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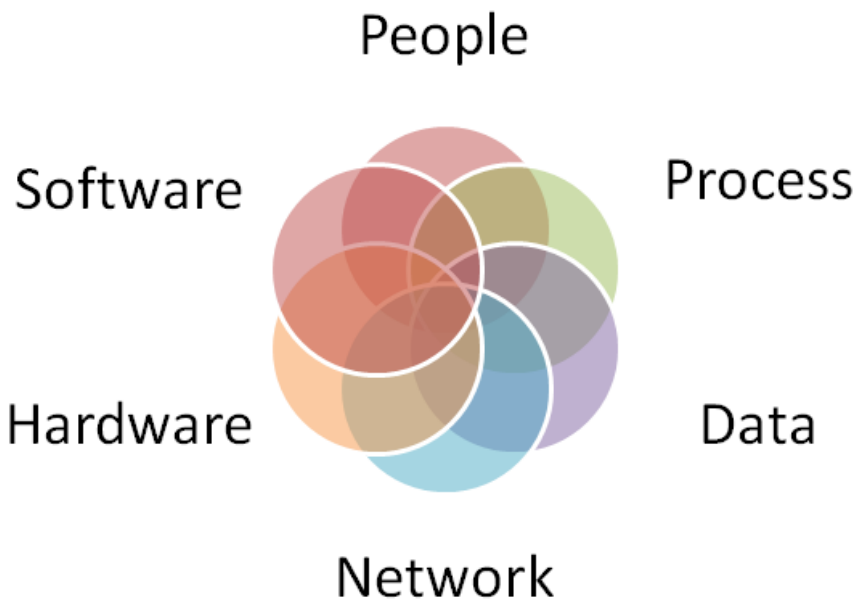

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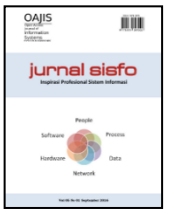
Jurnal Sisfo Vol. 12 No. 01 (2025) i–ii



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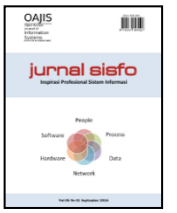

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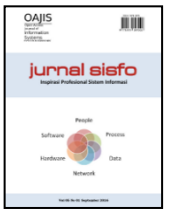
Jurnal Sisfo Vol. 12 No. 01 (2025) iii



Daftar Isi

Analisis Sentimen dan Korelasi Berita Saham pada Platform Trading Gotrade terhadap Perubahan Harga Saham

Christoforus Fachrasya, Retno Aulia Vinarti, Faizal Mahananto, Amalia Utamima, Renny Pradina Kusumawardani ……..…… 1

Proyek Pengembangan Notares Website Manajemen Keuangan Cerdas dengan Metode Scrum Agile

Rahmat Ramadhan Permana, Agung Budi Prasetya, Farhan Adika Suwardana, Arayzi Rayyansyah, Arjuna Putra Kharisma, Sholiq Sholiq, Rizal Risnanda Hutama ....……...……. 12

A Bibliometric Analysis of Digital Business Models: Comparative Insights Before and After COVID-19

Febby Candra Pratama ..…..... 32

Mapping a Decade of Digital Twin Research: Trends, Thematic Evolution, and China's Strategic Lead

Radityo Prasetianto Wibowo, Prasasti Karunia Farista Ananto, Eugenia Indrawan …… 46

Pengaruh Fitur Social Media Marketing terhadap Keputusan Pembelian Brand Fashion

Mudjahidin Mudjahidin, Ahmad Ikhsan, Talitha Firyal Ghina Nuha ……..……... 61

Penyusunan Disaster Recovery Planning (DRP) Pada Data Center Unusa Menggunakan NIST 800-34

Riko Adi Kurniawan, Endang Sulistiyani …..…….. 81

Application of Gamification to Enterprise Systems: A Systematic Literature Review

Tri Puspa Rinjeni, Mahendrawathi ER ……... 97

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Open Access
Journal of
Information
Systems
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jurnal sisfo

Jurnal Sisfo Vol. 12 No. 01 (2025) iv

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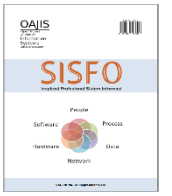
Jurnal SISFO Vol.12 No.01 (2025) 97–112



Application of Gamification to Enterprise Systems: A Systematic Literature Review

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Abstract

Implementing an enterprise system is a challenge for organizations to adapt to new routines. The comprehension of enterprise systems extends beyond the implementation phase, encompassing the learning context through the incorporation of gamification. Gamification has characteristics that help in recognizing appropriate elements to support effectiveness in its implementation. To understand further the application of gamification to enterprise systems, this research aims to describe the state of the art through a systematic literature review to determine the characteristics and effectiveness of the application of gamification to enterprise systems. This research selected 14 publications in 2018-2022 based on predefined criteria and quality assessments. The use of the most gamification elements in points, leaderboards, levels, and rewards represents gamification characteristics. ERPSim is a media that is widely used for ERP learning. The pre-test and post-test comparison method stands out as the most prevalent approach in gamification experiments. This comprehensive literature review serves as a valuable resource to determine the appropriate application of gamification according to its objectives and field of application.

Keywords: *Gamification, Enteprise System, ERP, ERPSim*

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1. Introduction

Enterprise systems is an information system representing the entire company to integrate and streamline business processes in various functional areas [1]. Implementing an enterprise system offers benefits such as enhanced transparency and visibility, which support organizational decision-making [2]. Many well-known industries around the world continue to invest in these systems because of their business integration capabilities and the ability to manage business transactions and real-time operations simultaneously [3]. Implementing enterprise systems is essential for adopting the best business practices and achieving integrated business processes.

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While enterprise systems offer numerous benefits, companies and organizations encounter challenges during implementation and renewal stages, such as system usage and user adoption [2]. Implementing an enterprise system (ES) is one of an organization's largest and most time-consuming and budget-intensive projects. This process requires employees to adapt to new routines, and some implementations fail due to a lack of employee engagement. The complexity and difficulty of using enterprise systems can decrease productivity, as employees may not fully utilize the systems' potential [4], leading new users to find the systems overly complex and hard to understand [5]. The success of the implementation not only depends on the techniques used but also on how effectively users engage with the system. Therefore, it is essential to explore techniques that enhance understanding during enterprise system implementation. Building a comprehensive understanding of these systems also involves learning. Current teaching methods face various challenges that need to be addressed to ensure effective learning and skill acquisition. Hence, innovative approaches in learning, such as the application of gamification, are necessary [6].

Gamification is the application of game concepts to the world outside of games to increase user engagement and skills [7]. The extensive application of gamification also provides opportunities for gamification to be applied to companies, especially in an information system implementation project [4]. The application of gamification in employee training and education has grown in popularity in recent years, and the results have been positive [8]. Based on the reason for the failure of enterprise system implementation projects and the benefits of gamification, it is necessary to study more deeply how the application of gamification related to enterprise systems in direct implementation in companies and learning. Appropriate gamification implementation is supported by selecting the right gamification characteristics. Gamification characteristics can be identified as game elements that are applied to the subject to determine the right media. Gamification elements such as leaderboards, badges, points, levels, stories, progress bars, avatars, collections and time are elements that are often used in the application of gamification in the world of digital learning [7]. Identifying the right elements in the application of gamification can assist in determining the suitability of the subject of the enterprise system. Designing games for education requires a strategy to help achieve maximum learning objectives [9]. The systematic literature review [4] found related concepts, effectiveness and other potentials of implementing gamification in enterprise systems [4]. Systematic literature studies in previous research focused on the use of gamification in enterprise systems for implementation, user training, and effectiveness [2]. Enterprise systems play a crucial role in business process integration and operational efficiency. However, research indicates that over 50% of enterprise system implementations fail due to low user adoption and engagement [4]. Gamification has emerged as a promising approach to address these challenges by improving user motivation and engagement. Despite the increasing interest in gamification, prior research lacks a comprehensive synthesis of its application in enterprise systems. To fill this gap, this study conducts a systematic literature review to analyze the characteristics and effectiveness of gamification in enterprise systems.

To further understand the application of gamification in enterprise systems, this study aims to elaborate the state of the art and future research opportunities through a systematic literature review. The research questions in this study are the characteristics of gamification in enterprise systems (RQ1) and how the effectiveness of the implementation of gamification in enterprise systems (RQ2). This study presents the research background in section II related to enterprise system and gamification. The methods of SLR in section III, the stages in conducting SLR based on [10]. Section IV describes the research results. Discussion of the research results is discussed in section V and closed with a conclusion in section VI. Based on the fourteen synthesized papers, gamification elements are often used in subjects and media in teaching and implementing enterprise systems.

2. Background

This section discusses the research background related to enterprise systems and gamification and the correlation between the two topics.

2.1 Enterprise System

Enterprise systems are an integral part of the organization that provides computer automation support for some business functions such as accounting, finance, marketing, customer service, human resource management, operations and others [11]. Enterprise systems integrate all the main functions of the company to help information flow dynamically for the benefit of the company [12]. Enterprise systems include enterprise resource planning (ERP), supply chain management (SCM), customer resource management (CRM), and other enterprise-level systems that are important to the entire company. Enterprise systems extend from back-end supply chain operations to front-end services that deal directly with customers. As such, the implementation process is becoming increasingly costly, intense, and failure-prone compared to traditional information system implementations [11].

ERP is an information system to comprehensively integrate all systems in the organization related to material, financial and human resources [13]. Through data standardization and process integration, ERP systems have the potential to facilitate communication and coordination, enable centralization of administrative activities, reduce information system maintenance costs, and increase the ability to deploy new information system functionality [8]. SCM is a system that helps in the corporate supply chain. The network of service, material, and information flows that connect a company's customer relationships, order fulfillment, and supplier relationship processes with its suppliers and customers are summarized in the SCM system. CRM integrates corporate strategy, business methodology, and technology to achieve a myriad of goals for companies that want to operate in a customer-driven environment [11].

2.2 Gamification

Gamification is defined as the use of game elements in a non-game context to facilitate learning [14]. In learning, gamification can increase learner engagement and material acquisition in learning [7]. Gamification is used as a tool for better understanding of certain materials or topics and also to illustrate certain scenarios or cases where demonstration and empathy are required [15]. Game elements that can be applied such as points, achievements and leader boards, storytelling, levels, feedback, progress, challenges, goals [16], avatars, badges and quests[8]. The use of gamification aims to increase participation, control behavior [16], encourage action, and increase user loyalty [17].

The key point of gamification is the inclusion of game tasks that players must perform with various benefits offered [15]. The characteristics of gamification can be identified from the gamification elements applied, the media used, the field of application and several other aspects that can determine the achievement of the goals of implementing gamification [7]. The general perception of gamification gives researchers reason to believe that gamification is a highly useful and applicable tool for improving learning outcomes and overall business results [15].

2.3 Enterprise System and Gamification

The popularity of gamification in increasing user engagement and motivation has led to its application in various fields beyond education. Previous studies have indicated that gamification is effectively used in implementing information system projects. Implementing an Enterprise System (ES) is one of the largest projects an organization can undertake in terms of budget and time [4]. For this reason, several previous studies discuss gamification and enterprise systems in Enterprise Resouce Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), and Knowledge Management System (KMS).

As a form of gamification, ERP Simulation (ERPSim) was developed by HEC Montréal for educational purposes and is available for free [5]. ERPSim enhances students' understanding of using ERP tools to

integrate business processes through team collaboration and competition against other teams [8]. By working in various business roles, students must make business decisions based on collected data [18]. ERPSim allows students to experience the integration of business processes in a dynamic environment, featuring elements like time acceleration, simulated interactions with business partners, and automated administrative tasks [8]. ERPSim now supports nine simulation scenarios grouped into four categories: (1) Distribution, (2) Logistics, (3) Manufacturing, and (4) Retail Games [18]. Another tool for gamification implementation is Kahoot [14].

The implementation of enterprise systems, not just ERP, typically demands significant time and money. To ensure the successful integration of gamification, it is essential to further explore the media and characteristics of the applied gamification to align it with learning needs.

3. Research Method

The research method employed in this study is a Systematic Literature Review (SLR) to identify the characteristics of gamification applications in enterprise systems. The research strategy is based on the guidelines [10]. The methodology consists of five stages: defining the research question, conducting the search process, establishing exclusion and inclusion criteria, implementing quality assessments, and synthesizing the findings [10]. The steps conducted in this study are illustrated in Figure 1.

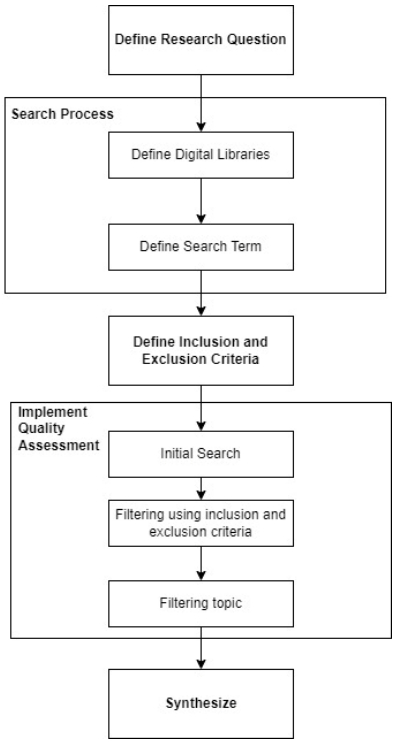

Figure 1. Research Method

3.1 Research Questions

This research formulates two research questions. RQ1 addresses the characteristics of gamification elements applied to enterprise systems. RQ2 explores the effectiveness of gamification implementation in enterprise systems.

3.2 Search Process

This stage outlines how the search process was conducted in digital libraries, focusing on keywords related to gamification and enterprise systems.

3.2.1 Digital Libraries

In determining the search formula, the search process uses keywords related to gamification and enterprise systems. These keywords are strategically placed in critical sections of the publications, including titles, abstracts, or abstract keywords. The search was conducted across reputable digital libraries, as detailed in Table 1.

Table 1. Digital Libraries

Number	Databases	URL
1	Emerald	https://www.emerald.com/
2	Science Direct	https://www.sciencedirect.com/
3	Taylor and Francis	https://www.tandfonline.com/
4	Wiley Online Library	https://onlinelibrary.wiley.com/
5	IEEE	https://ieeexplore.ieee.org/
6	ACM	https://dl.acm.org/
7	Springer	https://link.springer.com/

3.2.2 Search Term

Search queries across multiple digital libraries are utilized to identify publications candidates to this research. Each digital library employs distinct search terms, tailored to the specific requirements outlined in Table 2.

Table 2. Search Query

Database	Spesific Keywords	Search Result
Emerlad	(abstract:"gamification" OR (abstract:"gamify") OR (abstract:"gamified")) AND ((abstract:"enterprise") OR (abstract:"ERP") OR (abstract:"CRM") OR (abstract:"SCM") OR (abstract:"resource planning") OR (abstract:"knowledge management"))	20
Science Direct	(gamification OR gamify OR gamified) AND (enterprise OR ERP OR "resource planning" OR CRM OR SCM OR "knowledge management")	18
Taylor and Francis	[[Abstract: gamification] OR [Abstract: gamify] OR [Abstract: gamified]] AND [[Abstract: "enterprise"] OR [Abstract: "erp"] OR [Abstract: "crm"] OR [Abstract: "scm"] OR [Abstract: "resource planning"] OR [Abstract: "knowledge management"]]	3
Wiley	"gamification" in Abstract and "enterprise" in Abstract	3
IEEE	("All Metadata": gamification) AND ("All Metadata":enterprise systems)	32
ACM	[[Abstract: gamification] OR [Abstract: gamify] OR [Abstract: gamified] OR [Abstract: game]] AND [[Abstract: enterprise] OR [Abstract: erp] OR [Abstract: "resource planning"] OR [Abstract: crm or scm] OR [Abstract: "knowledge management"]]	123
Springer	gamification OR gamify OR gamified AND (ERP OR enterprise OR "resource planning" OR CRM OR SCM OR "knowledge management")	805
Total		**1000**

3.3 Inclusion and Exclusion Criteria

During the search in seven digital libraries, 1000 publications were identified as candidate data. After obtaining candidate data from the search query, the next step was to select data that met the inclusion and exclusion criteria outlined in Table 3.

Table 3. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Paper published between 2018 and 2022	Paper not written in English
Paper written in English	Paper is not in journals, conferences, or proceedings
Published by selected publishers	Paper is systematic literature reviews
Paper is in journals, conferences, or proceedings	

3.4 Implement Quality Assessment

Candidate papers retrieved from the search results were chosen according to specified inclusion and exclusion criteria. Out of 1000 candidate papers identified, 110 met these criteria. The results of the inclusion and exclusion criteria are detailed in Table 4.

Table 4. Inclusion and Exclusion Criteria

Database	Search Result	Inclusion Exclusion Criteria
Emerald	20	9
Science Direct	18	10
Taylor and Francis	3	3
Wiley	3	3
IEEE	32	15
ACM	123	33
Springer	805	40
Total	**1000**	**110**

Following the selection based on inclusion and exclusion criteria, the next step involves evaluating the candidate papers. This evaluation includes reviewing the abstracts to verify their alignment with the criteria for papers related to gamification and enterprise systems. The assessment outcomes are shown in Table 5.

Table 5. Assessment Results

Database	Search Result	Inclusion Exclusion Criteria	Assessment
Emerald	20	9	2
Science Direct	18	10	1
Taylor and Francis	3	3	1
Wiley	3	3	1
IEEE	32	15	2
ACM	123	33	2
Springer	805	40	2
Total	**1000**	**110**	**11**

According to the assessment results, 11 papers were deemed eligible for synthesis. However, two of these papers were inaccessible, reducing the count to nine. Given that this number was insufficient for a comprehensive analysis, we employed the snowballing technique to identify additional relevant studies. Unlike traditional database searches that rely on predefined keywords and indexing, snowballing allows for the exploration of influential studies by tracing citations and references from selected papers. This method is particularly beneficial in systematic literature reviews where keyword-based searches may fail to capture all relevant publications due to variations in terminology, indexing limitations, or evolving research trends. By following citation trails, snowballing helps identify seminal works and widely referenced studies that may have been overlooked in standard search results. Additionally, it mitigates selection bias by expanding the dataset beyond what is directly retrievable through database queries. As a result, this approach yielded five additional publications from various digital sources, including one from MDPI that was not initially included in the designated databases but was deemed relevant for enhancing dataset completeness. The use of snowballing ensured a broader and more representative selection of studies, increasing the reliability of the synthesis and providing a more nuanced understanding of gamification in enterprise systems. In total, by integrating both initial search results and those from the snowballing process, we finalized 14 publications for this study.

3.4 Synthesize

The Synthesis stage involved analyzing 14 publications to provide a comprehensive exploration of enterprise systems and gamification to answer two research questions. The findings from this synthesis are detailed in the Results section.

4. Results

This section presents the findings based on two research questions concerning the characteristics and effectiveness of gamification.

4.1 Literature Description

The assessment results were synthesized to address RQ1 and RQ2 regarding the characteristics and effectiveness of gamification. Based on these findings, categorization was conducted based on the number of papers by publication years spanning from 2018 to 2022. The highest number of papers discussing gamification and enterprise systems were published in 2021, totaling five papers. This distribution by year is illustrated in Figure 2.

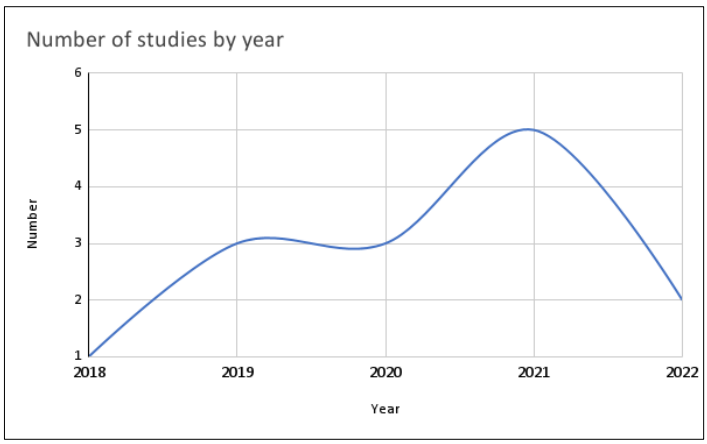

Figure 2. Number of papers by year

Figure 3 illustrates the distribution of papers from selected literature across digital libraries. Springer and IEEE dominate with a total of four papers, followed by Emerald. Additionally, there is one paper each from other digital libraries.

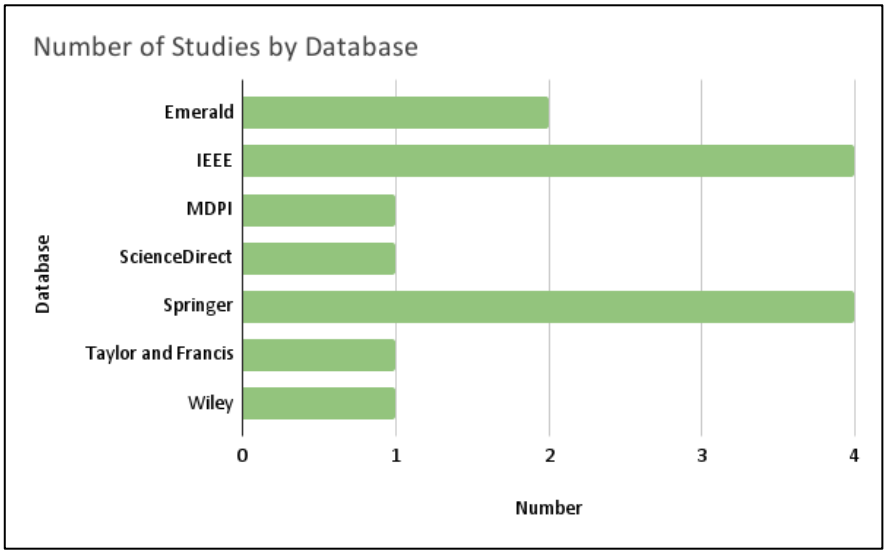

Figure 3. Number of papers based on database

To determine the case studies or participants for the research, papers were categorized based on the location taken. This helps identify the country with the most case studies on gamification and enterprise systems. Figure 4 displays the number of papers according to the case study locations. Two studies do not include the location of the case study or participants.

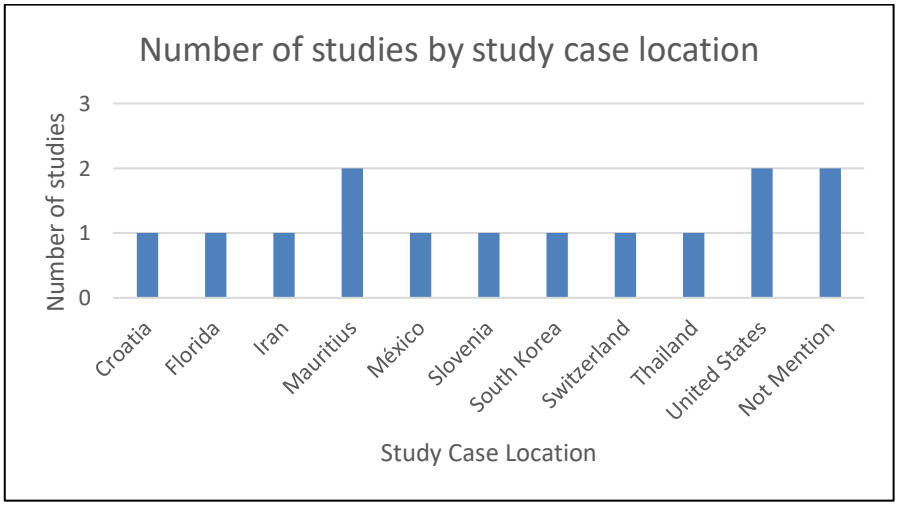

Fig. 4 Number of papers by case study location

Figure 4 presents the distribution of selected studies based on their case study locations. The data reveals that the majority of studies originate from diverse geographical regions, with Mauritius, the United States, and studies without a specified location having the highest representation (2 studies each). Other case study locations, including Croatia, Florida, Iran, Mexico, Slovenia, South Korea, Switzerland, and Thailand, each

contribute one study. This geographical distribution highlights the limited global coverage of research on gamification in enterprise systems, with a concentration in specific regions. Additionally, two studies did not explicitly mention their case study location, which may indicate a focus on conceptual frameworks or systematic reviews rather than empirical case studies.

Understanding the geographical context of these studies is crucial, as the effectiveness and adoption of gamification in enterprise systems may vary based on cultural, economic, and technological factors. Future research should aim to expand the geographical diversity of case studies to provide more comprehensive insights into how gamification is implemented and perceived across different regions.

Furthermore, as shown in the subsequent section, various research methodologies—including surveys, experiments, case studies, design science research, and mixed-method approaches—were utilized across these locations, further contributing to the study's depth and analytical rigor. Figure 5 illustrates the number of papers categorized by research methodology.

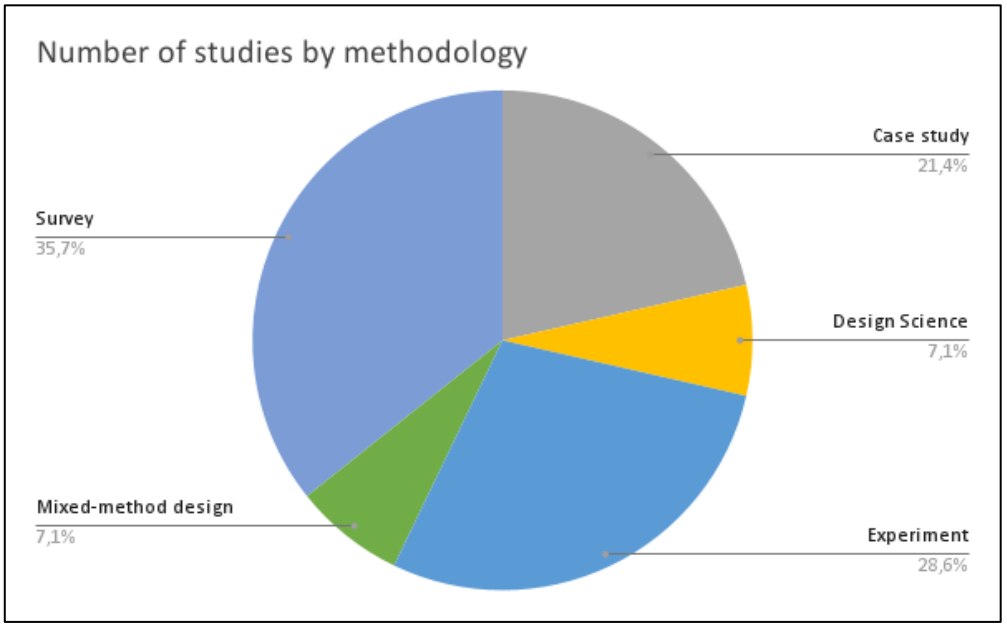

Fig. 5 Number of papers by case study location

4.2 Gamification Characteristics

Each study focuses on different aspects of applying gamification in enterprise systems. Out of 14 papers, 10 (71%) concentrated on ERP, while the others addressed knowledge management. In total, 27 gamification elements were identified as being applied to enterprise systems. These elements were compiled from the authors' descriptions and images in related studies. This study summarized the gamification elements based on their frequency of use and descriptions. Table 6 presents these gamification elements.

Based on the analysis, the top three frequently used gamification elements are Points, Leaderboards, and Levels. Besides these elements some games do not explicitly mention the applied gamification elements but are integrated into serious games. The games listed in Table 7 can help build knowledge for understanding the enterprise system.

Table 6. Gamification Elements

Number	Element	Description	Number of papers
1	Points	Player performance records include points earned for completing activities or experiences [17] and penalty points for rule violations or mistakes [19].	7
2	Leaderboard	Platform to measure and evaluate performance among users to foster competition [7].	5
3	Level	Levels are able to be integrated with a badge system, acting as an indicator that reveals the participant's activity [20].	4
4	Reward	Given to a player after performing a specified behavior to force a player to repeat it [20]. Rewards can be used as a media to appreciate achievements [21].	3
5	Achievement	This involves assigning tasks to achieve goals or satisfying the need to complete a given task. Due to this need, individuals often create new challenges by setting new attainable goals [20].	2
6	Avatar	An avatar is a representative image to show the player's vision in a gaming or gamification environment [22]	2
7	Badges	Describes the user's reputation [21].	2
8	Challenge	refers to any type of action that requires effort from participants to complete a specific task [23].	2
9	Contest	Contests are designed to give users the opportunity to be more creative [24].	2
10	Feedback	Gamification offers various types of feedback for users, such as point earning displays or input from other players [21].	2
11	Gifting	Encouraging collaboration can be enhanced by integrating points and reward elements [24].	2
12	Cooperation	Cooperation established through an activity [15]	1
13	Compensation	Rewarding users for making the right decision/action [8]	1
14	Competition	Helping people become intrinsically motivated by comparing their achievements and themselves to others [20]. Competition makes the process more engaging and attractive for players [21].	1
15	Grouping	Representing a team or group in the assignment of tasks or projects [24]	1
16	Hint	Guidelines for answering or completing tasks [6]	1
17	Task	Tasks or activities to be completed [1]	1
18	Time	A time limit for the duration of a quiz or assignment that requires students to complete the task immediately [22]	1
19	Teams	Representing a group or groups in specific activities [1]	1
20	Narrative	A backstory, context, or overarching narrative to enhance training content [8]	1
21	Missions	Game mechanics that require users to complete tasks to advance in training [8]	1
22	Progress Bar	Board to illustrate user progress [23]	1
23	Quest	Integrated with challenges to support game guidance [17]	1
24	Scenario/Story	Represents the flow and instructions of an activity [6]	1
25	Self-expression and status	Allow users to express their uniqueness and individuality [20].	1
26	Surprise	Unexpected elements introduced into team activities [24]	1
27	Virtual goods	Assets that hold perceived value within the game [25]	1

Table 7. Potential Games

Games	Description
The crossword game	Games that help remember terms in ERP. This game provides hints to help solve it. The user enters the word based on the given clue; if correct, the system will give a confirmation [6].
Quiz	The quiz game consists of a series of multiple-choice questions where the user's level of comprehension is considered [6].
Scenario-based games	Scenario-based games include images that depict real-life situations, enabling students to make decisions and analyze the outcomes [6].
Memory game pages (flashcard)	Games consisting of several face-down cards. The user matches the same card by opening the card [3].

4.3 Effectiveness of Implementing Gamification

This section discusses the effectiveness of implementing gamification in enterprise systems (RQ2), focusing on the objectives, implementation methods, and results. To determine the effectiveness of the application of gamification, it is necessary to know the field where gamification is applied, because the characteristics of gamification that are applied may be different. This research found three areas, namely in the scope of education or learning, work and organization. A summary of the research areas can be seen in Figure 6. This research found that the implementation in education and learning is all applied at the university level, aligning with the ERP curriculum used in several business programs at universities

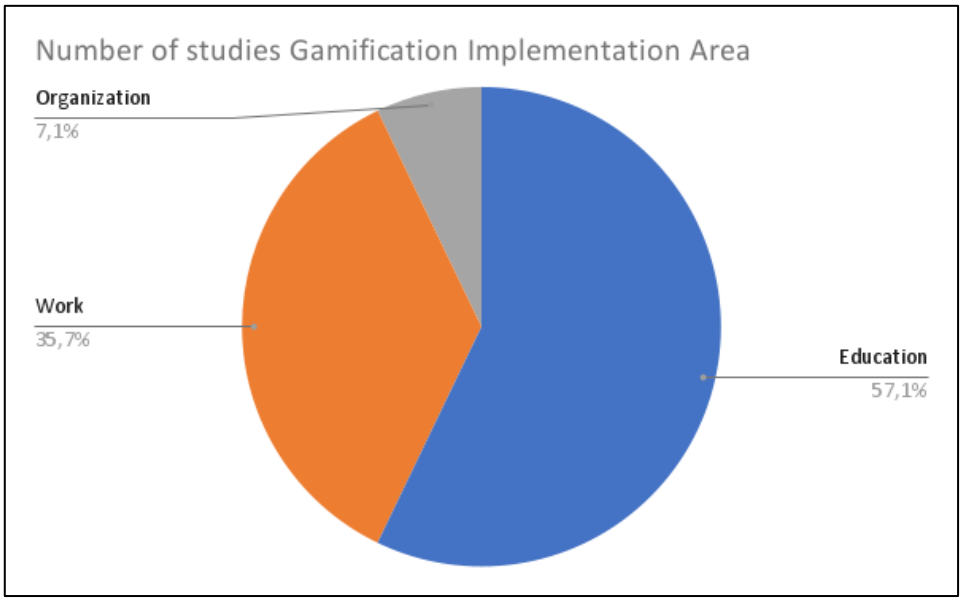

Figure 6. Number of Studies by Gamification Implementation Area

The research objectives influenced the choice of media used for implementing gamification. The results are summarized across three areas: education, work, and organization. A summary of the findings is presented in Table 8.

Table 8. Summary of Paper

Areas/Paper	Topics	Research	Results
Education/ [1]	Application of gamification in ERP learning	Examining the impact of concentration, perceived control, and perceived enjoyment on the application of gamification in ERP learning.	The model described all relationships of cohesion and team cohesion that impact learning outcomes.
Education/ [6]	Application of gamification in ERP learning	Develop and implement gamification in learning to improve understanding of ERP.	The students appreciated the game and responded positively to its use in teaching.
Education/ [3]	Application of gamification in ERP learning	Identify an appropriate and effective methodology for teaching ERP to university students in Mauritius.	A web-based simulation game was proposed and evaluated. Students gaining a deeper of ERP concepts after using the game. The web-based simulation showed positive outcomes according to the test results.
Education/ [18]	Application of gamification in ERP learning	Analyzing the impact of gamification on knowledge acquisition and future student engagement.	ERPsim can enhance knowledge acquisition and increase class interest in attending lectures.
Education / [23]	Application of gamification in ERP learning	Implement gamification concept into ERP system course for distance learning based on big-five factor concept.	Game-element selection based on personality traits did not significantly increase knowledge but was shown to enable better engagement in the course.
Education / [26]	Application of gamification in ERP learning	Developing a gamification system based on ERP to enhance learning motivation.	The questionnaire results at the end of the simulation indicated that students found the VEP engaging. Furthermore, comparing exam results before and after the simulation revealed improved learning outcomes among students.
Education / [5]	Application of gamification in ERP learning	Introducing ERPSim through workshops to improve the desirability of ERP learning.	Students' desires and interests are increased.
Education / [14]	Application of gamification in ERP learning	Employing gamification to elevate student engagement at the core of modern learning.	The integration of points, badges and some additional activities improved student engagement and grades.
Work / [27]	Implementation of gamification in KMS	Discover the definition and measurement of meaningful engagement and its role in predicting employee knowledge contribution through gamified knowledge management systems (KMSs).	Meaningful engagement encompasses five distinct dimensions: deep involvement, sense of purpose, self-discovery, striving for excellence, and personal expression. The research also indicates that cultivating meaningful engagement, which transcends hedonic and instrumental forms, is crucial for enhancing both the quality and quantity of knowledge contributions.
Work / [20]	Application of gamification to knowledge sharing	Propose an approach by understanding how Oil Industry Commissioning and Operations (OICO) companies foster knowledge sharing (KS) by utilizing a gamification approach and nudge theory.	The gamification approach is appropriate for developing knowledge sharing (KS) reward systems and knowledge performance management. It suggests that informing project managers about their project's knowledge performance accompanied by emoticons increases knowledge management (KM) buy-in. The approach proposed by this case study improved KS and organizational performance by 22 percent every six months.

Areas/Paper	Topics	Research	Results
Work / [24]	Application of gamification to knowledge workers	Examined how gamification elements were applied to influence and improve specific processes and practices.	Gamification enhances the creative environment by examining 8 elements and opinions from Zappos, assisting in maximizing the role of knowledge workers by dividing them into three categories.
Work / [8]	Implementation of gamification in ERP training	Exploration of gamification design in ERP training in government.	Recommendations for implementing gamification in ERP training
Work / [15]	Application of gamification in ERP implementation training	Examined the impact of educational innovation on the training process within a business software implementation project, as well as the influence of gamification on the testing phase and overall project processes.	recommendations for incorporating game design elements and educational innovations into the training and testing phases of business software implementation projects.
Organization / [28]	Application of gamification to knowledge management	Investigating how gamification within and outside Knowledge Management Systems (KMS), enhances diverse knowledge domains	Well-designed gamification can foster engagement and knowledge sharing especially for altruistic.

Most papers focus on designing and implementing gamification needs based. Research [6] proposed the application of games in ERP teaching by conducting experiments based on Bloom's Taxonomy. Experiments were designed based on Bloom's Taxonomy by applying four games, including crossword games, quiz, and Scenario-based games.

The experiment was conducted on second-year undergraduate students by dividing them into two groups, cycle 1 and cycle 2. Cycle 1 was the group that applied the four games with cycle only applying 1 game, the simulation game. The results were 85.7% in preference to gamification, indicating effectiveness, high retention rates, and increased interest in learning about ERP with games as the platform. 71.4% of students agreed to the feasibility of having ERP games in the learning curriculum. In the cycle 2 group, 76.5% of students liked the idea of introducing more hands-on with the use of games in the curriculum. After the game trial, a post-test questionnaire was filled, and it was seen that 80% of the students rated the design and appearance of the simulation game user interface as very pleasant. All students agreed to include mandatory lectures before playing the game. 86.7% of the students confirmed that the simulation game accentuated the students' level of understanding better compared to traditional methods. Students who engaged in the game using a gamified system had a better understanding of ERP concepts [6].

In addition to education, gamification is also applied to the field of work. The application of gamification at work is mostly in the knowledge management system (KMS). Gamification-based KMS in the workplace provides employees improved visibility of contributions, immediate feedback on work quality, and comparability with others' performance. Gamification-based KMS allows employees to earn points, improve status, and achieve digital badges based on knowledge contributions [27].

The last application of gamification in humanitarian organizations based on [28] research with non-governmental humanitarian organizations that provide medical assistance discusses knowledge management. The newly developed Knowledge Management System (KMS) must enable simple and quick online or offline access to and sharing of important knowledge, facilitate the formation of communities of practice (for example, knowledge exchange forums), implement efficient search processes, enable connectivity and improve usability. The application of gamification has been personalized based on the characteristics of its users. As has been applied by [28] dividing the representation of users into six

categories, including Commeter, Influencer, Contributor, Collaborator, Visitor and Sharer. This research designs gamification inside and outside the KMS system. The result of the hypothesis is adding a gamified profile increases the actual engagement of participants in the KMS [28].

Based on the synthesis findings, ERP emerges as the most studied topic in education. Experimentation stands out as the predominant methodology employed in this field. Some studies employ pre-test and post-test assessments to gauge student performance. Considering numerous studies dedicated to gamification development, it is crucial to incorporate a broader range of factors and approaches in gamification design.

5. Conclusion

This section presents conclusions and future research directions to guide for the development of similar research.

5.1 Conclusion

This research aims to present the state of the art of gamification application in enterprise systems by conducting a systematic literature review. Fourteen papers were selected from reputable journal databases from 2018 to 2022 based on predefined criteria and quality assessment. The snowballing technique was employed to expand the dataset by identifying additional relevant studies. The majority of the reviewed publications were from 2021, with Springer and IEEE being the most dominant sources.

The characteristics of gamification identified in the selected papers provide insights into RQ1, which explores the key elements and media used in gamification implementation. The most frequently used gamification elements include points, leaderboards, levels, and rewards, all of which play a crucial role in enhancing engagement and motivation. Additionally, various game-based learning tools such as crossword games, quizzes, scenario-based games, and memory game pages (flashcards) can support gamification in different settings. A commonly used platform, ERPSim, has been identified as an effective tool in teaching ERP concepts through collaborative team-based simulations. Understanding the characteristics of gamification contributes directly to its effective implementation. The effectiveness of gamification, as examined in RQ2, was primarily assessed through pre-test and post-test comparisons using existing platforms such as Moodle and Kahoot, as well as independently developed gamified learning environments.

The findings of this study have direct implications for both educational institutions and organizations. In higher education, universities can integrate ERPSim into business and information systems curricula, enabling students to experience real-time enterprise resource planning decision-making in a gamified environment. The implementation of leaderboards, badges, and progress tracking within learning management systems (LMS) can enhance student engagement and motivation. For instance, business schools can incorporate scenario-based gamification in ERP courses, where students simulate business operations and compete based on performance metrics.

In corporate settings, organizations can leverage gamification elements in Knowledge Management Systems (KMS) to encourage employee participation in knowledge sharing. By incorporating reward-based systems, leaderboards, and interactive challenges, companies can increase employee engagement and enhance productivity. For example, organizations implementing ERP training programs can use points-based progression systems to motivate employees to complete training modules, ensuring a smoother transition during ERP adoption.

5.2 Future Research Direction

Future research should explore industry-specific gamification strategies and investigate the long-term impacts on enterprise system adoption and user engagement. Additionally, research should delve deeper into the challenges associated with implementing gamification in enterprise systems, particularly in diverse organizational settings. Expanding studies to include a broader geographical representation will further strengthen insights into gamification applications across different cultural and business environments. Moreover, incorporating educational frameworks such as Bloom's Taxonomy and psychological principles in gamification design could enhance learning experiences, ensuring that gamification strategies cater to various learner needs while optimizing engagement and retention.

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