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Review

Quo Vadis Business Simulation Games in the 21st Century?

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Abstract: Business simulation games have become popular in higher education and business environments. The paper aims to identify the primary research trends and topics of business simulation games research using a systematic and automated literature review with the motivation of research (learning driven and domain driven). Based on these findings, the future development of business simulation games research projected papers that research business simulation games were extracted from Scopus. Second, the research timeline, main publication venues and citation trends have been analysed. Third, the most frequent words, phrases, and topics were extracted using text mining. Results indicate that the research on business simulation games has stagnated, with the most cited papers published in the 2000s. There is a balance between learning-driven and domain driven-research, while technology-driven research is scarce, indicating that the technology used for business simulation games is mature. We project that the research on business simulation games needs to be directed in the area of new technologies that could improve communication with and among the users (virtual reality, augmented reality, simulation games) and technologies that could improve the reasoning and decision-making complexity in business simulation games (artificial intelligence).

Keywords: simulation games; digital education; knowledge management; business games; project management; decision; topic mining; text mining

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1. Introduction

With the establishment of simulation games in the 1950s, their production has expanded dramatically, as has the usage of simulation games in formal and informal education. Higher education institutions started integrating simulation games into their courses in the mid-60s to provide an active learning experience to the students [1]. Since then, simulation games have been widely employed to boost students' learning, using both general and tailored simulation games [2]. Further growth of simulation game usage in education occurred in the 21st century, additionally driven by mobile technology [3]. According to the Global Opportunities and Industry Forecast 2020–2027 research, the simulation and virtual training market was worth $204.41 billion in 2019 and is projected to reach $579.44 billion by the end of 2027 [4].

Modern generations, such as Generation Z, demand changes in learning processes suited for the new digital era. Generation Z strives for informal learning and is interested in using various new information and communication technologies in the educational process [5,6]. Applying game elements, such as simulation games, within the educational process is one of the major innovative ways to motivate students, which is especially important in business and management education [7]. Business simulation games allow students to learn by experiencing different situations in a simulated environment. In addition to their usage in formal learning, business simulation games are often used in informal learning, such as business professionals, who first make business decisions in a simulated environment to improve their decision-making skills and avoid mistakes in real business settings [7].

This change has naturally led to increased scientific research on business simulation games [8]. Several systematic literature reviews were conducted about business simulation games. The first group of reviews focuses on a narrow group of business simulation games, focusing on a specific business function, such as decision support systems [9], project management [10], and business process change [11]. The second group of reviews focus on the learning outcomes and is driven by specific research questions, such as empirical evidence of learning and effective teaching [4] and the impact of simulation games on capabilities in decision-making and cognitive skills [12]. The third group of reviews focus on the usage of specific technology, such as neuroscience research devices [13,14] and virtual reality [15]. These groups of reviews can be referred to as domain-driven, technology-driven, and learning-driven research. However, the limitation of these reviews is that they focus on a single topic, engaging in a microlevel analysis focusing on a narrow aspect of business simulation games. Only one review could be considered a macrolevel analysis [4], but it did not include all topics related to business simulation games.

The current literature reviews were mostly applied as systematic literature reviews (SLRs), using standard formats such as Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which is time-consuming, causing their narrow focus. Automated literature reviews (ALRs) using natural language processing, such as word extraction, phrase extraction, and topic mining, overcome the barriers of SLRs [16]. Using ALRs allows the unstructured analysis of research papers, allowing the broad macrolevel analysis, which leads to the extraction of a broad range of topics, thus overcoming the narrow focus of SLRs.

The current study uses a mixed approach, combining SLR and ALR to analyse the research on business simulation games to address the gaps mentioned above and deliver a wider perspective on the research trends and perspectives. This work combines computational and qualitative methods to identify important research themes, examine temporal trends of those issues over the past several decades, and suggest viable future avenues in business simulation games research. This article discusses the subsequent research questions: What are the primary research trends and topics in business simulation games research? What is the balance between learning-driven and domain-driven research topics? The answers to both questions will be used for developing the future development of business simulation games research (Figure 1).

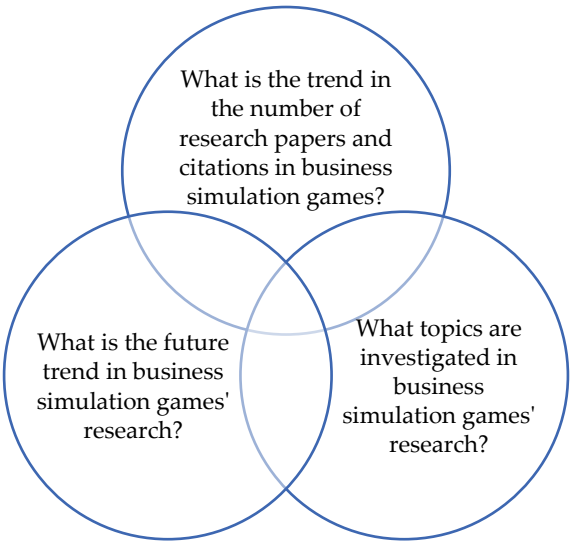

Figure 1. Research questions; Source: Authors' work.

The paper has several contributions. First, to the best of our knowledge, this is the first study to analyse research on business simulation games using the combined SLR and ALR approach. Second, the proposed framework for data analysis is a versatile method

applicable to numerous research topics. Thirdly, this work can shed light on previous and future research on business simulation games by examining the most important research trends and themes from 1973 to 2023.

To achieve the specified objective of the study, this paper is organised as follows. The first part of the paper delivers an introduction to the selected theme. After the introduction, the theoretical background is given in the second part of the paper, presenting the background for investigating simulation game perspectives in several fields. The third part of the paper refers to the methodology used in the paper. The fourth part of the paper presents the results obtained by the mixed research methods. Finally, in the fifth part of the paper, final concluding remarks, limitations of the paper, as well as recommendations for further research are provided.

2. Theoretical Background

2.1. Simulation Games

Simulation can be defined as an already-known process from the real world, represented in a safe, non-mistakable environment [17]. It is generated by a mathematical/algorithmic model allowing numerous diverse solutions for different situations of the presented process [18]. Furthermore, the simulation represents a methodology that supports recognising and understanding the relationship between entities and other components of the same process [19]. Namely, simulation represents the specific model for testing, evaluating, and using simulated processes in reality [19]. On the other hand, the game can be defined as a simulative, virtual environment for attaining the most attention of the player in specific situation/s [17]. Additionally, the game motivates the player to achieve the best score based on their performance and provides the player with experiences of win or loss scenarios [17]. According to [20], the game is founded on several components such as (i) mechanics that define the main aim of each game; (ii) stories that define the process flow of the game; (iii) aesthetics that represent the optical, auditory, and emotional sense of the player for each game; and (iv) applied technologies that provide physical support for using the game.

Many authors still need to debate using both terms, simulation and game, as one concept due to their differences in objectives and characteristics [21]. However, numerous authors defined and described simulation games from different perspectives over time, but, persistently, they observed it as one concept called "simulation games". Nowadays, in academic circles, it is also common to use the term "digital simulation games" for simulation games since many of them are mostly supported by a digital platform or by some other digital tool or software [21].

Simulation games are designed to combine the virtual and the real world. The simulation game design encloses the conceptual content establishment and the game process development that together support predefined game objectives. It is also significant to comprehend that the process flow of designing games is moving forward from the real to the virtual (game) world while applying the game proceeds from the virtual (game) to the real world [22]. According to the authors of [23], a simulation game is a mash-up of game and simulation elements representing rivalry, collaboration, rules, participants, and characters with powerful, real-world features. Furthermore, simulation games support mutual communication between game participants [24]. Therefore, simulation games bring real real-world problems closer to the player and make it easier for the player to solve them [24].

Various authors emphasise the role of simulation games in the educational system, e.g., [17,25,26]. For example, the authors of [27], in their study from 1989, highlighted the 30 year-long application of business simulation games for learning and teaching purposes. Their widespread utilisation in education stems precisely form the goals of simulation games, which are always in some way oriented toward learning new processes, phenomena, etc. [24,28]. According to the authors of [9,22], simulation games allow students to experience the real world in a "safe, simulated" environment. In that way, simulation

games encourage students to acquire new knowledge interestingly through practical work and active participation in solving certain problems [9,22]. Similarly, the authors of [21] argue in their work about how simulation games use the scenario-based technique to support students in applying existing knowledge and gaining new knowledge within a certain situation/problem. In addition to motivating students to acquire new knowledge, simulation games also improve learning efficiency, enhance students' performance in the education system, and facilitate quality communication between students [29].

2.2. Business Simulation Games

The first business simulation game, Monopologs, appeared in 1955 and was developed by Rand Corporation and based on experiencing the U.S. Air Force logistics system [30,31]. Over time, the development of different business simulation games for various purposes increasingly progressed due to the strong research and practice interest in their utilisation possibilities [27]. According to the authors of [23], business simulation games are used for numerous purposes but are most recognisable in the education sector as a tool for teaching and learning. However, over time, more organisations are recognising the importance of simulation games' role in business management and are starting to use business simulation games to achieve certain business goals [23]. Therefore, business simulation games today acquire their role in different human life fields such as information technology, learning, teaching, strategic and operations management (business decision-making), accounting, medicine, administration, engineering, etc. [17,22,24,31–33]. Disciplines that are, at first sight, outside of the scope of business are also often the topic of the simulation's research, which can be the basis for the simulation games' development, such as health care [34], sustainable urban development [35], business process management [36], enterprise resource planning [37], investments [38], and knowledge management [39].

The obstacles and perspectives of business simulation games are relevant to research topics since they reveal the problems and perspectives of their implementation in higher educational institutions and business entities [40,41].

Research on business simulation games can be domain driven, technology driven, and learning driven.

Domain-driven research on business simulation games focuses on a specific field of business. Numerous authors investigate the role of simulation games and their importance in learning various domains, such as economics, finance, and the business management of different organisations, e.g., [31,42,43]. For example, the authors of [44] accentuate the importance of simulation games in learning business finance. However, in addition to the education field, the authors of [31] emphasise how papers dealing with business simulation games are also linked to research topics such as decision-making, teamwork and similar experience gaining, and strategy development. Similarly, the authors of [42] accentuate how quality business strategy establishment and successful business process management depend on simulation games. According to the organisational level, simulation games are mostly domain driven and can be divided into three categories: (1) top management business simulation games focused on gaining management experience; (2) functional business simulation games oriented to take on a role in one of the organisation's departments; and (3) concept business simulation games relating to taking on a role in the management of a particular business concept such as sales [31].

Technology-driven research on business simulation games focuses on a specific technology used in a simulation game design, such as neuroscience research devices [13,14] and virtual reality [15].

Learning-driven research on business simulation games focuses on the impact of simulation games on formal and informal learning. Research in this area is vast. In their work, the authors of [32] stress that applying simulation games were the key determinant for achieving quality decision-making processes and increasing teamwork effectiveness. According to the authors of [21], simulation games ensure higher levels of analytical, strategic, problem solving, social, and communication skills among employees, enhance

the possibility of making quality and efficient negotiations, and support gaining mutual knowledge and making decisions within the team. Accordingly, simulation games can be used in the organisation to train employees to work in new systems, which, in turn, can facilitate the adoption of new information systems in organisations [9]. Learning-driven research on business simulation games can be divided into two categories: (1) research on business simulation games as a teaching tool that helps teachers to present and explain complex concepts to facilitate presentation, analysis, and evaluation of business problems; and (2) research on business simulation games as a training method which enables students to acquire new skills, the application of which will solve a certain business problem in a safe and fast way in reality [23].

Domain-driven and learning-driven approaches are, in some cases, combined. For example, the authors of [10], in their work, refer to some of the previously mentioned skills that are comprised within the project management field (e.g., negotiations, problem-solving skills, decision making, etc.), which have also been improved in people who have used simulation games to learn to manage projects more effectively.

Bearing in mind all facts mentioned above in the theoretical part of the paper, a need for synthesised literature on the chosen topic and more detailed knowledge of the fields where business simulation games are applied and investigated arises. Accordingly, a bibliometric analysis is conducted, followed by text and topic analysis of papers published on business simulation games.

3. Methodology

A mixed-method approach combining SLR and ALR was used to fulfil the paper's goals and obtain deep knowledge.

3.1. Systematic Literature Review

SLR refers to the process of a stand-alone literature review conducted systematically, formally, and rigorously [45]. SLR was conducted by searching the literature within the Scopus database as one of the most prominent indexing service engines [46]. Figure 2 represents the stages of SLR.

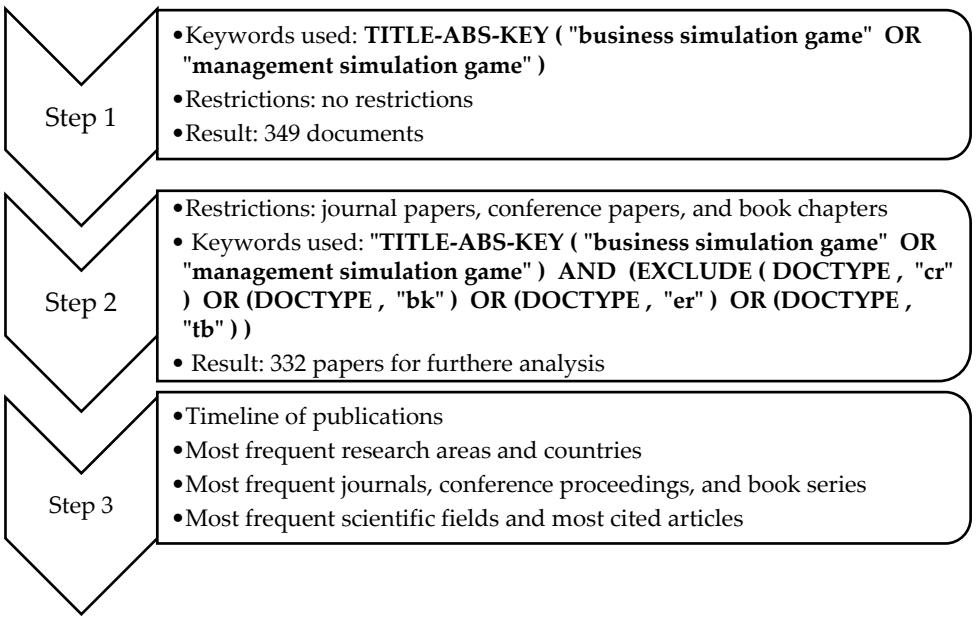

Figure 2. Stages of SLR; Source: Authors' work.

In the first step of the search process, the keywords "business simulation game" OR "management simulation game" were used. The search covered title, abstract, and keywords, and the timespan was all years (from 1955 to 2022). In the first step, 349 documents

were extracted. Among these documents were 14 conference reviews, 1 book, 1 retraction, 1 note, and 1 erratum. In the second step, the search process was restricted by specific research fields, excluding conference reviews, books, retractions, and erratus, resulting in the extraction of 332 papers published in journals, book chapters, and conference proceedings. In the third step, bibliometric analysis was conducted, including a timeline of publications, most frequent research areas and countries, most frequent journals and conference proceedings, book series, most frequent scientific fields, and most cited articles.

3.2. Automated Literature Review

In the second stage, ALR was conducted using a text mining approach, automatically extracting comprehensive information from text [47].

Wordstat was used for text mining analysis [48]. Scientific articles were mined for valuable information, patterns, nontrivial knowledge, and trends using word, phrase, and topic extraction [49].

First, the most frequent words were extracted from the papers. Second, the most frequent phrases were extracted from the papers. To provide a timeline of the research, phrases were analysed concerning the year of the paper's publication. Third, topic mining was conducted using cluster analysis, which was performed using the average-linkage hierarchical clustering algorithm [50]. The distance between two clusters represents the medium distance between each observation in one cluster and every other observation. The dendrogram defines only the temporal order of the branching sequence; the sequence of phrases cannot be interpreted as a linear representation of those distances [51]. Therefore, any cluster on the dendrogram can be rotated across its branches without affecting its signification. The extracted information is visually presented in word clouds, bubble plots, and dendrograms [52].

Figure 3 represents the stages of ALR.

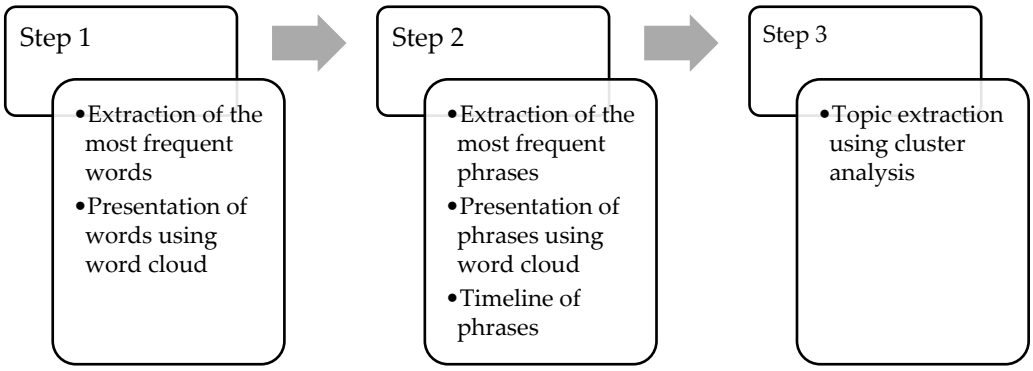

Figure 3. Stages of ALR; Source: Authors' work.

4. Results

4.1. Systematic Literature Review

This chapter presents: (i) the timeline and paper access type; (ii) the most frequent research areas and countries; (iii) the most frequent journals and conference proceedings and book series; and (vi) the most cited articles.

Figure 4 presents the publication years of the research papers from the Scopus database. The first 5 papers indexed in Scopus that researched business simulation games were published in 1973. In the next three decades, the number of papers was constant, ranging from 1 to 5 per year. Business simulation games became a more attractive research topic in the 21st century, with a rapid increase in 2008. Both 2012 and 2016 are the years with the most published papers related to the topic, with five or 10.2% of papers. The timeline is approximated by the linear trend, with a coefficient of determination of 56.69%.

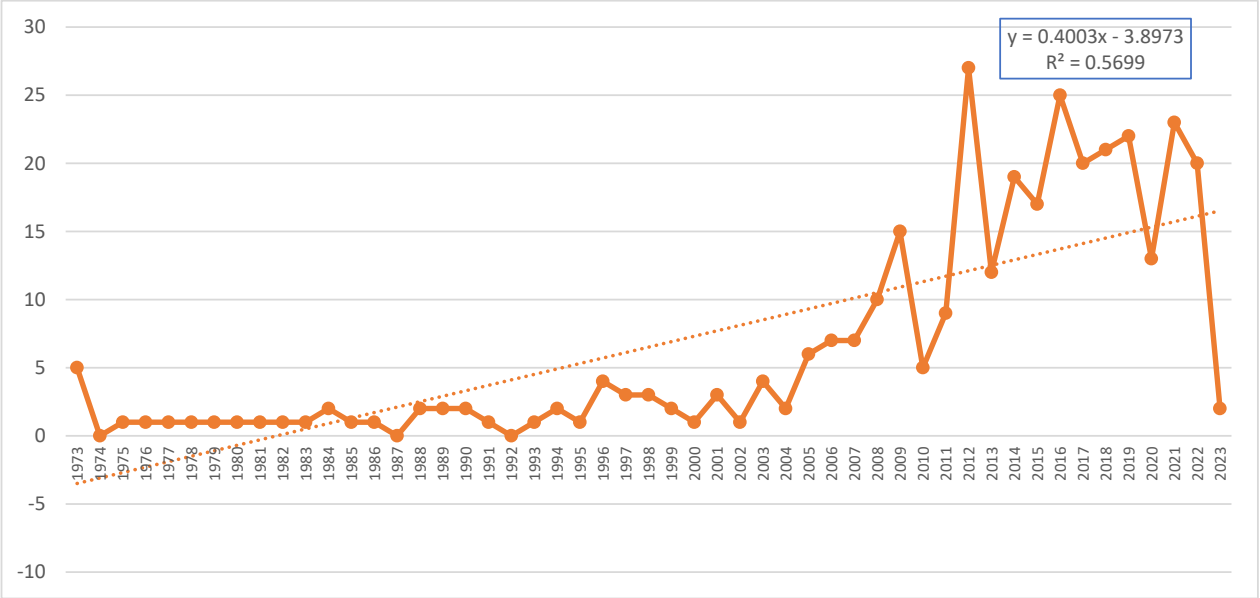

Figure 4. Number of papers per publication year (2000−2021); Source: Authors' work based on Scopus.

Figure 5 presents the paper's access availability in two periods: (i) 1973 to 1999; and (ii) 2000 to 2023. From 1973 to 1999, the papers were predominately published in paid subscription publications (88%). Although the number of paid subscriptions decreased from 2000 to 2023, it is still more than half of the papers (59%). The number of papers published in all forms of open access has increased substantially. As per Figure 5, the highest increase is in the category All open access, which increased from 5% to 18% of publications, is followed by the increase in green open access, which increased from 5% to 11%. Gold open access increased from 2% to 8%. Bronze and Hybrid Gold did not even exist before 2000. However, the number of papers published in these modes of publication is still low (2% per category).

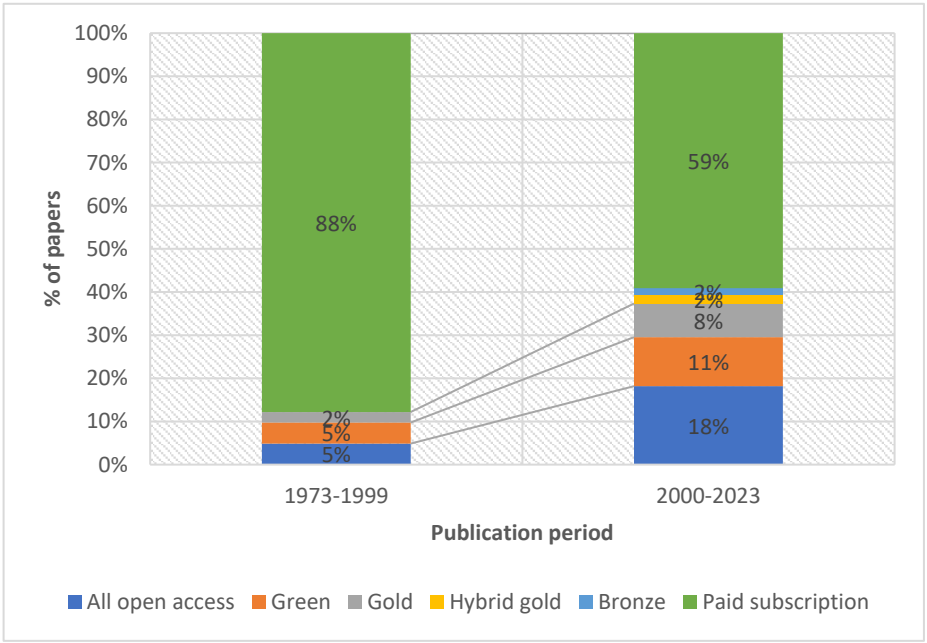

Figure 5. Paper's access type in the period 1973–1999 vs. 2000–2023; Source: Authors' work based on Scopus.

Table 1 presents the paper's research areas. Most papers fell into the Computer Science category with 54%; the second most represented areas are Social Sciences with 37%; and Business, Management, and Accounting with 31% papers. The remaining papers fell into various research areas such as Engineering (22%); Mathematics (12%); Economics, Econometrics, and Finance (6%); Decision Sciences (6%); Psychology (6%); and Environmental Science (5%). Other various research areas cover 17% of research papers.

Table 1. Research areas.

Subject Area	Documents
Computer Science	54%
Social Sciences	37%
Business, Management, and Accounting	31%
Engineering	22%
Mathematics	12%
Economics, Econometrics, and Finance	6%
Decision Sciences	6%
Psychology	6%
Environmental Science	5%
Other research areas	17%

Source: Authors' work based on Scopus.

Figure 6 presents the author's countries. Most of the authors were from the USA (16.3%). The German authors produced 13.0% of papers, the United Kingdom authors 9.7%, Spanish 8.2%, Taiwan authors 6.0%, and Finnish authors 5.7%. The result shows that the topic is investigated worldwide, in the USA, and Western European countries.

Figure 6. The research paper's countries; Source: Authors' work based on Scopus.

Table 2 presents the research papers' publication in journals, conference proceedings, or book series. The research papers were published in various publications related to education, management, information technology, the environment, and other topics. However, these publications are highly diversified. The journal in which most of the research is published is Simulation and Gaming (6%), followed by Lecture Notes in Computer Science (3%). Other journals and conference proceedings published less than 10 papers in the observed period, indicating that there is still no dominant publication venue for research on business simulation games.

Table 2. The research papers publication journals, conference proceedings, or book series.

Source	# of Papers	% of Papers
Simulation and Gaming	19	6%
Lecture Notes in Computer Science, Lecture Notes in Artificial Intelligence, Lecture Notes in Bioinformatics	10	3%
International Journal of Management Education	8	2%
Communications in Computer and Information Science	7	2%
Computers and Education	7	2%
ACM International Conference Proceeding Series	5	2%
Advances in Intelligent Systems And Computing	5	2%
Journal of Educational Computing Research	5	2%
Procedia Computer Science	5	2%
Proceedings Winter Simulation Conference	4	1%
Journal of Business Research	3	1%
Journal of Marketing Education	3	1%
Lecture Notes in Informatics Proceedings Series of The Gesellschaft Fur Informatik	3	1%
Simulation Gaming	3	1%
Sustainability Switzerland	3	1%

Source: Authors' work based on Scopus.

Table 3 presents statistics about paper citations. Among 332 analysed documents, most of them (241 documents or 72.59%) were cited at least once in Scopus. The total number of citations is 5570, and the total number of citations without self-citations is 5363. On average, one document was cited 17.38 times, and 16.15 without self-citations. The total h-index for the documents regarding the topic is 34, which confirms the relevancy of the topic.

Table 3. Citation statistics.

# of papers (1973–2022)	332
# of cited papers (1973–2022)	241
# of citations	5570
# of self-citations	407
Average citation per paper	17.38
Average citation per paper without self-citations	16.15
h-index	34

Source: Authors' work based on Scopus.

Figure 7 shows the times cited and publications over time. Both 2012 and 2016 have the most publications, earlier years have fewer, and, in recent years, the number of publications on the topic is increasing, except in 2020, which can be explained by the trend that most of the publications were oriented toward the COVID-19 pandemic crises during that time [53]. As for the citations, the Figure 8 shows that the number of citations varies in line with the number of publications. Both the number of papers and the number of citations is increasing, indicating that the topic's importance has been increasing over the years and is correlated (Figures 7 and 8).

Table 4 presents the top 10 most cited publications on the topic. The most cited papers are mainly from the early 2000s.

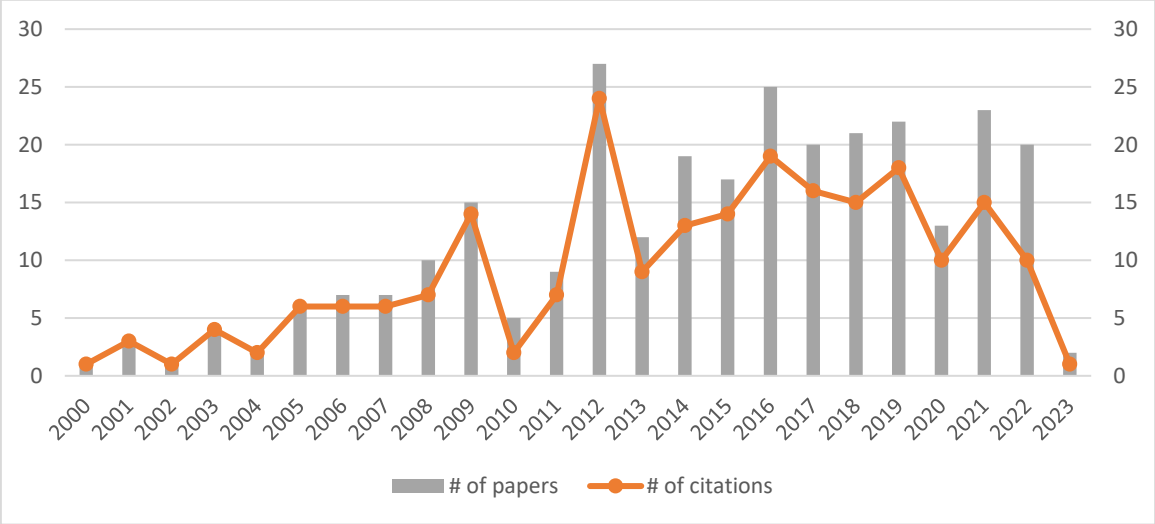

Figure 7. Number of papers and citations from 2000 to 2023; Source: Authors' work based on Scopus.

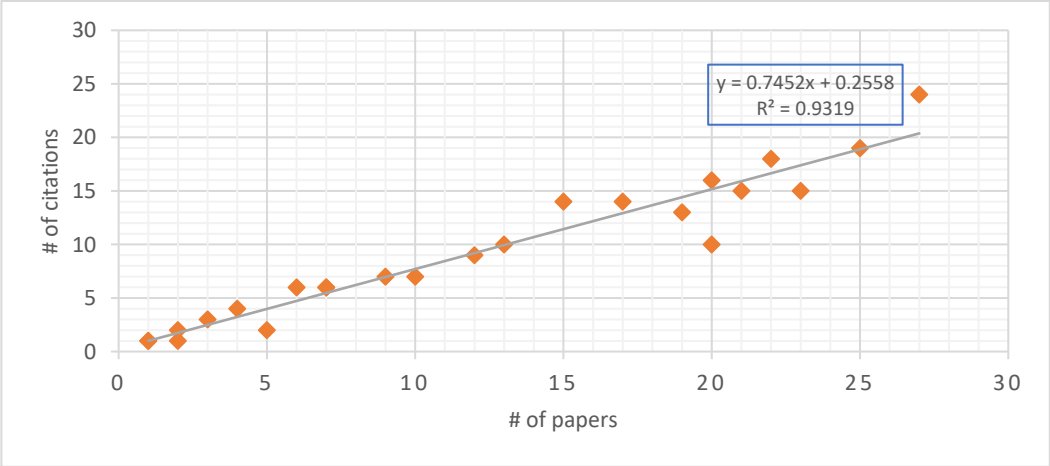

Figure 8. Scatter plot of the number of papers and citations from 2000 to 2023; Source: Authors' work based on Scopus.

Table 4. Number of citations of the top 10 most cited publications.

Paper	Publication Year	# of Citations					Primary Research Motivation	
		<2019	2019	2020	2021	2022	Learning-Driven	Domain-Driven
[54]	2007	334	28	30	37	25	∅	✓
[55]	2002	275	25	19	15	20	∅	✓
[56]	2000	202	7	6	12	8	∅	✓
[31]	2009	141	13	14	22	15	∅	✓
[57]	2014	77	26	34	27	33	✓	∅
[58]	2007	150	11	12	9	14	✓	∅
[59]	2011	86	15	19	34	28	✓	∅
[60]	1988	142	10	7	3	6	✓	∅
[30]	1998	133	8	7	7	1	∅	✓
[29]	2009	107	12	6	12	15	✓	∅

Source: Authors' work based on Scopus.

The two top most cited papers investigate the impact of knowledge coordination on virtual team performance over time using business simulation games [54,55]. The third most cited paper investigates the knowledge and group characteristics while playing business simulation games [56]. Two papers provide an overview of business gaming [30,31].

The rest of the ten most-cited papers are related to education, followed by business and management, and one paper explains the taxonomy of the given topic.

Primary research motivation was also investigated. It can be concluded that half of the most cited papers are dominantly learning driven, the other half were domain driven, and none were technology driven.

4.2. Automated Literature Review

This part of the paper presents the results of ALR: (i) the most frequent words; (ii) the most frequent phrases; and (iii) the extracted topics of the research.

Table 5 presents the extraction of the words with the highest occurrence in the empirical papers. The analysis did not include words directly related to the topic of research such as simulation, business, and management.

Table 5. Extracted words (100+ frequency).

WORDS	FREQ.	NO. CASES	% CASES	TF • IDF
LEARNING	720	175	52.87%	199.3
STUDENTS	466	161	48.64%	145.9
RESEARCH	229	120	36.25%	100.9
EDUCATION	213	109	32.93%	102.8
RESULTS	208	141	42.60%	77.1
DECISION	180	72	21.75%	119.2
KNOWLEDGE	179	77	23.26%	113.4
TEACHING	179	79	23.87%	111.4
SKILLS	173	76	22.96%	110.5
PERFORMANCE	163	66	19.94%	114.1
DEVELOPMENT	150	83	25.08%	90.1
DESIGN	148	84	25.38%	88.1
ANALYSIS	145	82	24.77%	87.9
EXPERIENCE	142	72	21.75%	94.1
SYSTEMS	141	59	17.82%	105.6
MODEL	139	66	19.94%	97.3
TEAM	137	32	9.67%	139.0
DATA	121	68	20.54%	83.2
ENVIRONMENT	119	67	20.24%	82.6
MAKING	117	61	18.43%	85.9
PROCESS	117	71	21.45%	78.2
STUDENT	117	50	15.11%	96.0
PROJECT	108	29	8.76%	114.2
TRAINING	108	56	16.92%	83.3
SYSTEM	106	45	13.60%	91.9

Source: Authors' work based on Scopus.

The highest TF-IDF value has the word "learning", which occurs 720 times. Among the top ten most frequently mentioned words in the observed papers are words such as "students", "research", and "education", which are related to the topic itself, and they appear in more than 50% of observed papers. Furthermore, among the top ten most frequently mentioned words are words such as "decision", "knowledge", and "teaching", which pinpoint the interconnection of the observed topic with education and research.

Among the most frequently mentioned words are also words that connect the topic to the educational process, as well as the words such as "performance", "development", and "design", which relate the selected topic to business performance and the connection to the practice.

Research motivation (learning driven, domain driven, and technology driven) was not investigated due to the generic nature of extracted words.

Figure 9 shows word cloud visualisation of the words with the highest occurrence among the selected papers.

Figure 9. Word cloud word occurrence; Source: Authors' work based on Scopus.

Table 6 presents the phrase extraction of the phrases with the highest occurrence in the selected papers to develop further in-depth knowledge of the business simulation games and the application fields. The phrase with the highest frequency and TF-IDF index indicating relevance is "decision making", which occurs 96 times in the 48 research papers emphasising the relevance of the simulation games for decision-making training. "Supply chain" is the second phrase with the highest frequency in the selected papers, which occurs 66 times in 22 papers. The third phrase with the highest frequency is "learning outcomes", which occurs 60 times in 29 papers. The top ten most frequently used phrases are mostly domain driven, such as "higher education", "experiential learning", "learning environment", "real world", and "teaching and learning". However, several phrases are domain driven, such as "decision support systems", "entrepreneurship education", "sustainable development", "enterprise resource planning", and "football manager". Primary research motivation was also investigated. It can be concluded that most of the frequent phrases are dominantly learning driven; several were domain driven, while, again, none of the papers were technology driven.

Table 6. Extracted phrases (10+ frequency).

WORDS	FREQ.	NO. CASES	% CASES	TF • IDF	Primary Research Motivation	
					Learning-Driven	Domain-Driven
DECISION MAKING	96	48	14.50%	2	✓	∅
SUPPLY CHAIN	66	22	6.65%	2	∅	✓
LEARNING OUTCOMES	60	29	8.76%	2	✓	∅
HIGHER EDUCATION	44	30	9.06%	2	✓	∅
EXPERIENTIAL LEARNING	34	21	6.34%	2	✓	∅
LEARNING ENVIRONMENT	31	16	4.83%	2	✓	∅
DECISION SUPPORT SYSTEMS	31	13	3.93%	3	∅	✓
REAL WORLD	26	20	6.04%	2	✓	∅
TEACHING AND LEARNING	26	19	5.74%	3	✓	∅
TEACHING METHODS	26	11	3.32%	2	✓	∅
INTELLIGENT TUTORING	24	5	1.51%	2	✓	∅
FLOW EXPERIENCE	23	7	2.11%	2	✓	∅
TEAM COHESION	23	4	1.21%	2	✓	∅
PROBLEM SOLVING	22	16	4.83%	2	✓	∅
LEARNING PROCESS	20	15	4.53%	2	✓	∅
ENTREPRENEURSHIP EDUCATION	20	7	2.11%	2	∅	✓
TEAM PERFORMANCE	19	7	2.11%	2	✓	∅
SUSTAINABLE DEVELOPMENT	19	4	1.21%	2	∅	✓
PERCEIVED LEARNING	17	10	3.02%	2	✓	∅
EMOTIONAL INTELLIGENCE	17	2	0.60%	2	✓	∅
LEARNING EXPERIENCE	15	12	3.63%	2	✓	∅
ENTERPRISE RESOURCE PLANNING	15	11	3.32%	3	∅	✓
LEARNING PERFORMANCE	15	7	2.11%	2	✓	∅
STUDENT ENGAGEMENT	15	4	1.21%	2	✓	∅
HUMAN FACTORS	14	6	1.81%	2	✓	∅
UNDERGRADUATE STUDENTS	13	13	3.93%	2	✓	∅
SKILLS DEVELOPMENT	13	11	3.32%	2	✓	∅
DESIGN METHODOLOGY	12	12	3.63%	2	✓	∅
INFORMATION SYSTEMS	12	10	3.02%	2	∅	✓
LEARNING EFFECTIVENESS	12	7	2.11%	2	✓	∅
ACTIVE LEARNING	12	7	2.11%	2	✓	∅
INTRINSIC MOTIVATION	11	5	1.51%	2	✓	∅

Table 6. *Cont.*

WORDS	FREQ.	NO. CASES	% CASES	TF • IDF	Primary Research Motivation	
					Learning-Driven	Domain-Driven
ARTIFICIAL INTELLIGENCE	11	5	1.51%	2	∅	✓
ENTREPRENEURIAL ATTITUDE	11	4	1.21%	2	∅	✓
TRANSFORMATIONAL LEADERSHIP	11	3	0.91%	2	∅	✓
DATA COLLECTED	10	10	3.02%	2	✓	∅
KNOWLEDGE AND SKILLS	10	9	2.72%	3	✓	∅
QUASI EXPERIMENTAL	10	9	2.72%	2	✓	∅
TECHNOLOGY ACCEPTANCE MODEL	10	8	2.42%	3	✓	∅
STUDENTS PERCEPTIONS	10	7	2.11%	2	✓	∅
THINKING SKILLS	10	5	1.51%	2	✓	∅
HIGHER ORDER THINKING	10	4	1.21%	3	✓	∅
VIRTUAL TEAMS	10	4	1.21%	2	✓	∅
TEAM LEARNING	10	3	0.91%	2	✓	∅
ERP CHALLENGE	10	2	0.60%	2	∅	✓
FOOTBALL MANAGER	10	2	0.60%	2	∅	✓
REMEDIAL TUTORING	10	1	0.30%	2	✓	∅

Source: Authors' work based on Scopus.

Figure 10 shows word cloud visualisation of the phrases with the highest occurrence among the selected papers.

Figure 10. Word cloud phrase occurrence (10+ occurrence); Source: Authors' work based on Scopus.

Figure 11 presents the bubble plot of the frequency of the most frequent keywords per publication year.

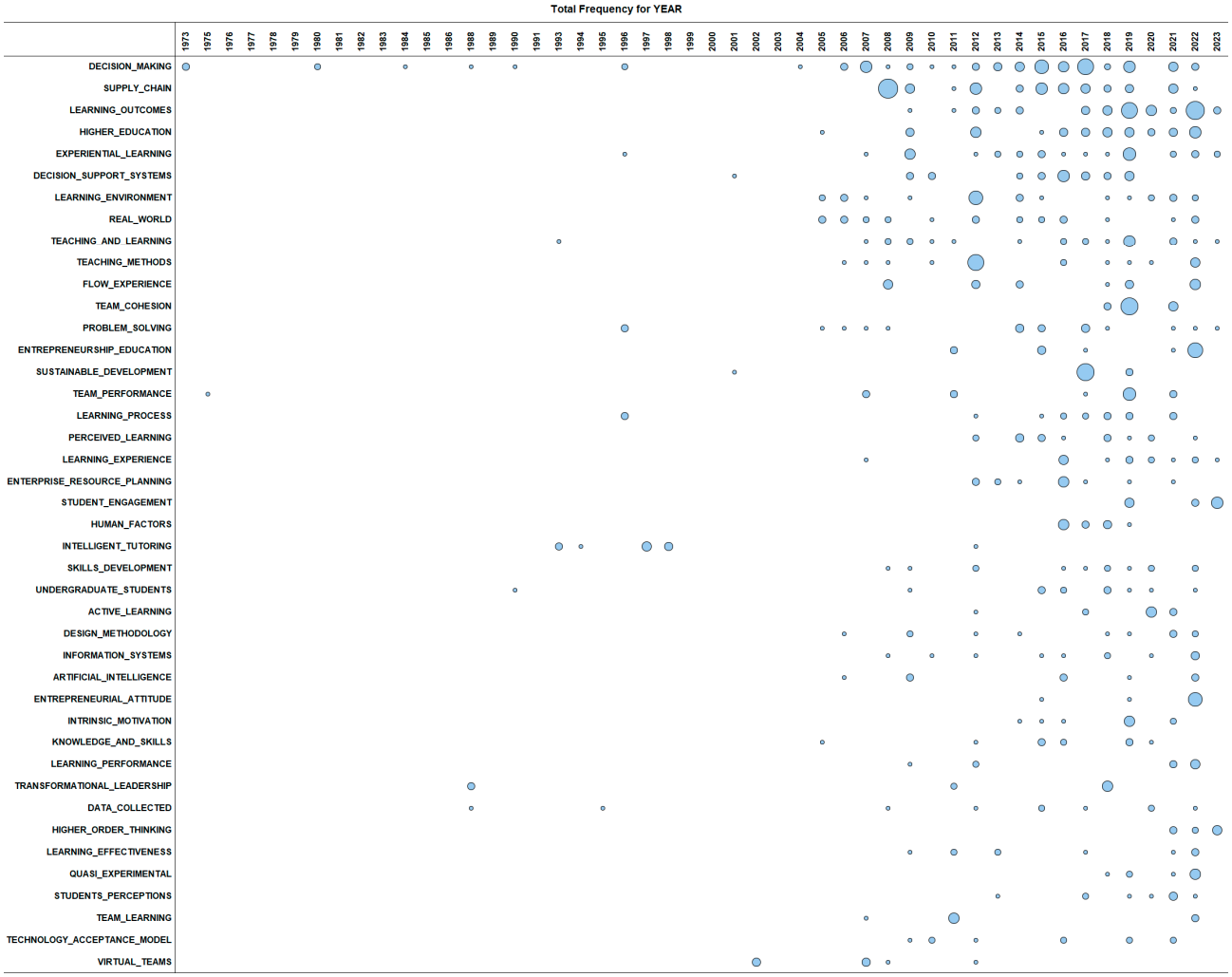

Figure 11. Bubble plot of the publication's total frequencies; Source: Authors' work based on Scopus.

For instance, the most frequently occurring phrase listed in Table 6 (decision making) is first mentioned in the paper published in 1973. Still, it is mostly mentioned in novel publications, demonstrating its relevance in recent years. Most of the phrases have occurred more frequently during the last ten years, with only a few mentions in earlier publications. Papers with learning-driven phrases related to education and learning have a constant interest.

Table 7 presents the highest frequency keywords per publication year, highlighting the most important keywords at the given period. The table shows that the different periods concentrate on different aspects of the business simulation games. For instance, papers from 2000 to 2005 focused on sustainable development, virtual teams, and real-world research and learning environments. That indicates that businesses adopted simulation games firstly for decision-making support. From 2005, the investigation focused on higher education and learning management from 2005 to 2010 could be described as knowledge driven. The next decade shows the expansion of interest in the topic from different aspects. It introduces various business simulation games in several domains, such as information systems, entrepreneurship, sustainable development, enterprise resource planning, and football. The papers from 2015 explore business simulation games from numerous perspectives, according to the current state of business, education, and technological development.

Table 7. Highest frequency keywords per year.

Year	Highest Frequency Keywords per Year
1973	DECISION_MAKING
1975	TEAM_PERFORMANCE
1980	DECISION_MAKING
1988	TRANSFORMATIONAL_LEADERSHIP; DATA_COLLECTED
1990	UNDERGRADUATE_STUDENTS
1993	INTELLIGENT_TUTORING; TEACHING_AND_LEARNING
1994	INTELLIGENT_TUTORING
1995	DATA_COLLECTED
1996	LEARNING_PROCESS; PROBLEM_SOLVING
1997	INTELLIGENT_TUTORING
1998	INTELLIGENT_TUTORING
2001	SUSTAINABLE_DEVELOPMENT
2002	VIRTUAL_TEAMS
2005	REAL_WORLD; LEARNING_ENVIRONMENT
2006	REAL_WORLD; LEARNING_ENVIRONMENT
2007	VIRTUAL_TEAMS; TEAM_PERFORMANCE; DECISION_MAKING; REAL_WORLD
2008	SUPPLY_CHAIN; FLOW_EXPERIENCE
2009	EXPERIENTIAL_LEARNING; ARTIFICIAL_INTELLIGENCE; DESIGN_METHODOLOGY
2010	TECHNOLOGY_ACCEPTANCE_MODEL; DECISION_SUPPORT_SYSTEMS; INFORMATION_SYSTEMS
2011	TEAM_LEARNING; TEAM_PERFORMANCE; ENTREPRENEURSHIP_EDUCATION; LEARNING_EFFECTIVENESS; TRANSFORMATIONAL_LEADERSHIP
2012	TEACHING_METHODS; LEARNING_ENVIRONMENT
2013	LEARNING_EFFECTIVENESS; ENTERPRISE_RESOURCE_PLANNING
2014	PERCEIVED_LEARNING; PROBLEM_SOLVING
2015	KNOWLEDGE_AND_SKILLS; ENTREPRENEURSHIP_EDUCATION; UNDERGRADUATE_STUDENTS; PERCEIVED_LEARNING
2016	HUMAN_FACTORS; ENTERPRISE_RESOURCE_PLANNING; LEARNING_EXPERIENCE; DECISION_SUPPORT_SYSTEMS; ARTIFICIAL_INTELLIGENCE
2017	SUSTAINABLE_DEVELOPMENT; DECISION_MAKING; HUMAN_FACTORS; PROBLEM_SOLVING
2018	TRANSFORMATIONAL_LEADERSHIP; HUMAN_FACTORS; UNDERGRADUATE_STUDENTS
2019	TEAM_COHESION; INTRINSIC_MOTIVATION; TEAM_PERFORMANCE; LEARNING_OUTCOMES; STUDENT_ENGAGEMENT
2020	ACTIVE_LEARNING; DATA_COLLECTED; LEARNING_OUTCOMES; SKILLS_DEVELOPMENT
2021	STUDENTS_PERCEPTIONS; HIGHER_ORDER_THINKING; TEAM_COHESION; LEARNING_PERFORMANCE; ACTIVE_LEARNING
2022	ENTREPRENEURIAL_ATTITUDE; ENTREPRENEURSHIP_EDUCATION; QUASI_EXPERIMENTAL; LEARNING_OUTCOMES; LEARNING_PERFORMANCE
2023	STUDENT_ENGAGEMENT; HIGHER_ORDER_THINKING; LEARNING_OUTCOMES; EXPERIENTIAL_LEARNING; LEARNING_EXPERIENCE

Source: Authors' work based on Scopus.

The final step of the analysis is topic mining which was conducted to extract clusters of phrases providing a more precise description of the research topics of the papers in the field of business simulation games. The cluster analysis was conducted using the Wordstat program, and seven different clusters were extracted, as presented in Figure 12. Figure 13 presents the mapping of clusters and cluster phrases, indicating the relevance and cohesion of the cluster items.

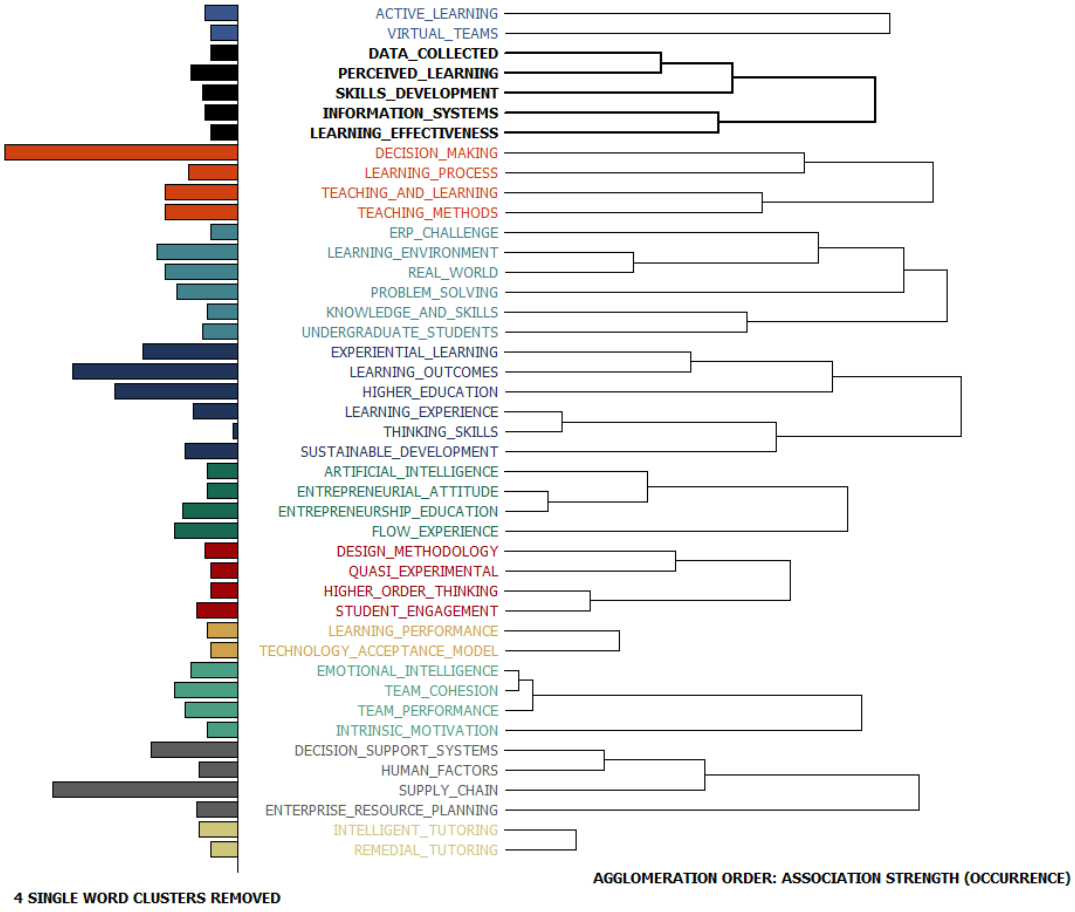

Figure 12. Cluster results of the phrases; Source: Authors' work based on Scopus.

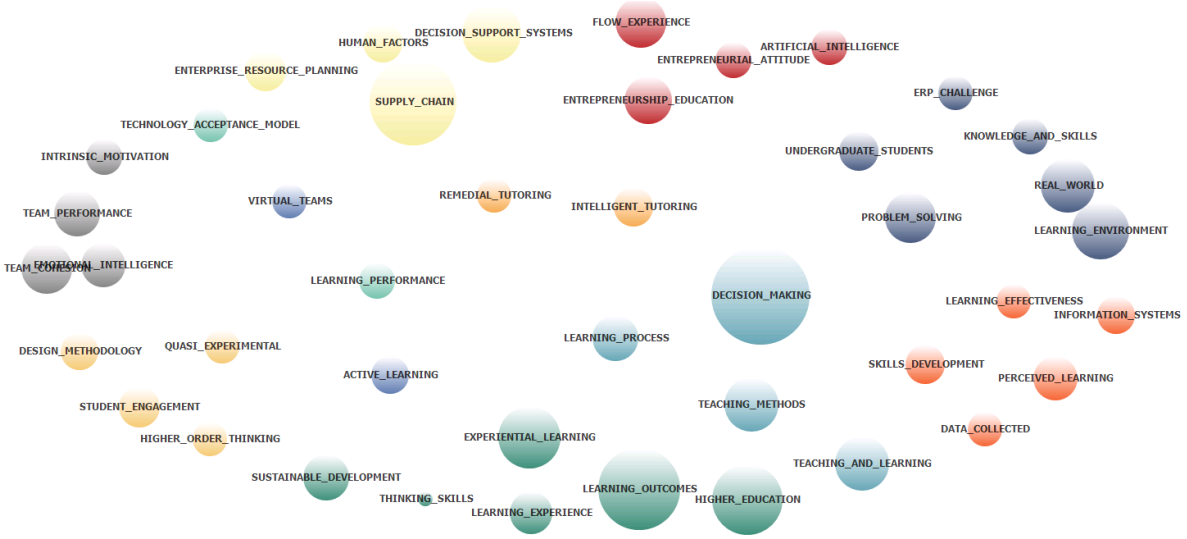

Figure 13. Mapping of clusters; Source: Authors' work based on Scopus.

A careful review of abstracts and the full text was performed to understand each cluster better. As a result, the cluster reflects the most important aspects of business simulation games utilisation (Table 8). Most clusters are domain driven (6 clusters), followed by learning-driven research (5 clusters). None of the clusters contained phrases that would indicate technology-driven research.

Table 8. Extracted clusters.

Topic Theme	Topic Keywords	Primary Research Motivation	
		Knowledge Driven	**Domain Driven**
Active learning	**Active learning**, Virtual teams	✓	∅
Information systems	Data collected, Perceived learning, Skills development, **Information systems**, Learning Effectiveness	∅	✓
Learning process	Decision-making, **Learning process**, Teaching and learning, Teaching methods	✓	∅
ERP challenge	ERP challenge, Learning environment, Real world, Problem-solving, Knowledge and skills, Undergraduate students	∅	✓
Experiential learning	**Experiential learning**, Learning outcomes, Higher education, Learning experience, Thinking skills, Sustainable development	✓	∅
Entrepreneurial attitude	Artificial intelligence, **Entrepreneurial attitude**, Entrepreneurship education, Flow experience	∅	✓
Design methodology	**Design methodology**, Quasi-experimental, Higher_order_thinking, Student engagement	✓	∅
Technology acceptance model	Learning performance, **Technology acceptance model**	∅	✓
Emotional intelligence	**Emotional intelligence**, Team cohesion, Team performance, Intrinsic motivation	∅	✓
Decision support systems	**Decision support systems**, Human factors, Supply chain, Enterprise resource planning	∅	✓
Intelligent tutoring	**Intelligent tutoring**, Remedial tutoring	✓	∅

Source: Web of science, 2022.

Following the analysis of clusters in terms of extracted phrases and primary motivation of the research, two groups of clusters are extracted: (i) *Learning-driven*, which contains Cluster 1 (Knowledge management), Cluster 2 (Learning environment), and Cluster 6 (Design methods), which refers to both to academic and business which use simulation games as a learning tool for student and employee's education, and business goals. (ii) *Domain-driven* consists of Cluster 3 (Business games), Cluster 4 (Decision-making games), Cluster 5 (Project management games), and Cluster 7 (Firm performance games). Papers in this group often include case studies of the different simulation games or investigations of application fields of simulation game utilisation, as well as publication papers that describe simulation games as decision making, firm performance, and project management tools. The presented simulation games' perspectives are shown in Figure 14.

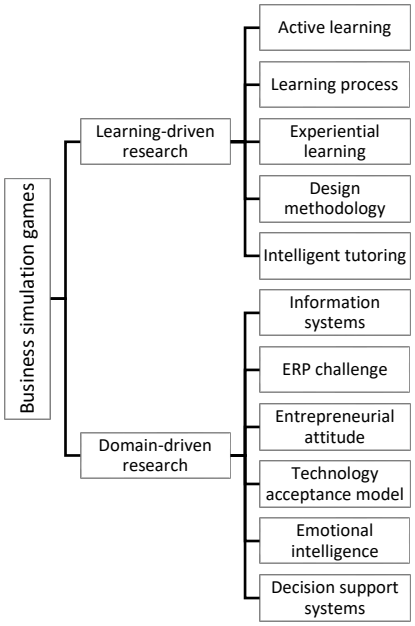

Figure 14. Business simulation games research perspectives; Source: Authors' work.

5. Conclusions

Business simulation games are widely used both in high education and in business. This paper aims to identify the relevance and profoundly explore the existing literature to develop in-depth knowledge and extract patterns and the most important findings. The research goals were to provide insight into the research trends and topics in business simulation games' research and to investigate the balance between learning-driven and domain-driven research topics. The analysis is the basis for the projections of future developments in business simulation games research.

The paper contains several contributions.

Firstly, by combining SLR and ALR, the current study analyses the research on business simulation games to solve the gaps mentioned above and provide a broader perspective on the research trends and perspectives. This paper combines computational and qualitative methodologies to identify significant study themes, examine the temporal trends of these concerns over the past several decades, and suggest possible future pathways for business simulation games research.

Secondly, the suggested data analysis framework is flexible and adaptable to various study areas. In addition to combining the SLR and ALR methods, we introduce the concept of the primary motivation in business simulation research, including learning-driven, domain-driven, and technology-driven research. Such an approach can be easily transferred to other educational, business, and management approaches.

Thirdly, this paper sheds insight into past and future research on business simulation games by analysing the most significant research trends and themes from 1973 to 2023. The following trends were identified, providing the answers to the following questions:

- *What is the trend in the number of research papers and citations in business simulation games?* The SLR analysis revealed that the number of published papers increased after 2000 and is steadily developing. Although the number of published papers follows the linear trend, the growth of the published papers is steady, indicating stagnation. This conclusion is confirmed by the citation analysis, revealing that the most cited papers were published between 2000 and 2010, indicating that the research field of business simulation games is stagnating.
- *What topics are investigated in business simulation games' research?* Our analysis revealed that business simulation games investigations have two major perspectives: (i) the Learning-driven perspective that focuses on various aspects of teaching, knowledge

transfer, and training in higher education and business; and (ii) the Domain-driven perspective, which refers to the domain to which business simulation game has been focused, such as decision making, enterprise resource planning, entrepreneurship, sustainability, and other issues. The most cited papers, the most frequent phrases, and the extracted topics were analysed concerning their primary research motivations. The most cited papers were mostly learning-driven, while a smaller number were domain-driven, which is not unexpected. Authors tend to cite the most often methodological papers, while narrow-focused papers are less cited [61]. The most striking conclusion is that none of the most cited papers are technology driven, leading to the conclusion that the stagnation in research likely results from the stagnation in the application of new technologies in business simulation games. The ALR analysis revealed that most frequent phrases are learning driven, while domain-driven phrases occur less often. However, when the topic analysis was conducted, the situation changed, indicating that the extracted topics were mostly domain driven; however, almost the same number of topics were learning driven.

- *What is the future trend in business simulation games' research?* The future trend is estimated based on the two conclusions. First, the SLR indicates the stagnation of the research in business simulation games. Second, the SLR and ALT reveal the balance between domain-driven and learning-driven research papers. Still, the technology-driven topics and phrases were not extracted, indicating that the technology used for business simulations is mature. Based on these two trends, the future of business simulation games does not seem to be on the path to breakthrough discoveries any near time, at least until new technologies, likely based on artificial intelligence [62], massive gaming [63], augmented reality [64], e-learning [65], or social media [66], are introduced in the concept of business simulation games.

This paper has several practical implications. Regarding research results that revealed three main research perspectives of business simulation games, the obtained results can be a potential guideline for higher education institutions and businesses in various industries when deciding to implement simulation games in their processes. Through the results of this work, higher education institutions can become aware of the areas in which they could use simulation games to make the learning process more interesting and effective for students of Generation Z, who require a different approach to educational methods. In the same way, the results of this research can guide practitioners from the business world to consider their business perspectives in which they could incorporate and apply simulation games to establish higher quality and more efficient firm performance.

The limitations of this work are as follows. First, only papers from the Scopus database were included in the investigation, and other databases should be included in further investigations. Second, text mining has been conducted based on the paper titles, abstracts, and keywords, while the full text of the papers could be included in future work. Additionally, to obtain deeper insights into the application of simulation games in higher education, considering the results of this study, it would be interesting to conduct a systematic review of the literature with expanded keywords in the search process that would refer to the technical perspectives of simulation game usage, supported by further qualitative or quantitative research.

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