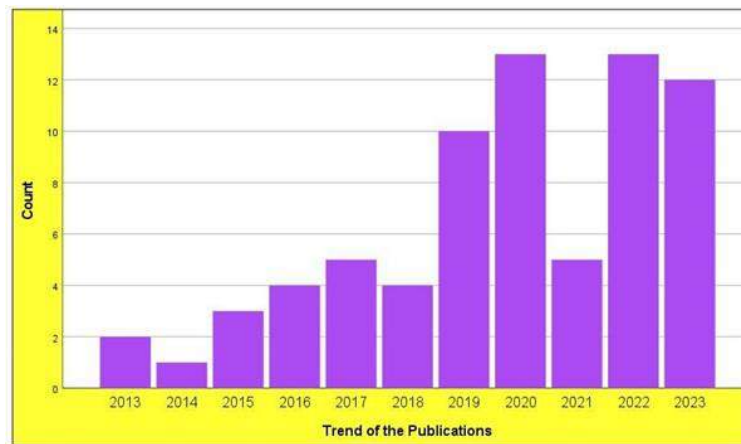


Figure 1: Trend of the Distribution of Selected Papers

3.1.2 Analysis of Papers by Research Approach and Method

The selected papers are classified in two ways about the research approaches. Primarily, they are categorised as empirical, theoretical, mixed, and review papers. In terms of the second classification of research approaches, articles can be categorised into qualitative, quantitative, mixed methods, and review studies. The most frequent type of research is empirical, accounting for almost 63% of the total articles. According to the second categorisation, the most commonly used methods are qualitative and quantitative, each representing over 36% of all articles. The information can be seen in Figure 2.

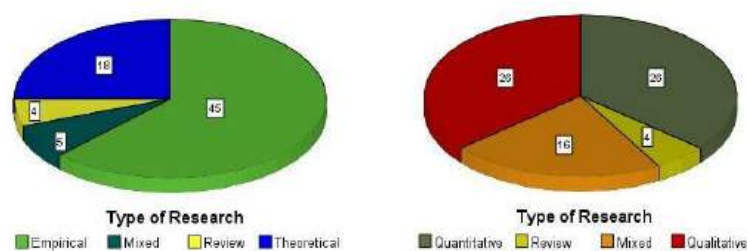


Figure 2: The Classification of Papers According to the Research Type

As can be seen in Figure 3, surveys (32%), case studies (19%), and conceptual modelling (15%) are commonly used research methods. However, a wide range of methodologies are adopted, including mixed methods. Additionally, some rarely-used methods have emerged in the field, such as ONARM+ and Blinded design. Furthermore, this field is suitable for the use of experimental, Design Science

Research (DSR), and focus group research methods. As regards the empirical studies, data collection mostly includes questionnaires for surveys and interviews for case studies.

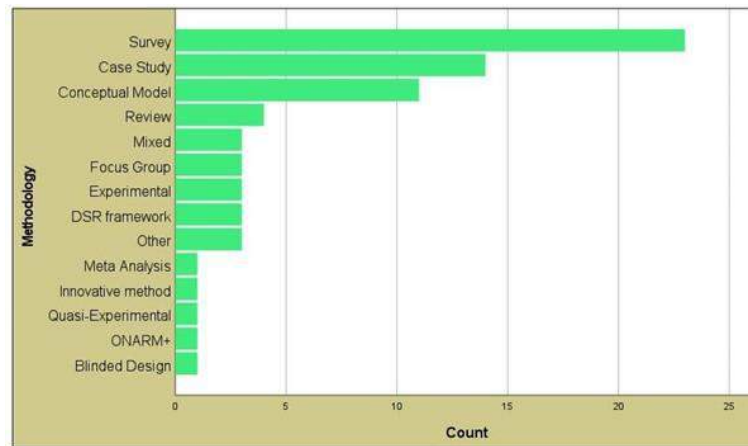


Figure 3: Types and Frequency of Methodologies

3.1.3 Analysis of Papers by Authors' Keyword

This descriptive analysis was conducted to investigate the most important topics covered and uncovered in gamification and knowledge management research. In this case, from the 72 papers, we found a total of 347 keywords. We organised them using Microsoft Excel and analysed them with word cloud software, resulting in the image shown in Figure 4. From gamification and related fields, 'gamification' (57), 'serious-game' (6), and 'game-based-learning' (2) were prominent. From a KM perspective, 'knowledge-management' (15), 'knowledge-sharing' (10), and 'knowledge-transfer' (3) were frequently mentioned keywords. Therefore, it can be said that apart from the two most frequent words (gamification and knowledge management), researchers delineate some topics of interest from similar or related fields applied to learning on the one hand ('serious game' and 'game-based learning') and KM processes on the other hand ('knowledge transfer' and 'knowledge sharing').



In this section, we discuss the main results of the in-depth content analysis of the selected papers. The analysis is conducted about the main research question presented above.

Gamification can be seen as a method of enriching and facilitating KM subfields by incorporating game design elements to boost employee engagement, content creation, and satisfaction (Bahadoran, et al., 2023). In recent years, there has been a lot of attention to incorporating game elements into non-gaming facilities. According to some studies, the utilisation of gamification in education and learning can provide significant benefits for motivation, user interaction, and social effects (Saleem, et al., 2022). In the 1990s, researchers began to challenge the idea that schools and universities were the sole locations for learning, initiating studies in the field of workplace learning (Torresan & Hinterhuber, 2023). In addition, it was observed that employees preferred gamified training over traditional training methods (Kalafatoğlu, 2020). Furthermore, gamification serves as a medium for interactions among knowledge workers, enabling them to explore various roles and behavioural patterns. Gamification can help individuals make informed decisions about the types of supporting Knowledge Management Systems (KMS) (Shpakova, et al., 2016).

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different classifications, we considered a list of some commonly used KM processes. According to Kassaneh, et al., (2020) frequently employed knowledge management processes include acquisition, creation, storage/retrieval, transfer, sharing, application, and protection (Kassaneh, et al., 2020).

In addition to KM processes, we also considered other important “sub-fields” or areas of interest for gamification that are to some extent related to knowledge management. These subfields, depicted in Figure 5, encompass knowledge workers, knowledge management system design, learning and training, innovation, and KM-extended gamified customer relationship management (KM-extended gamified CRM) which were found in the analysed papers. Our analysis involved classifying reviewed papers based on the gamification potential within KM sub-fields, as illustrated in Figure 5.

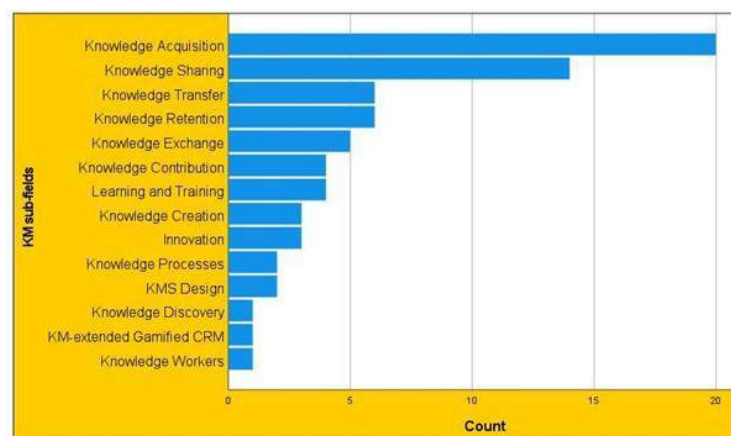


Figure 5: Knowledge Management Sub-fields

According to Figure 5, knowledge acquisition, knowledge sharing, and knowledge transfer together cover more than 55% of all KM sub-fields that have been impacted by gamification. We found no interrelation between gamification and other KM processes (e.g.: knowledge storage/retrieval, knowledge application, and knowledge protection), at least in the articles investigated in this study. Other sub-fields that are somewhat connected to the KM processes but are less explored are innovation, knowledge workers, and KMS design. These themes will be crucial for further research in the field.

Gamification can therefore be applied across various KM processes (Bahadoran, et al., 2023), and motivates business employee engagement (Friedrich, et al., 2020). Based on the SLR presented in this article, the highest number of research studies during the last decade have focused on the relationship between gamification and knowledge acquisition (20 studies), showing the impact of

gamified activities on knowledge acquisition (Zorrilla Pantaleon, et al., 2021, Vanderstraeten, et al., 2022, Sousa-Vieira, et al., 2023). Academic papers interrelate gamification to knowledge acquisition, presenting a novel educational approach (Loebel, 2023), an application for language learning (Chinzer, et al., 2023), creating a model of gamification (Pathak, et al., 2022), or designing gamification-based courses in higher education (Módné Takács, et al., 2021).

Although the second-highest number of articles belongs to knowledge sharing (14 studies), there is also a variety of papers focusing on frameworks, models, and solutions for utilising game-like content in knowledge sharing. Some academic works have presented or investigated solutions or a gamified approach, demonstrating enhanced and properly directed knowledge sharing among members of an organisation (Swacha, 2015, Mizuyama, et al., 2019, Veerasamy, et al., 2023), or even proposing a set of solutions (Bencsik, 2022), others have introduced a theoretical framework (Singhsomransukh & Heo, 2017) or a model (Gronau, et al., 2023) that leverage game mechanics to encourage employees to share their knowledge. In addition, several academic papers have indicated that gamification enhances knowledge sharing (Dale, 2014, Silic & Back, 2017, Jalili, 2020, Lacosta & Thomas, 2020, Van Toorn, et al., 2022).

Academic works are showing positive effects of gamification on knowledge transfer in business sectors (Patrício, et al., 2018) such as software development teams (Galeano-Ospino, et al., 2021), or demonstrating the positive impact of blockchain-supported gamification on knowledge transfer (Pfeiffer, et al., 2020). Knowledge creation is one of the essential components of technology companies that mediate the effect of gamification on firm performance (Hidayat & Abdurachman, 2022). Gamification, when integrated into a KM-processes-based model, catalyses facilitating the creation and transfer of knowledge (Jurado, et al., 2019).

In addition to processes, gamification has already entered into other KM sub-fields. By leveraging gamification, some scholars have introduced an analytical framework (Patrício, et al., 2018) and new blended learning approaches to enhance creativity and innovation (Zagel, et al., 2019). Others have proposed conceptual models to help organisations implement gamified knowledge management systems (KMS) in higher education institutions (Sanmorino & Ermatita, 2019) and consulting firms (Malingkas & Ce, 2020).

The results of recent research also showed a direct impact (Suh, et al., 2022, Hasan, et al., 2023), and an indirect impact (Feng, et al., 2022) of gamification on knowledge contribution. Generally, gamified platforms for collaboration in industrial environments (Lithoxoidou, et al., 2020) and higher education (Da Silva Alcantara, et al., 2022) are welcomed and helpful, especially in the domain of knowledge exchange. Gamification has the potential to improve knowledge

retention (Putz & Treiblmaier, 2019, Luh, et al., 2022, Pruyn, 2023, Romero Rodríguez, 2023).

Regarding the topic of learning and training, gamification stimulates curiosity to learn (Han, et al., 2023), enhances learning performance (Denden, et al., 2020), and promotes competition while enhancing teamwork (Criollo-C & Luján-Mora, 2019). Although gamification can help make the roles of various knowledge workers more visible within the company and even identify new roles, only a few studies have investigated this issue (Spanellis, et al., 2020).

3.2.2 RQ2: Which industries and HE fields have embraced gamification in KM sub-fields?

As can be seen in Figure 6, except for the "general" category, which included theoretical studies without a specified field of business or HE, the other categories show the areas within which researchers have investigated the interrelation between gamification and KM sub-fields. In both business and HE, there is a significant role for "Informatics" as an umbrella term encompassing software development, cybersecurity, computer science, and certain engineering fields. When a wide range of different fields can be seen in both sections, there is an even wider focus on other types of informatics and information sciences in HE. It can be said that the majority of the research in the business area is focused on the service sector.

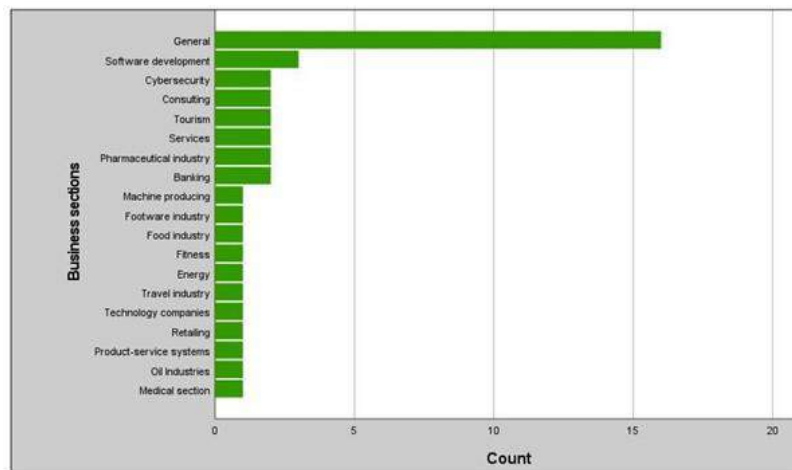


Figure 6: (a) Business fields in which gamification is interconnected with KM

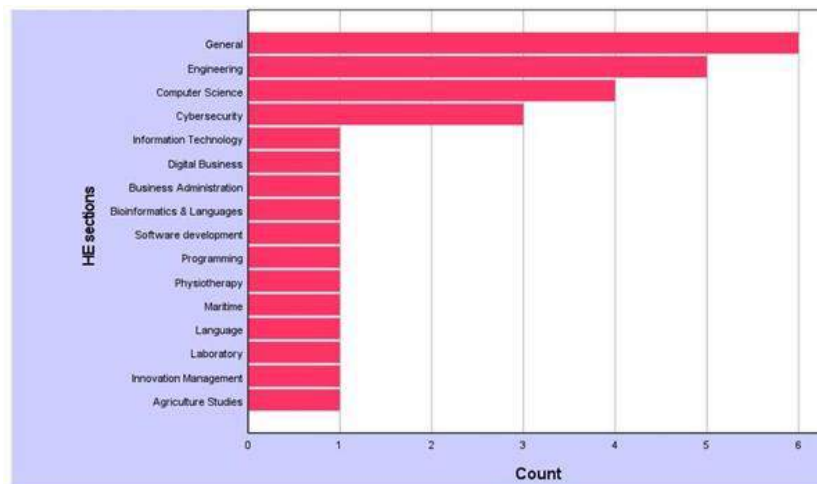


Figure 6: (b) HE fields in which gamification is interconnected with KM

3.2.3 RQ3: What are the similarities and differences between businesses and HE institutions that utilise gamification in knowledge management?

This section presents a comparative study between the business and higher education sectors, focusing on their respective approaches to gamification and their relevance to knowledge management. We examine various KM sub-fields and their different priority in each sector. The goal is to highlight commonalities and differences, stimulating further discussion on the subject.

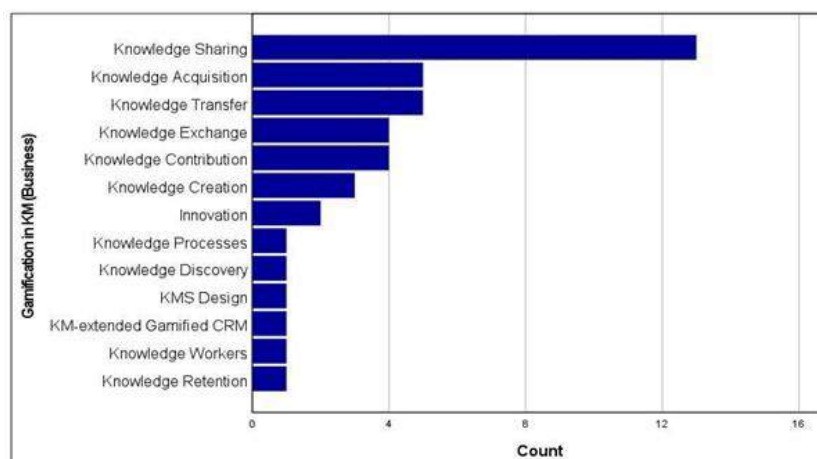


Figure 7: (a) Contributions of gamification to KM in business

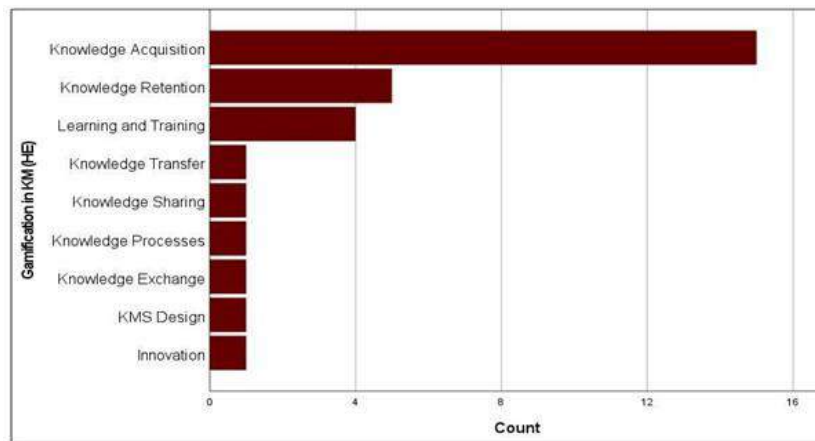


Figure 7: (b) Contributions of gamification to KM in HE

According to Figure 7, studies in both areas have commonly focused on knowledge acquisition. It is more emphasised in higher education; however, the intersection between gamification and knowledge sharing is higher in the business area. The first three important categories for the business sector are sharing, acquisition, and transfer of knowledge. However, in higher education, these rankings will be replaced by knowledge acquisition, retention, and learning and training.

If we group the categories depicted in Figure 7 into 'main KM processes' (knowledge acquisition, knowledge creation, knowledge storage/retrieval, knowledge transfer, knowledge sharing, knowledge application, and knowledge protection) and 'other KM sub-fields' (learning and training, innovation, KMS design, knowledge contribution, and knowledge workers), we can see that both sectors (business and higher education) have a strong focus on the first group. However, the business field seems to be more heterogeneous and HE is more focused on some specific KM processes.

This analysis demonstrates that, although the business and higher education sectors share common interests in knowledge management, they also exhibit significant differences in focus and approach. Exploring the reasons behind these differences could offer valuable insights for both aforementioned sectors

3.3 Summary and Comparison to Previous SLRs

As shown in Table 2, concerning the interrelationship between gamification and KM, literature reviews are scarce. Researchers have explored the relevance of gamification to knowledge sharing (KS) in the business sector (Friedrich, et al., 2020), its impact on knowledge acquisition (KA) within manufacturing (Keepers, et

al., 2020), and its influence on knowledge transfer (KT) in software development (Galeano-Ospino, et al., 2021). Notably, the sole study in the education sector, which also encompasses higher education participants, examined augmented reality and gamification's relevance to KA (Lampropoulos, et al., 2022).

Table 2: Similar Systematic Literature Reviews

Authors	Year	Coverage	Num. of articles	Focus area	Interrelations	Impacts
Keepers et al	2020	no limitation	16	Manufacturing	gamification, KA	Three research areas are frequently the focus of gamification in manufacturing: operational tasks, training, and KA.
Friedrich et al	2020	1980-2017	54	business	Game mechanics, and KS	The positive impact of intrinsic motivation on KS quality
Galeano-Ospino et al	2021	2015-2019	33	software development	gamification, KT	The positive effect of gamification on KT
Lampropoulos et al	2022	no limitation	113*	Education (all levels including HE)	Augmented reality & gamification, KA	The positive impact of gamification on KA

*Explanation: This research has conducted a more extensive investigation, incorporating three more databases and keywords such as augmented reality (AR), and has spanned all educational levels from primary school to higher education (HE).

The findings indicate that, in contrast to previous similar reviews, our review is distinguished by:

- A broader scope of study to ascertain the most significant KM topics covered over the past two decades.
- Authors' keyword analysis to know the most investigated topics in the mentioned period.
- An analysis of papers on KM sub-fields including knowledge processes and other related topics of KM.
- A classification of scholarly articles according to research types and methodologies.
- A comparison of business and HE sectors regarding the interplay between gamification and KM sub-fields.

4 Conclusions

This systematic literature review provides a comprehensive analysis of the links and relationships between gamification and knowledge management. It provides insights into the most frequently discussed covered topics and categorises the work by research type and by business and academic contexts. The study has identified the most frequently addressed topics over the last two decades, analysed the research approaches and methods used in the selected papers and compared the application of gamification in KM between business and higher education. The results showed a growing interest in the role of gamification in knowledge management, especially in its impact on knowledge processes in business and higher education.

The findings of this SLR have significant implications for organisations looking to integrate gamification into their KM areas. By understanding the key areas where gamification has been implemented and the areas in which it has been used, organisations can make informed decisions about the use of gamification for knowledge processes and related sub-fields. These insights can be valuable for HE institutions looking to improve their KM processes through gamification. The analysis can be useful for the development of gamification strategies tailored to the specific needs and objectives of higher education institutes. The comparison between the business and higher education sectors in terms of gamification application within KM offers valuable insights into the differences and commonalities in their approaches. This comparative analysis can assist higher education institutions in understanding how their use of gamification in KM aligns with or differs from practices in the business sector. This understanding can help them make informed decisions regarding the adoption and adaptation of gamification strategies. Furthermore, companies interested in implementing gamification can benefit from considering the past experiences of other companies and, in some cases, similar industries. This could be advantageous for integrating gamification into KM processes. In the context of higher education, there are potential research areas. It would be beneficial to identify fields that are more focused on by companies but not adequately covered by academics.

The purpose of this SLR was to identify research opportunities for individuals interested in the intersections between gamification and knowledge management. Scholars and practitioners can explore the potential impact of gamification in underrepresented KM sub-fields, such as KM systems and knowledge workers, to further advance the understanding of gamification's role in organisational and educational contexts.

This review has several limitations, including the search terms utilised, the databases chosen, the research areas selected, and the publication period

considered. It is crucial to remember that the data only covers articles that were published in both Scopus and the Web of Science, thus the trends might not be indicative of the whole academic community. Nonetheless, it represents an important additional contribution to previous reviews on the topic.

Acknowledgements

The study leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 101034319 and from the European Union — NextGenerationEU.

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A black silhouette of a city skyline, including various skyscrapers and a prominent tower, is positioned along the diagonal boundary between the light blue and orange background sections.

IFKAD 2024 Proceedings
ISBN: 978-88-96687-17-8
ISSN: 2280-787X