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GENERATIVE AI-DRIVEN GAMIFICATION IN MARKETING: A TCCM-BASED SYSTEMATIC LITERATURE REVIEW AND FUTURE RESEARCH DIRECTIONS

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The rapid advancement of Generative Artificial Intelligence (GenAI) has increased the potential to create, customise, and deploy gamification effectively in different sectors, including education, healthcare, software creation, and online engagement. Many studies are exploring the use of GenAI, and the literature remains fragmented and conceptually weak, even though gamification is on the rise. This article provides a review of the literature through a the systematic literature review intends to integrate the research undertaken. Research gaps that need to be addressed to expand the field using The Theory-Context-Characteristics of Gamification & GenAI Methodology (TCCM) framework. Research articles were systematically searched and filtered using the PRISMA protocol. From the Scopus database and additional literature sources, including publications from Notable publishing houses such as Taylor & Francis, Emerald, and Springer. The first search in the Scopus database found 2,515 papers and 79 from other sources. A thorough analysis resulted in the inclusion of 52 research articles. An analysis based on TCCM indicates that there is a dominance of study of theories of motivation and learning, education, serious games, healthcare rehabilitation, programming education and game design. AI-Generated Game Content, Adaptive Difficulty Modifications are the characteristics in the study. The Feedback is automatic, and learning is tailored and adaptable. A range of methodological techniques comprises experimental, and mixed-methods investigations. Studies with longitudinal and cross-contextual are rare. Identifying the gap through this literature review develops a structured research agenda for future studies in the context of theory integration, contextualization, human-centred design considerations and Improved Methodological Rigor based on the TCCM framework.

Index Terms : *Generative Artificial Intelligence, Gamification, Personalized Learning, Games, Systematic Literature Review, PRISMA, TCCM, Engagement.*

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1. INTRODUCTION

Technological advancement has always impacted teaching methods across a different types of learning environments. The implementation of Artificial Intelligence (AI) will greatly aid in this change, allowing for the creation of smart and adaptive teaching spaces. The history of AI dates back to mid-20th century. The twenty-first century saw the growth of generative AI due to deep learning as well as the introduction of Generative Adversarial Networks (GANs). According to Goodfellow et al. (2014), machines have been given the capability of producing realistic data such as images or even text. Most probably, after the development of neural network technology, the entire area of artificial intelligence has progressed significantly and content generation frameworks (Vaswani et al., 2017).

The launch of large language models like ChatGPT and other generative AI tools has happened after 2022, the usage of AI increased swiftly in the education, healthcare sector and more increased interest in adaptive learning has been caused by these custom-made learning frameworks (Dwivedi et al., 2023).

The concept of gamification has advanced with the development of artificial intelligence. It is an effective strategy to enhance the motivation, engagement and performance of the learners. Gamification is the use of game elements such as points, badges, etc. gamification employs concepts from video games to affect learning results and user behaviour. (Deterding et al., 2011). Earlier studies have shown that gamification encourages the stimulating feelings of happiness, interest and curiosity, making learning more manageable and effortless to undertake. Teaching process becomes more interactive and fun (Hamari et al., 2014). Moreover, the inclusion of artificial intelligence technologies has made more adaptable and personalized gamified systems, enabling learning environments to alter dynamically in reaction to the actions and achievements of learners (Landers, 2015).

The integration of artificial intelligence with gamification has therefore become a promising avenue for the development of intelligent tutoring systems, serious games and learning platforms for personalization.

The recent evolution of Generative Artificial Intelligence (GenAI) has strengthened the potential of gamified learning systems. Automatic content creation, which enables AI and responsive feedback, real-time personalisation, and a gamified, more flexible, and learner-centred environment (Dwivedi et al., 2023). Consequently, the combination of generative AI and gamification has become highly fascinating to messenger clouds, such as Experts from education, health, corporate training, and digital engagement. The speedy growth of research after 2023 has made this concept fragmented and not conceptualised. A collection of varied works shows a slowed-down area of overall Expansion.

Many review studies have been done in artificial intelligence, gamification, and educational technology to summarise the current research. Recent literature review studies (2023) explored the use of virtual reality in education, and Chen et al. (2023) investigated the impact of augmented reality on student engagement. Lampropoulos and his team (2022) studied gamification and new technologies in education. Abbes (2024) examined how generative AI can be used for personalized learning. Gómez-Niño and his team (2024) studied the use of virtual reality in education, while Chen and his team (2023) investigated how augmented reality affects student involvement.

In 2024, researchers looked at how gamification could help develop skills needed in the twenty-first century. Later, in 2025, Marengo and his team studied how artificial intelligence and gamification were used in higher education.

Likewise, Vijay and his team (2025) and Mäenpää et al. (2025) conducted systematic reviews on adaptive gamification and AI-supported learning systems. Although these studies provide useful insights, most of them focus on higher education, online learning platforms, or general digital learning environments, and do not provide a comprehensive synthesis of the literature in terms of theories, constructs, contexts, and methods.

Apart from that, numerous recent studies on Generative AI technologies have not been completely integrated after the rapid growth of the published earlier reviews and were not systematic; thus, a

structured literature review was required. Theoretical integration is another shortcoming of existing research. Earlier investigations have employed various theoretical frameworks, including Self-Determination Theory, Constructivist Learning Theory, Adaptive Learning Theory, and the Technology Acceptance model, elaborating learner motivation, engagement, and personalised learning in gamified surroundings. Limited research has often been applied independently to these theories and has studied how to combine principles of motivational learning and constructivist learning to elucidate on adaptive learner-centred learning environments. This limitation is especially relevant in early childhood education, where learning is dependent on individual Advancement, ecological involvement, and general motivation but not traditional uniform education techniques.

Montessori education is well-known for a learner-centred pedagogy model, giving precedence to self-regulated learning, sensory involvement and active inquiry. These qualities are very consistent with the self-determination theory. The importance of having others helps with your learning, as in the Interpersonal Learning Theory. The concept of learning is based on one's experience and interaction. Young children with disabilities may require flexible schooling and other provisions. Learning environments not only cater to needs but also enhance interest. to ecological signals. Despite this, studies on generative AI-based gamification exist. The current literature has been found to lack some important aspects in education contexts. Accordingly, a structured and systematic literature review is required to consolidate the information. Existing studies focused on the theoretical domain of gamification and the lack of these methods. In this study, we follow Paul and Criado's (2020) structured review approach, which uses the TCCM framework for analysing prior studies, examining and ascertaining potential future explorations also, the PRISMA framework directs. The process of systematic review guarantees that the selection of recent studies is both Clear and detailed. As such, it is this study that seeks to address.

1. What theories, constructs, contexts, and methods have been used in Gamification driven by generative A.I.?
2. After the emergence of Generative AI, what are the main research trends and gaps in the literature?
3. What is the integration of motivational and constructivist learning perspectives that support flexible and inclusive learning spaces, especially in early childhood and specialized education situations?

The remainder of the paper presents a literature review methodology. The research comes to a conclusion by evaluating the theories, contexts, characteristics and methods of the studies, then proceeds with research gaps evaluation and potential developments.

2. LITERATURE REVIEW

The increasing adoption of artificial intelligence and gamification in education is giving rise to more studies on adaptive as well as personalized learning environments. To terminate the growing literature, various reviews have been published in the past in the areas of artificial intelligence, gamification, and educational technology. Lampropoulos et al. (2022) reviewed emerging technologies in education and reported that artificial intelligence and gamification are widely used to enhance learner engagement and learning effectiveness. Abbes (2024) look at the use of generative artificial intelligence. Adaptive learning systems are becoming increasingly necessary for personalized learning in present-day learning environments. The role of gamification was assessed by Gómez-Niño et al. (2024), cultivating twenty-first-century skills, determining gamified learning environments motivate, engage and develop skills. In addition to that, systematic research has examined the intersection of artificial intelligence and gamification. Marengo et al. (2025) examined the use of AI-based education gamification. The significance of adaptive feedback and individualized learning journeys. Studies in 2023 regarding intelligent game mechanics enhance the learning experience of the learner outcomes and activities. A

systematic review of 2025 about AI-supported gamification (PRISMA) indicated that digital learning platforms and university students are the focus of most studies. Despite the useful information that these reviews provide, the scope is limited. Earlier reviews concentrated on higher education, online learning, or general digital environments. Early childhood education and special education rarely meet in informal environments. Moreover, numerous studies examine gamification and artificial intelligence separately without offering an exhaustive aggregation of theories, concepts, contexts and methods utilized in literature.

A limitation of previous reviews is the rapid advance of generative artificial intelligence. The design of gamified learning systems has greatly changed with the advent of artificial intelligence after 2023. The literature review has not fully incorporated many recent studies on generative AI gamification. There's an apparent disconnect between subsequent findings and earlier evaluations.

Table 1: Consideration of previous studies for review

No.	Review Study (Citation)	Review Focus	Type of articles used for review	Number of studies	Year range
1	Vijay et al. (2025)	AI-based adaptive gamification	Journal articles on AI gamification systems	Meta-analysis of 4 studies	2015–2025
2	Marengo et al. (2025)	AI + gamification in higher education	Peer-reviewed journal articles from Scopus, ScienceDirect, PubMed, Emerald	59	2019–2024
3	Kassenkhan et al. (2025)	AI and gamification in education	Bibliometric and review studies	101	2010–2025
4	Gómez-Niño et al. (2024)	Gamification + AI for 21st-century skills	Scopus indexed journal articles	175	2000–2023
5	Lao (2025)	AI-driven game design and user experience	ACM, IEEE, WoS indexed articles	74	2020–2025
6	Mäenpää et al. (2025)	Gamification + AI in education / risk management	PRISMA systematic review	18	2015–2025
7	Abbes (2024)	Generative AI + gamification for personalized learning	Journal articles and review papers	58	2019–2024
8	Lampropoulos et al. (2022)	Gamification + AR + education	Systematic literature review	670	2000–2022

3. METHODOLOGY

This research uses a systematic literature review (SLR) to integrate existing views on gamification driven by generative AI. The review complies with the PRISMA guidelines, or Preferred Reporting Items for Systematic Reviews and Meta-Analyses. It presents a systematic and clear method for the identification, screening and selection of related research papers. The PRISMA method makes sure the review process is systematic, reproducible, and free from selection bias. The literature search was conducted in the Scopus database, which is a trusted source for peer-reviewed academic literature journals. The following search query was used to conduct the search.

TITLE-ABS-KEY ("Generative Artificial Intelligence" OR "Artificial Intelligence" OR "Generative AI")

AND

TITLE-ABS-KEY ("gamification" OR "game element*" OR "gamified*" OR "advergame*" OR "fun" OR "playful*")

The first search returned 2,515 documents. Filters for document type and language aimed to enhance relevance. To improve relevance, filters were applied based on document type and language.

Applied filters:

- Document type: Article
- Language: English

After applying these filters, 52 documents were obtained for further screening.

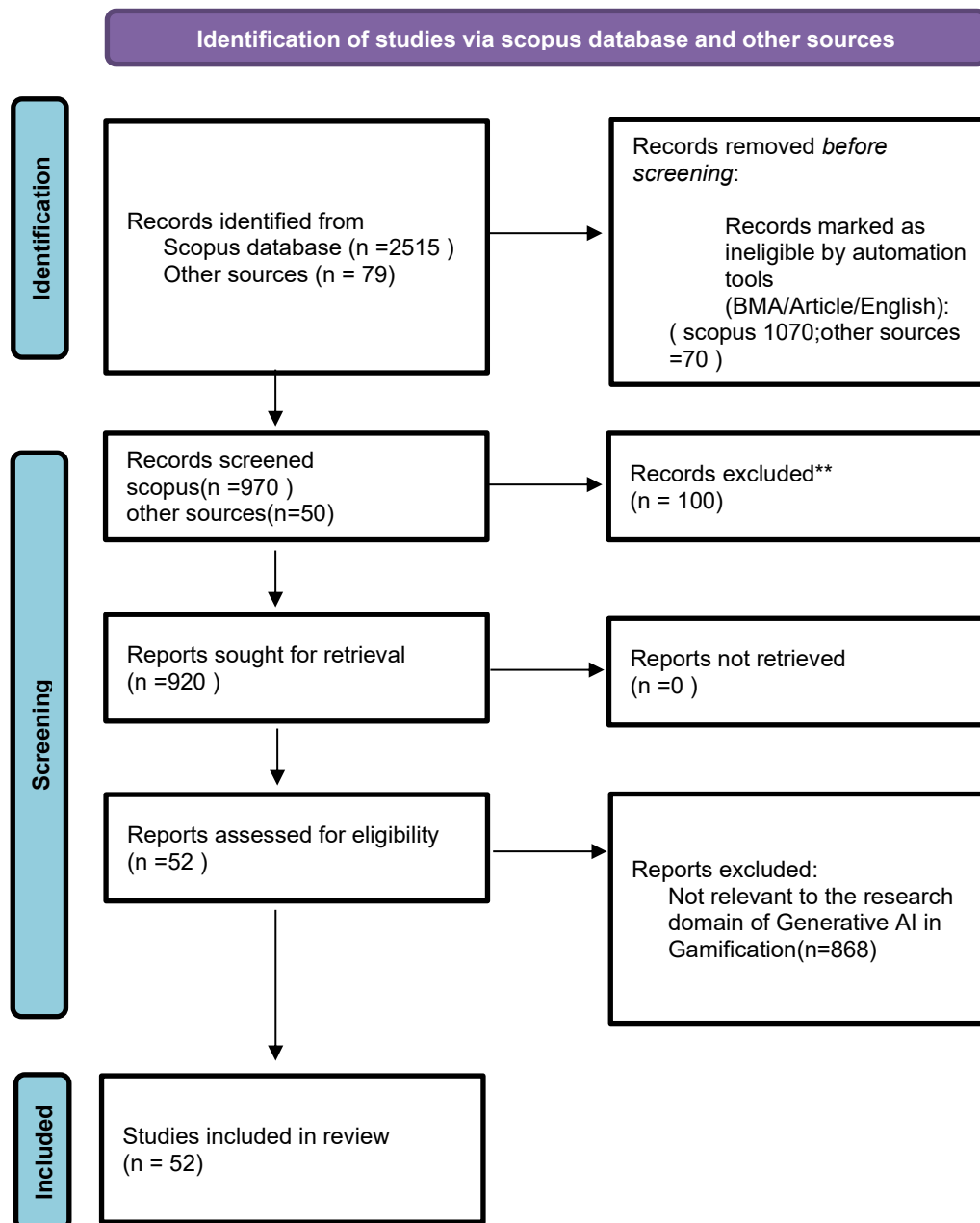


Figure 1: Identification of studies via scopus database and other sources

Source: Developed by authors using PRISMA flow diagram.

The PRISMA framework described the final articles selected through the phases of identification, screening, eligibility and inclusion. In the identification phase, pertinent articles were retrieved from the Scopus database and other reputable sources using predetermined searches using the keywords

associated with generative artificial intelligence and gamification. During the screening phase, Certain records were removed based on redundancy, non-English papers and. Pre-determined standard. The remaining articles were scrutinised thoroughly in the eligibility stage to make sure that they are pertinent to the research area of AI-driven gamification. Ultimately, at the end detail analyses in this paper using TCCM after the studies selected in the inclusion stage structure. The final studies analysed the TCCM (Theory–Context Characteristics–Methodology) framework and the relation variable further, and also investigated via the Antecedent–Mediator–Consequence (AMC) method.

4. DISCUSSION

4.1 Theoretical frameworks employed in earlier research

Earlier research on AI-based gamification has taken on various theoretical perspectives to understand student motivation, engagement, and learning Outcomes. Self-Determination Theory claims that learners have higher motivation when they experience competence, relatedness, and autonomy. When people feel that their needs for autonomy, competence and relatedness are satisfied. Using rewards, feedback, and challenges in gamified learning environments increases intrinsic motivation that is consistent with Self-Determination theory. Another theory often used is Constructivist Learning Theory, which states that learners efficiently construct knowledge through interaction, exploration, and experience rather than instructional information (Piaget, 1972). The ability for learners to do, experiment, receive feedback and information and make it compatible using constructivist learning principles. In addition, studies have employed Adaptive Learning theory, flow theory, and the technological acceptance model to show learner engagement and implementation of technology in gaming systems. Nonetheless, these sorts of theories are used. Research on the integration of motivational factors has been limited. Constructivism describes the adaptive characteristics and learner-centred environments that have been analysed in previous research.

4.2 Characteristics examined in previous research

The existing literature on AI-based gamification has examined several constructs related to learner behaviour and learning outcomes. Commonly studied constructs include motivation, engagement, learning performance, usability, personalisation, satisfaction, and learning effectiveness. Many studies focus on adaptive difficulty levels, intelligent feedback, and personalised learning paths as factors influencing learner performance. These constructs are frequently analysed in digital learning environments, intelligent tutoring systems, and online education platforms. However, constructs related to developmental learning characteristics are less frequently examined. In early childhood education, learning depends on factors such as individual pace of learning, sensory interaction, and response to the environment. These constructs are particularly important for young learners and children with disabilities, who require flexible learning environments that adapt to their abilities and needs. The existing literature gives limited attention to these developmental constructs, indicating the need for further investigation.

4.3 Contexts studied in previous research

Most studies on AI-driven gamification have been conducted in higher education, online learning platforms, corporate training, and general school education. Research frequently examines university-level learners and digital classrooms, where gamification is used to increase engagement and performance. Some studies also investigate gamification in healthcare education and professional training. In contrast, early childhood education has received limited attention in the literature. Montessori education represents a learner-centred pedagogical approach that emphasises self-paced learning, sensory interaction, and independent exploration. These characteristics make Montessori learning compatible with adaptive and personalised gamified systems. The need for flexible learning environments is even greater for children with disabilities, who often require individualised pacing and

continuous interaction with their surroundings. Despite this strong theoretical connection, the application of AI-driven gamification in Montessori and special education contexts remains largely unexplored.

4.4 Methods Employed in Prior Investigations

The methodological underpinnings of the TCCM framework indicate that the preponderance of research on generative AI-enhanced gamification predominantly employs quantitative research designs. These studies largely depend on survey-based methodologies, which are then subjected to statistical analyses such as regression analysis, ANOVA, and structural equation modeling. Moreover, a number of investigations integrate experimental designs to enable comparisons between gamified and non-gamified, or adaptive and non-adaptive, learning systems, especially within educational contexts. Conversely, a relatively small proportion of studies adopt qualitative or mixed-method approaches, which are primarily utilized to gain insights into user experience and system design. In summation, the existing literature is significantly characterized by quantitative and experimental research, whereas qualitative, mixed-method, and longitudinal studies are infrequently encountered, thereby highlighting a methodological deficiency. Future research should adopt more diverse research designs to better understand the effectiveness of generative AI-driven gamification in different learning contexts.

4.5 Antecedents–Mediators–Consequences Framework

The effect of the antecedents is often explained through mediators, such as engagement, motivation, satisfaction, flow experience, perceived usefulness, and interaction level. These mediating variables describe the internal processes through which users respond to gamified and AI-supported systems. The literature shows that the main antecedents are related to technological and system design factors, including AI-based personalization, adaptive game mechanics, feedback systems, rewards and badges, intelligent tutoring, and user interface design. These antecedents represent the key inputs that determine the effectiveness of gamified AI environments. The most frequently cited outcomes encompass learning performance, learning effectiveness, skill acquisition, behavioral intention, technology acceptance, participation levels, and user satisfaction. These observed consequences collectively suggest that the fundamental objective of gamification, particularly when driven by generative AI, is to enhance engagement, improve learning efficiency, and boost user performance.

Table 2: AMC Table based on the Gamification features of Review Studies

Study	AI Gamification Features (A)	Motivation / Engagement (M)	Satisfaction / Experience (M)	Performance / Learning (C)	Behaviour / Participation (C)
Vijay et al. (2025)	✓	✓		✓	✓
Marengo et al. (2025)	✓	✓	✓	✓	
Kassenkhan et al. (2025)	✓	✓	✓	✓	✓
Gómez-Niño et al. (2024)	✓	✓		✓	✓
Lao (2025)	✓		✓		✓
Mäenpää et al. (2025)	✓	✓	✓	✓	✓
Abbes (2024)	✓	✓	✓	✓	
Lampropoulos et al. (2022)	✓	✓		✓	✓

The Antecedent–Mediator–Consequence (AMC) framework was used to classify the key gamification-related variables examined in previous studies (MacInnis, 2011). AI-based gamification features, adaptive systems, and game mechanics were treated as antecedents, while motivation, engagement,

satisfaction, and user experience were considered mediators. The consequences reported in the literature mainly include performance improvement, learning effectiveness, and user participation. The tick marks in Table X indicate the presence of these variables in the reviewed studies.

Conversely, the present review identifies a notable deficiency within the existing body of research. A significant proportion of the extant studies primarily concentrate on the correlation between antecedent variables and resultant outcomes, with mediating processes often overlooked, and context-specific influences infrequently incorporated. Furthermore, the scope of research exploring varied learning environments is restricted, thereby underscoring the necessity for subsequent investigations that incorporate antecedents, mediators, and consequences within a holistic, theoretically grounded framework.

5. RESEARCH GAP

A review of existing research shows several areas that need more study. First, most of the current research on gamification using AI focuses on higher education and digital learning. In contrast, early childhood education and special education settings are not studied as much. Moreover, previous studies often use Self-Determination Theory and Constructivist Learning Theory separately. There's not much research on how these two theories can be combined to explain learning that adapts to the learner's needs.

Third, the rapid development of generative artificial intelligence after 2023 has resulted in new research that has not been fully synthesised in earlier reviews. Fourth important constructs relevant to early education such as pace of learning and response to environment have received limited attention in the existing literature.

These limitations indicate the need for a structured systematic review to synthesise the literature on generative AI-driven gamification and to identify theoretical, contextual, and methodological gaps, particularly in the context of early childhood and special education.

6. ACADEMIC AND PRACTICAL IMPLICATIONS

Our study provides both academic and practical implications for research on generative AI-driven gamification. From an academic perspective, the study contributes to the literature by synthesising prior research using the TCCM framework, which provides a structured understanding of the theories, contexts, characteristics, and methods employed in existing studies. The review shows that most prior research is concentrated in educational environments, while marketing and business applications of AI-driven gamification remain limited, indicating the need for broader contextual exploration. By incorporating the Antecedent–Mediator–Consequence (AMC) perspective, the study also provides a clearer conceptual explanation of how gamification elements and AI-based features influence user responses, such as motivation, engagement, and satisfaction, which, in turn, affect performance and behavioural outcomes. The findings further highlight the need for stronger theoretical integration and more diverse methodological approaches, including qualitative and mixed-method research, to better understand the effectiveness of AI-based gamified systems.

From a practical perspective, the results of this review suggest that integrating generative artificial intelligence with gamification can significantly improve user engagement, experience, and performance through personalisation, adaptive feedback, and intelligent game mechanics. For educators, AI-driven gamification can create personalised, interactive learning environments that enhance student participation and learning outcomes. For marketers and business practitioners, gamification combined with AI technologies can be used to enhance customer engagement, brand interaction, and user retention through adaptive, interactive digital platforms. In addition, system designers can use gamification features such as rewards, feedback, and adaptive difficulty to create more user-centred and effective applications. Overall, the study reveals the importance of designing AI-based gamified systems that are helpful in achieving better outcomes across educational, marketing, and digital environments.

7. LIMITATIONS OF THE STUDY

Our study has several limitations that should be considered while interpreting the findings. First, the review was limited to articles retrieved from the Scopus database and selected academic sources, which may have excluded relevant studies indexed in other databases. Although Scopus is widely recognised for its high-quality peer-reviewed publications, restricting the search to a limited number of databases may reduce the comprehensiveness of the review.

Second, only articles published in the English language were included in the analysis. As a result, relevant studies published in other languages were not considered, which may limit the global representation of research on generative AI-driven gamification. Third, the study focused mainly on journal articles, and conference papers, book chapters, and grey literature were excluded to maintain the quality of the review. This restriction may have resulted in the omission of some recent or emerging studies, particularly in the rapidly developing field of artificial intelligence.

Another limitation relates to the contextual distribution of the reviewed studies. Most of the selected articles were conducted in educational and digital learning environments, while fewer studies examined marketing, business, and customer engagement contexts. Therefore, the findings may not fully represent the application of AI-driven gamification across all domains. In addition, the majority of previous studies used quantitative or experimental research designs, and fewer studies adopted qualitative or longitudinal approaches, which limits the understanding of the long-term effects of gamification.

8. CONCLUSION

Our study conducted a systematic literature review to analyse the existing research on generative AI-driven gamification using the PRISMA method and the TCCM framework. The review shows that research on artificial intelligence and gamification has increased significantly in recent years, particularly after the development of generative AI technologies. The findings indicate that most previous studies focus on educational and digital learning environments rather than pure marketing, where gamification is used to improve engagement, motivation, and performance. Theoretical analysis reveals that Self-Determination Theory, Constructivist Learning Theory, and Technology Acceptance Model are the most frequently used frameworks, although these theories are often applied independently rather than in an integrated manner.

The context analysis shows that higher education and online learning platforms dominate the literature, while marketing, business, and customer engagement contexts remain less explored. The characteristics examined in previous studies mainly include gamification elements, adaptive feedback, personalisation, and intelligent tutoring systems, which are found to influence user motivation, satisfaction, and behavioural outcomes. The methodological analysis indicates that most studies use quantitative and experimental approaches, with limited use of qualitative and longitudinal research designs.

Overall, the review highlights the growing importance of generative AI in enhancing gamified systems and provides a structured understanding of the current state of research. By applying the TCCM and AMC perspectives, the study offers a comprehensive overview of theories, contexts, variables, and methods used in AI-driven gamification research.

9. FUTURE RESEARCH DIRECTIONS

The future research directions that can be suggested for the study are: First, future studies should explore the application of generative AI-driven gamification in diverse contexts such as marketing, customer engagement, healthcare, and business environments, as most existing research is concentrated in educational settings, and personalisation is given utmost importance. Expanding the context of research will provide a better understanding of how gamification and artificial intelligence can be used across different domains. Second, future research should focus on stronger theoretical integration by combining multiple theoretical perspectives such as Self-Determination Theory, Constructivist Learning Theory,

Flow Theory, and Technology Acceptance Model. Integrating these theories can provide a more comprehensive explanation of user behaviour in AI-driven gamified environments. Sticking to a particular theory will limit the knowledge. Third, there is a need for more diverse methodological approaches. Most existing studies use quantitative and experimental designs, while qualitative, mixed-method, and longitudinal studies are limited. Future research should adopt multiple research methods to better understand the long-term effectiveness and user experience of gamified systems. Qualitative research will explore more experiences of the users. Fourth, future studies should examine human-centred and inclusive design in AI-driven gamification, particularly for young learners, users with disabilities, and diverse user groups. Studies are only concentrating on learners who have the power to use their learning skills. Generative AI has the potential to create adaptive and personalised environments, but more research is required to ensure that these systems are effective and ethically designed.

Finally, future research should investigate the relationships among gamification features, psychological mediators, and behavioural outcomes using structured frameworks such as TCCM and AMC to develop stronger conceptual models for AI-driven gamification research.

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