




Article

Digital Games Adopted by Adults—A Documental Approach through Meta-Analysis

Alessandro Pinheiro , Abílio Oliveira , Bráulio Alturas and Mónica Cruz 

Instituto Universitário de Lisboa (ISCTE-IUL), ISTAR-IUL, 1649-026 Lisboa, Portugal; braulio.alturas@iscte-iul.pt (B.A.); monica_susana_cruz@iscte-iul.pt (M.C.)

* Correspondence: alessandro.pinheiro@iscte-iul.pt (A.P.); abilio.oliveira@iscte-iul.pt (A.O.)

Abstract: The gaming industry has seen a considerable expansion thanks to the ever-increasing and widespread consumption of digital games in different contexts of use and across all age groups. We are witnessing a commercial boom and awakening the attention of researchers from different scientific areas to address an interdisciplinary topic. Digital games consumption has inspired some studies investigating the use and adoption of these games and, in this context, we ask: “how has the use and adoption of digital games by adults been studied?”. We conducted a documental study with a meta-analysis approach to answer these questions, considering the most relevant research papers published in the last fifteen years, according to a set of inclusion criteria. The planned objectives consider identifying the main dimensions in the studies about the use and adoption of digital games by adults and the findings of this study delineate several dimensions as prospective latent variables for inclusion in future studies within acceptance models for digital games. Furthermore, our research illuminates the socialization dimension, particularly when amalgamated with other conceptual dimensions. This nuanced understanding underscores the intricate interplay between various factors influencing the acceptance and adoption of digital gaming technologies.

Keywords: digital games; technology acceptance models; meta-analysis; big data; gaming; adults



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1. Introduction

Advances in computer and communication technologies, especially the internet, provided new experiences for people and the social environment in which they were inserted, especially in the second half of the 1990s, when information processing devices started to connect [1,2]. To understand how these technologies influence or interfere with people’s perception and behavioral manifestation during their use and adoption, models are structured and validated through mathematical methods (the Technology Acceptance Model and the Unified Theory of Acceptance of Technology, for example) and seek to explain the various cause and effect relationships arising from the interaction of people with the most diverse technologies. One of the various existing technologies that deserves special attention in the present investigation is digital games, which can produce different states of immersion in virtual reality environments [3,4]. In recent years, integrating immersion and virtual reality (VR) technologies has revolutionized the learning process across various fields and educational settings. These cutting-edge tools offer unparalleled opportunities for engaging, interactive, and effective learning experiences [5–7].

In the current context, serving as the impetus for this study, the systematic investigation into the causal interplay between individuals and digital gaming technologies, facilitated by meticulously structured and validated mathematical models, fosters a nuanced comprehension of the intricate dynamics through which these technological advancements shape human perception. This investigative endeavor entails a comprehensive scrutiny of the diverse dimensions inherent to human experience, thus advancing our comprehension of the profound ramifications of digital games within the broader framework of

human existence, with specific relevance to scholarly inquiries in the domain of Cloud Gamification.

Regarding the use of digital games, especially for ludic purposes, we are aware that aspects of socialization are present in most of the studies from recent years [8–12]. As technology is in full expansion, both in computational and communicational nature, as in the increase in adepts to its use and adoption, digital games have also been the object of research by methodologies that use models intending to evaluate and investigate the relationships with different variables that explain the interactions between this digital technology and people, in different contexts [13–15], for example. Given this scenario, we aim to answer the question, “How has the use and adoption of digital games by adults been studied?”.

In pursuit of this inquiry, we strive to provide insightful perspectives across various scientific domains, particularly focusing on studies that address topics at the intersection of “big data and gamification”. The dimensions unearthed in our study hold significance as they facilitate the development of meticulous data collection strategies. Moreover, these identified dimensions create opportunities for tailoring gamification experiences, thereby enabling personalized interactions within the digital gaming domain.

Our research is also relevant to the areas of “new concepts and techniques in gamification design”. Within this domain, it may uncover novel insights into concepts and techniques by revealing which dimensions are pivotal for user adoption. Game designers can leverage this information to customize gamification elements, aligning them with the identified dimensions and enhancing user engagement and satisfaction.

Simultaneously, our study extends its scope to the field of “player behavior modeling”. Within this scientific context, it may reveal potential latent variables. For example, if certain dimensions are identified as influential but not explicitly measured, these may be considered latent variables in future models, paving the way for more comprehensive and accurate player behavior models.

To achieve the projected objectives, we conducted a systematic review. The criteria considered the choice of platforms for the bibliographic survey, the use of articles published in indexed international journals and conference proceedings in a pre-defined period, and around the theme of “the use and acceptance of digital games by the adult population”. Google Scholar, Web of Science, EBSCOhost, and IEEE Xplore were used as platforms. The research terms used on these platforms considered the concept of digital games, using twelve terms, one at a time, associated with the term “acceptance model” (as detailed in methods). Regarding the concept of digital games, according to some authors, we understand that they represent the evolution of electronic games by adding new technologies [16–19].

According to the inclusion criteria employed, forty-eight articles were selected and five sections of these articles—abstracts, keywords, introductions, methodologies, and conclusions—were examined using techniques of textual content analysis—as part of big data research—using the Iramuteq software (v. 0.7 alpha 2).

A meta-analysis was conducted to ascertain the primary dimensions—concepts and themes—that arise from the quantity of data provided by the selected articles, all of which encompass technology adoption models associated with the use of digital games by an adult audience. Textual content analysis techniques were employed as they play a pivotal role in data mining, being utilized to extract insights from extensive sets of textual data [20].

The selection of this method is substantiated by its inherent capacity to mitigate researcher-induced bias, concurrently enhancing the objectivity of the derived outcomes.

This study makes a substantive contribution to advancing both theoretical frameworks and practical applications in digital games, offering valuable insights for the scholars and professionals involved in the conceptualization and development of digital games. Through a meticulous meta-analysis, this research investigates dimensions within technology adoption models specific to digital games among adults, unveiling a pronounced emphasis on socialization across various contexts, including enjoyment, behavior, performance, gaming

experience, and perceived quality. This study also improves the method applied to the treatment of data used in a previous study, with less than ten percent of the data used in the present study. In our previous study, as mentioned, we aimed to discover the most important dimensions investigated in previous studies that analyzed the use of digital games by adults in teaching and learning contexts [21].

To answer the main research question, we designed three objectives, as follows: to identify the main dimensions—concepts and themes—provided by the selected articles in studies about the use and adoption of digital games by adults (whose methodologies and technology adoption models were considered); to present the meanings around the identified dimensions; and to present some dimensions as potential latent variables for future studies.

In the subsequent sections of this article, we outline the structure of our research, highlighting the contribution of each component to the investigation, as follows:

- Section 2: Background

In this section, we contextualize and position our research within the broader context of the field. We justify the adoption of meta-analysis as an essential tool for synthesizing and analyzing the results of individual studies addressing similar questions. Furthermore, we present detailed arguments supporting including relevant individual studies for the present research. We also contextualize the use of conceptual maps derived from textual analyses and data mining techniques, emphasizing their fundamental role in visualizing and conducting in-depth analyses of the concepts, themes, and relationships within the documents in our study.

- Section 3: Methodology

Section 3 elaborates on the procedures and phases employed in conducting the meta-analysis, including using data mining techniques through the open-source software Iramuteq. We describe how these approaches were implemented to statistically treat large volumes of data and textual analysis.

- Section 4: Presentation of Results

In this section, we present the results of our research, following the order of the phases of the adopted meta-analysis. The results are presented objectively and systematically, providing a clear overview of the research findings.

- Section 5: Discussion

In Section 5, we interpret the results, in light of previous studies, and contextualize them within the existing research landscape. We assess to what extent the established objectives were achieved and how the research question was addressed, offering critical insights and an in-depth analysis.

- Section 6: Conclusions and Implications

In the final section, Section 6, we provide a thorough analysis of the explored theme in our study and offer well-founded suggestions for future research. These conclusions are supported by the results and discussion conducted throughout the article, contributing to the advancement of knowledge in the field.

This study represents an endeavor to push the boundaries of knowledge, leveraging textual content analysis techniques to examine pertinent documents, the creation of conceptual maps to visualize and organize complex information, and the application of data mining techniques to identify hidden patterns and trends within the data.

2. Background

This theoretical framework explores various acceptance models applied to digital games and considers a literature review and meta-analysis to advance our understanding of adult user acceptance dynamics in this evolving domain. Through an interdisciplinary

lens, we strive to contribute to the ongoing discourse surrounding the adoption and impact of digital gaming technologies in contemporary society.

2.1. Systematic Literature Review and Meta-Analysis

A meta-analysis is a widely employed statistical procedure to integrate and consolidate the results from multiple independent studies addressing a common research question or topic.

This technique is commonly applied in scientific disciplines, including but not limited to medicine, psychology, education, and various domains of empirical research. Meta-analysis plays a highly relevant role by enabling the synthesis and critical analysis of existing evidence across multiple realms of research, contributing to more comprehensive and methodologically rigorous analyses of accumulated data [22,23].

Meta-analysis is also a systematic analytical procedure used in scientific research to quantitatively synthesize the results of various empirical studies related to a specific research question. This process involves the rigorous search and selection of relevant studies, the extraction of pertinent data, its transformation, and the combination of data using appropriate statistical techniques. The heterogeneity among studies is assessed, and the results are interpreted to conclude the overall effect or the relationship between the variables of interest. Additionally, if necessary, sensitivity and subgroup analyses can be conducted to assess the robustness of the results. The results of meta-analysis are often presented clearly through graphs, tables, and statistical measures. While meta-analysis is a powerful tool for aggregating evidence from diverse studies, it is crucial to conduct it with methodological rigor, considering the limitations and potential sources of bias in the included studies [22,24,25].

Meta-analysis in documentary studies represents a valuable approach to quantitatively synthesize and analyze scattered results in documents and written sources. However, it is imperative to adopt a rigorous methodological approach, from formulating the research question to interpreting and reporting the results to ensure the validity and reliability of the conclusions reached. Meta-analysis in documental studies contributes to a more solid and informed evidence base in various research areas that rely on document analysis as an integral part of their methodology [26–28].

Systematic review and meta-analysis are closely related and are usually performed together to synthesize and analyze the available scientific evidence on a particular research topic. A systematic review is a rigorous research method that involves identifying, selecting, and critically evaluating all relevant studies published in a specific area. It is conducted following a pre-defined protocol, with clear criteria for the inclusion and exclusion of studies, seeking to minimize bias and to ensure the objectivity of the selection process. The systematic review aims to combine all the available evidence on a research question to obtain a comprehensive and unbiased view of the current state of knowledge. A meta-analysis, in turn, is a statistical technique used to combine the results of different studies included in the systematic review. It allows researchers to calculate the overall effect, a weighted average, of results from individual studies. By combining data from multiple studies, meta-analysis increases the sample size and accuracy of estimates, providing a more robust measure of the effect of an intervention, treatment, or association between variables [25,29,30].

Meta-analysis, in line with the systematic literature review, has been widely used in studies on technology adoption models in the last five years. Its primary purpose is identifying potential gaps that deserve attention in future investigations. In this context, the meta-analysis has been dedicated to presenting and summarizing the number of publications relevant to a specific topic and analyzing the similarities between the sample profile and the comparison of the variables considered in a conceptual model. Such a methodological approach, based on the systematization and critical analysis of the scientific literature, offers valuable support for understanding the advances and challenges in the

study area, helping to guide future research and improve academic knowledge in the context of technology adoption [31–33].

The review of the studies mentioned above indicates that, in general, quantitative data analysis is widely favored in conducting meta-analysis approaches, with the use of statistical software developed for this purpose being common, ref. [34] for example. However, in this work, an unconventional method will be presented that involves the use of software initially developed to evaluate qualitative data, more specifically, Iramuteq 0.7 alpha 2. We also emphasize that, in the present study, we seek to consolidate the same method already used in a previous study with a smaller number of data [21].

Specifically, the performance of the present meta-analysis plays a fundamental role in a larger-scale study. Precisely, a doctoral thesis is duly evaluated by a competent academic council. The primary objective of the meta-analysis concerning the doctoral thesis is to enable the formulation of a comprehensive (conceptual) explanatory model related to adults' use and adoption of digital games.

The subsequent section systematically addresses some relevant conceptual models related to the adoption and use of technologies and emphasizes the relevance of conceptual dimensions in the context of this research.

2.2. Acceptance Models Applied to Digital Games

Understanding users' intentions and reactions towards different technologies has led to developing models that explain these interactions through the "user and technology" interface. By incorporating new variables into existing models and using mathematical methods for verification and validation, extended models have been created based on popularized ones, which have been duly proven. The Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) were the most widely used models between 2001 and 2018 for explaining human interactions with various technologies. According to a survey conducted on the ProQuest platform, the TPB accounted for 26.5% of the records, while the TAM constituted 24.4%. The Theory of Reasoned Action (TRA) represented 17.6% of the records, the Social Cognitive Theory (SCT) accounted for 17.3% of the records, and the Unified Theory of Acceptance and Use of Technology (UTAUT) comprised 4.2% of the records [35–42].

One of the technologies that these models have been applied to is digital games. Digital games are considered the technological evolution of electronic games, incorporating new technologies that enable them to provide digital sound and images.

Digital technologies allowed for the progression of electronic video games, leading to the development of modern consoles with advanced capabilities, including computer-like functions, online game acquisition, multiplayer gameplay, internet browsing, and other features [16–19].

In addition to the use of digital technologies in consoles, in studies that analyze the interaction of users with digital games through models of the use and acceptance of technologies, it is also expected to consider some terms that represent digital games, such as video games, online games, mobile games, computer games, android games, phone games, social games, and exergames [43].

In recent years, numerous studies have been conducted on using and integrating digital games across various domains. This research has spanned over the past fifteen years and its scope has encompassed diverse contexts. Notably, investigations have been undertaken primarily in areas around cognitive aspects, such as education and learning [44,45]. Additionally, examinations have been carried out in domains related to health and well-being [46,47], interpersonal interaction [48,49], and recreational pursuits and leisure activities [50,51], as well as instances where the potential adverse consequences resulting from usage have been portrayed [52].

Similarly, as studies are developed with the various technologies through models of the use and acceptance of technologies, studies arise investigating digital games [15,53,54]

and, in this study, concept maps will be used to explain the relationships both between dimensions and between these dimensions and such models.

Within the Structural Equation Models (SEMs) domain, conceptual dimensions pertain to theoretically defined constructs or latent variables, representing the underlying relationships among the observed variables or indicators within the model.

These conceptual dimensions are pivotal in the model's specification and the subsequent interpretation of its results. In the context of SEMs, these dimensions are foundational elements, playing an indispensable role in the theoretical representation of relationships among observed variables, constituting an integral part of the data analysis and synthesis [55,56].

3. Materials and Methods

In this study, the relationship between data mining and the open-source software Iramuteq, used as a text analysis tool, can be justified because Iramuteq is based on R and is designed to assist in analyzing large datasets of textual data. Textual analysis constitutes a critical component of data mining, wherein meaningful information is extracted from unstructured data, such as, for example, documents [57–59].

Furthermore, in addition to conducting systematic literature reviews, researchers have employed meta-analysis as a valuable method for applying statistical techniques to consolidate and summarize extensive datasets related to subjects, themes, or thematic statements [42–44]. In this context, concept maps serve as a schematic structure that aids in generating meanings by organizing various concepts. A hierarchical arrangement of these concepts makes it possible to visualize the diverse potential relationships, thereby representing the conceptual dimensions. Concept mapping facilitates the objective materialization of such conceptual dimensions, free from researcher bias or interference.

This characteristic holds particular significance when qualitative methods, such as interviews, are utilized, as the researcher may already possess preconceived notions on the subject, potentially leading to the distortion of results during data interpretation [60,61].

Much software that allows the construction of concept maps requires the researcher to acquire a license to use, which is associated with paying a monetary amount. An inclusive alternative found was the development and availability of open-source software. Thus, in the present study, Iramuteq deserves to be highlighted, which, through the statistical environment of the R software [62], which can be changed and expanded through the Python language, allows a statistical analysis of texts from qualitative studies. Iramuteq was developed in 2009 and enables several lexical analyses and the materialization of conceptual dimensions through the Descending Hierarchical Classification—DHC. This uses Correspondence Factor Analysis (CFA) through the calculation of frequencies and chi-square correlation values of each word of the textual corpus—gathering of the various texts considered in an analysis—the graphic representation of the data, outlining the proximity between word classes, and those with specific classes [62].

This section outlines a comprehensive examination of studies published over fifteen years, covering the period from 2006 to 2021, focusing on adults' use of digital games. The adopted workflow is inspired by the main steps used in conducting meta-analyses in scientific studies and consists of eight stages [22,23], namely:

- **Study Identification:** A literature search was conducted on platforms that included indexed international journals and conference proceedings, focusing on materials relevant to the topic of “the use and acceptance of digital games by the adult population”. Four platforms, namely Google Scholar, Web of Science, EBSCOhost, and IEEE Xplore, were used for this purpose.
- **Study Selection:** To ensure the comprehensiveness of the review, twelve distinct terms were used to explore the concept of digital games. Each term was used individually and in conjunction with the term “acceptance model” during the search process, as illustrated in Figure 1.

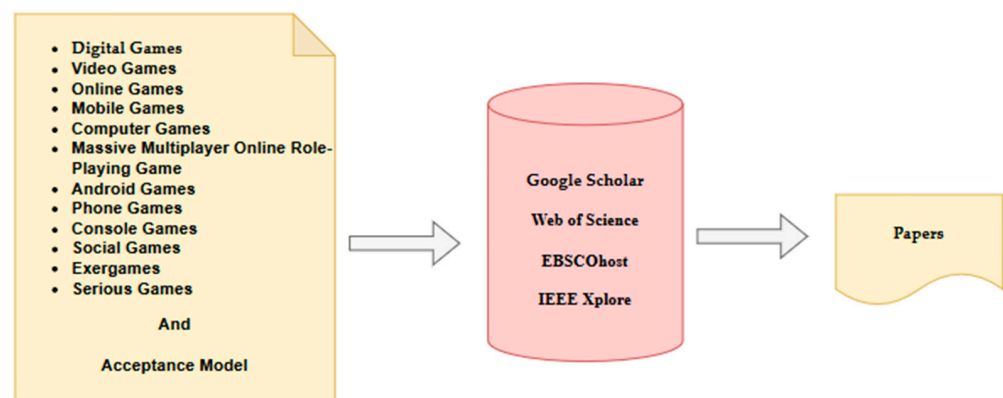


Figure 1. Twelve key terminologies associated with the “acceptance model”, self-elaboration.

The search began on 30 April and concluded on 14 July 2021, capturing a significant set of relevant publications. The initial data collection phase (in which we used twelve conceptual terms for digital games in association with the term “acceptance model”) yielded a total of 4943 articles, which formed the basis for a comprehensive analysis of the subject (this ample number includes all the terms used, considering the repetition of studies across multiple themes). In the first phase (Phase I) of article selection, abstracts and keywords were analyzed, resulting in the selection of 1480 articles (approximately 30% of the initial total). In the second step (Phase II), the analysis extended to the article introductions for the final selection of articles from those previously chosen, resulting in 183 articles (approximately 4% of the initial total). As the last inclusion criterion (Phase III) and based on the analysis of the methodologies of the selected articles, only studies in which the adult population constituted the sample—such as adult students over eighteen years old and the elderly, for example—were used, resulting in 48 articles (approximately 1% of the initial total) (Table 1) (Appendix A Table A1).

Table 1. Phases (Stages) of systematic article selection.

Initial Phase (Data Collection)	Phase I (Analysis of Abstracts and Keywords)	Phase II (Analysis of Introductions)	Phase III (Analysis of Methodologies)
4943 articles (including duplicates across multiple themes)	1480 articles (approximately 30% of the initial data collection)	183 articles (approximately 4% of the initial data collection)	48 articles (approximately 1% of the initial data collection)

Only studies indexed in peer-reviewed databases were considered as a criterion for excluding articles. Additionally, studies that addressed technology use and acceptance models, either for the construction of explanatory models or for conducting systematic reviews, were selected.

These criteria were applied to ensure the inclusion of works that had undergone rigorous evaluation and were directly aligned with the analysis theme.

- **Data Extraction:** To extract the necessary data for analysis (to answer the research question), we systematically used the abstracts, keywords, methodologies, introductions, and conclusions of the 48 selected articles.
- **Data Transformation:** Data transformation was carried out using Iramuteq (which employs statistical methods for exploring and visualizing patterns in textual data, allowing for the quantitative analysis of texts). However, for this transformation to be possible, the texts were grouped by type (namely, abstracts, keywords, and methodologies, or introductions and conclusions) in UTF-8 format, processed (removing special characters such as quotes and hyphens, etc.), and identified with three asterisks (which is a pattern of this software). After preparing the texts from the 48 selected articles, they were imported into the software used, which, in general, and specifically for

Iramuteq, (1) it divides the texts into smaller words, removes common words that do not contribute to the analysis, and lemmatizes the words, meaning to normalize them to their base forms, and possibly encoding additional categories or variables associated with the texts (if relevant to the analysis); (2) Iramuteq creates a contingency table that represents the frequency of word occurrence concerning the documents or categories specified by the researcher; (3) it performs multiple correspondence analysis, a statistical technique used to analyze the relationship between words and categories in a textual dataset (identifying patterns, relationships, and associations between words); and (4) it extracts data (graphical and statistical outputs).

- **Statistical Analysis:** This encompasses two stages (based on the 48 selected articles), namely (1) the data mining of abstracts, keywords, and methodologies; and (2) the data mining of introductions and conclusions. Descending Hierarchical Classification (DHC), Similarity Analysis, and Correspondence Factorial Analysis were used in the statistical analysis of the texts.

The statistical analysis through the software is grounded in various parameters, including the number of texts and textual segments, word occurrences, the average word frequency, and the total frequency of each form. Additionally, the software also performs grammatical classification based on a reduced-form dictionary. This analysis considers the behavior of word frequencies within a set of texts, employing logarithmic scales for a more precise and comprehensive analysis [63].

The application of Correspondence Analysis provides a more in-depth understanding of the semantic and structural relationships within extensive datasets. Conversely, Hierarchical Descendant Classification enables a meticulous exploration of the organization and interactions within the analyzed documents, contributing to elucidating how the texts interrelate.

Regarding identifying data trends, the Iramuteq software employs Similarity Analysis as a pivotal tool [64].

- **Heterogeneity Assessment:** To choose words (statistically significant) capable of generating conceptual dimensions, words that appeared in ten or more segments of text from the textual corpus were considered. These are presented in tables based on grammatical form (Form), classification (Type), number—frequency—of text segments containing the word in the class (Class. t.s.), number—frequency—of text segments in the corpus containing the word at least once (Class. total), the percentage of text segments containing the word in this class concerning its occurrence in the corpus (%), chi-square (Qui2), and significance level (p -value).
- **Interpretation and Presentation of Results:** Using the selected software tools (Iramuteq), the findings are conveyed through graphs, tables, and statistical measures that indicate the effect size and the estimate's reliability.

4. Results

Within this section, the outcomes are showcased following the procedural framework delineated in the materials and methods. Throughout the data extraction and transformation phases, two distinct stages were employed for executing a statistical analysis and heterogeneity assessment.

4.1. Data Mining from Abstracts, Keywords, and Methods of Selected Articles (First Stage)

In the initial phase of this study, denoted as the first stage, the primary objective was to discern and identify conceptual dimensions using DHC and Similarity Analysis. This was achieved by structuring a textual corpus derived from the abstracts, keywords, and methodologies of the forty-eight articles under consideration. Several criteria were employed to pinpoint these conceptual dimensions effectively.

To create classes (or clusters), Iramuteq employs Multiple Correspondence Analysis, considering the construction of frequency tables to identify the words with the highest frequencies and their relationships. The software generates a multidimensional space where

coordinates represent each word and document. Subsequently, clustering techniques are executed based on the resulting coordinates from Multiple Correspondence Analysis (such as the K-means method, for example). Following this step, Iramuteq identifies patterns in the relationships between words and documents, grouping those that share similar characteristics. After the creation of classes, the software allows for the visualization of results through graphs and tables that facilitate interpretation [64,65].

Firstly, words displaying a *p*-value of less than 0.005, indicating statistical significance, were analyzed and considered for inclusion. Secondly, certain words that were deemed unsuitable for conceptual ideation, such as “research”, “study”, “acceptance”, “questionnaire”, “finding”, and “conclusion”, were eliminated from the selection process. Subsequently, words were included based on their frequency of occurrence within the text segments. Only words that appeared ten times or more in the total text segments were retained for further analysis. These chosen words were seen as pivotal in representing the conceptual dimensions within the corpus.

The corpus encompassed 48 texts, resulting in 810 text segments (TSs). Remarkably, 801 of these text segments, accounting for 98.89% of the corpus, were utilized in the subsequent analysis. The vast compilation of data and textual content amounted to a staggering 29,282 occurrences. They yielded a total of 2711 distinct words, as depicted in Figure 2.

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Number of texts: 48
Number of text segments: 810
Number of forms: 3399
Number of occurrences: 29282
Número de lemas: 2711
Number of active forms: 2136
Número de formas suplementares: 575
Número de formas ativas com a frequência >= 7: 396
Média das formas por segmento: 36.150617
Number of clusters: 9
801 segments classified on 810 (98.89%)

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Figure 2. Analysis of abstracts, keywords, and methods. Iramuteq 0.7 alpha2.

The DHC revealed nine classes originating from two main branches of the total corpus analyzed, sub-corpus A and sub-corpus B. Sub-corpus A is composed of Classes 1, 2, 5, and 8, whose TSs present the words used in the abstracts and the keywords. Sub-corpus B is composed of Classes 3, 4, 6, 7, and 9, whose TSs present the words used in the methodologies. The DHC and its subdivisions are shown in Figure 3.

The data analysis from the DHC is presented below by class and following the content analysis software used. For the choice of (statistically significant) words capable of giving rise to conceptual dimensions, the words that appeared in ten or more TSs of the textual corpus were considered—presented in the tables by grammatical form (Form), classification (Type), number—frequency—of text segments that contain the word in the class (Class t.s.), number—frequency—of text segments in the corpus that have the word at least once (Class total), the percentage of occurrence of text segments that contain the word in this class concerning their occurrence in the corpus (%), chi-square (Chi2), and the level of significance (*p*-value).

- Class 1 (from abstracts, keywords, and methods) comprises 21.22% of the total analyzed corpus.

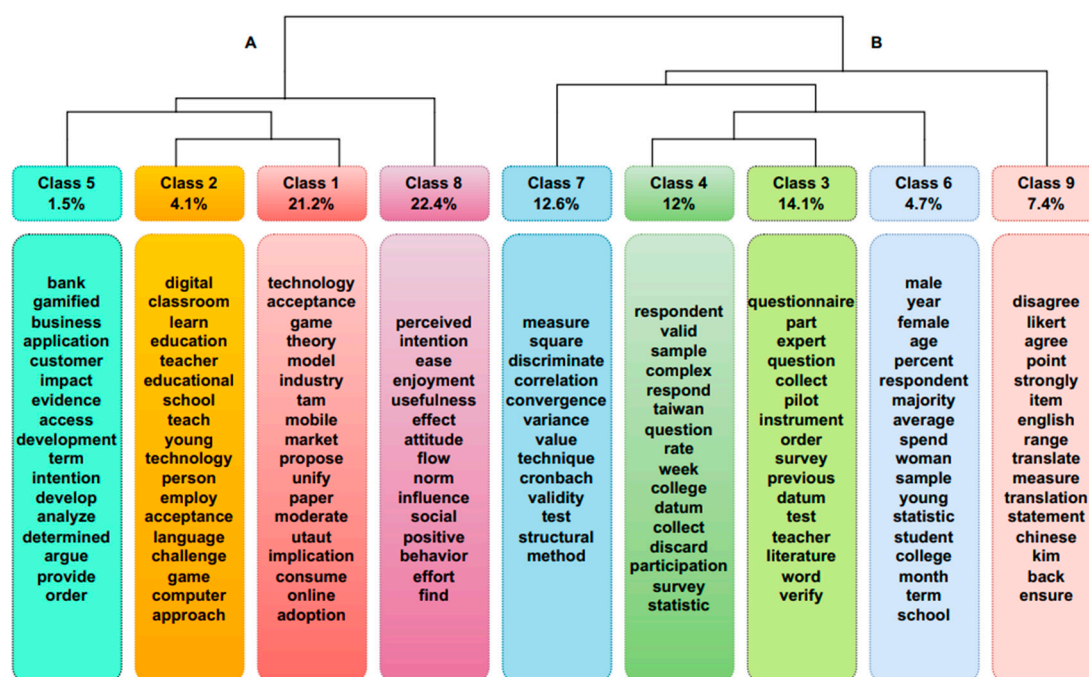


Figure 3. DHC from abstract, keywords, and methods (own work using Iramuteq).

Class 1 suggested meanings around the word “industry” (with 100% occurrence in the corpus). This class, as a dimension, suggests that the most recurrent themes refer to the consumption of people (consumer—81.82%) in a given industry (industry—100%) in a specific market (market—76%) that involves entertainment attributes (entertainment—69.23%) and relationships (network—64.29%), which also involves offering services through mobile phone (phone—50%), stimulating behavior (behavior—44.12%) of service use in mobile games (mobile—43.36%) through the use of the internet (online—36.62%)—Table 2.

Table 2. Class 1—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
industry	noun	15	15	100.00	56.74	<0.0001
consumer	noun	9	11	81.82	24.49	<0.0001
market	verb	19	25	76.00	46.31	<0.0001
entertainment	noun	9	13	69.23	18.22	<0.0001
network	noun	9	14	64.29	15.80	<0.0001
phone	noun	13	26	50.00	13.31	0.00026
behavior	noun	15	34	44.12	11.13	0.00084
mobile	noun	62	143	43.36	51.01	<0.0001
online	unrecog.	52	142	36.62	24.47	<0.0001

The word “industry” related to the words in this class, except to the words “network” and “phone”, requiring the production of a new concept map. The concept map resulting from the word “industry”—see Figure 4—suggests that this was the great inspiration for most of the works presented in this investigation, establishing an association with the words game, mobile, online, user, marketing, grow, virtual, internet, behavior, and consumer, for example.

Based on the abovementioned words, in association with the word “industry” and based on the 48 selected articles, the conceptual text can be expressed as “the studies are inspired by industry data that, through marketing practices, explore in some way the growth of online games, considering mobile devices with internet access and the experience of users in the face of virtual realities”.

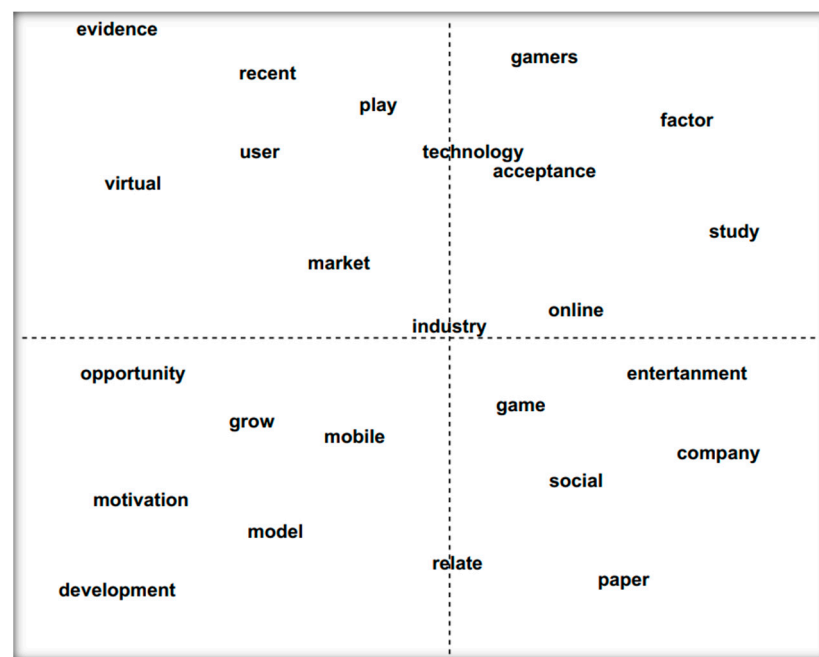


Figure 4. Class 1 similarity analysis (industry)—Source: Iramuteq.

Not least, the word “industry” was also associated with the words “social” and “entertainment”, suggesting the existence of socialization and entertainment’s dimension in studies on the use of digital games by the adult population.

The word “network” was associated with the words game, mobile, online, user, experience, and social, for example. Such associations suggest social relationships through online games on mobile devices—see Figure 5.

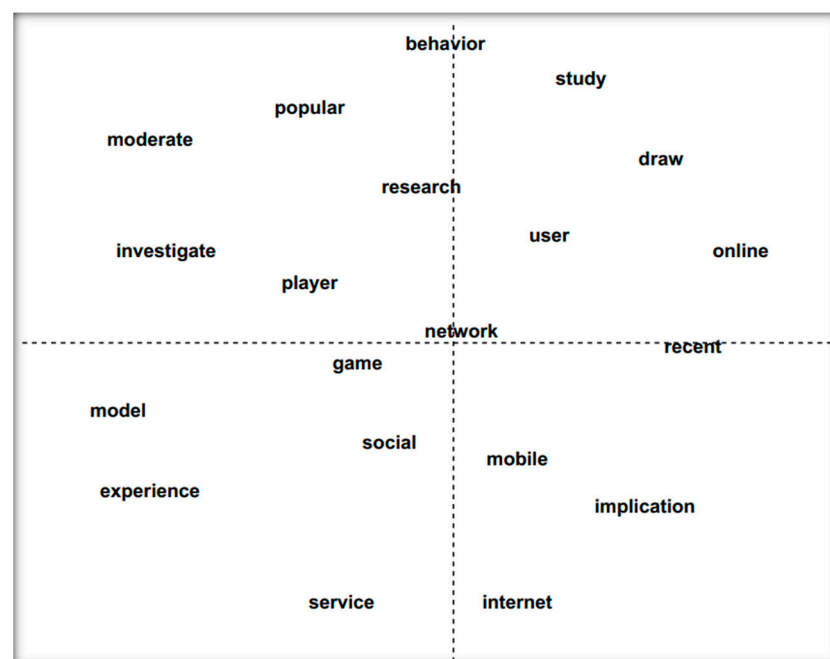


Figure 5. Class 1 similarity analysis (network)—Source: Iramuteq.

- Class 2 (from abstracts, keywords, and methods) comprises 4.12% of the total analyzed corpus.

Class 2 proposes meanings around the word “classroom” (with 84.62% occurrence in the corpus). This class presents meanings for providing a classroom with digital game resources (classroom—84.62%), whose educational process (educational—72.73% and education—41.18%) considers learning (learn—56.52%) and teaching (teach—41.67%) through these digital tools in schools (school—31.82%)—Table 3.

Table 3. Class 2—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
classroom	noun	11	13	84.62	216.76	<0.0001
educational	unrecog.	8	11	72.73	132.90	<0.0001
learn	verb	13	23	56.52	164.61	<0.0001
teach	verb	5	12	41.67	43.48	<0.0001
educational	noun	7	17	41.18	60.38	<0.0001
teacher	noun	14	38	36.84	108.14	<0.0001
school	noun	7	22	31.82	43.94	<0.0001

The word “classroom” presented a connection with the selected words in this class, except with the word “teach”, which did not require the production of a new concept map since the word “teacher” presented an intrinsic relationship with the word “teach.” The concept map resulting from the word “classroom”—see Figure 6—suggests the relationship between digital games and pedagogical activities in the classroom and is related to teaching and learning methods.

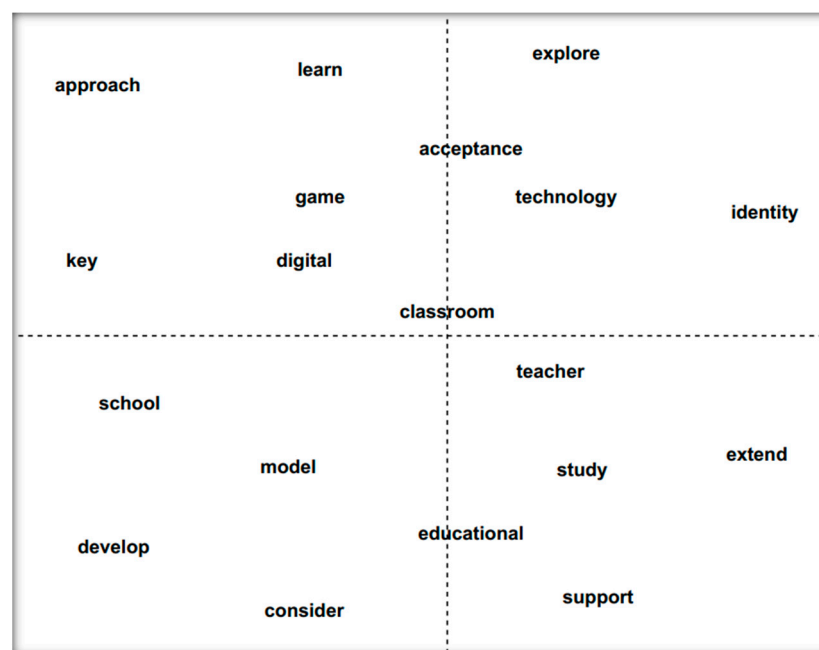


Figure 6. Class 2 similarity analysis (classroom)—Source: Iramuteq.

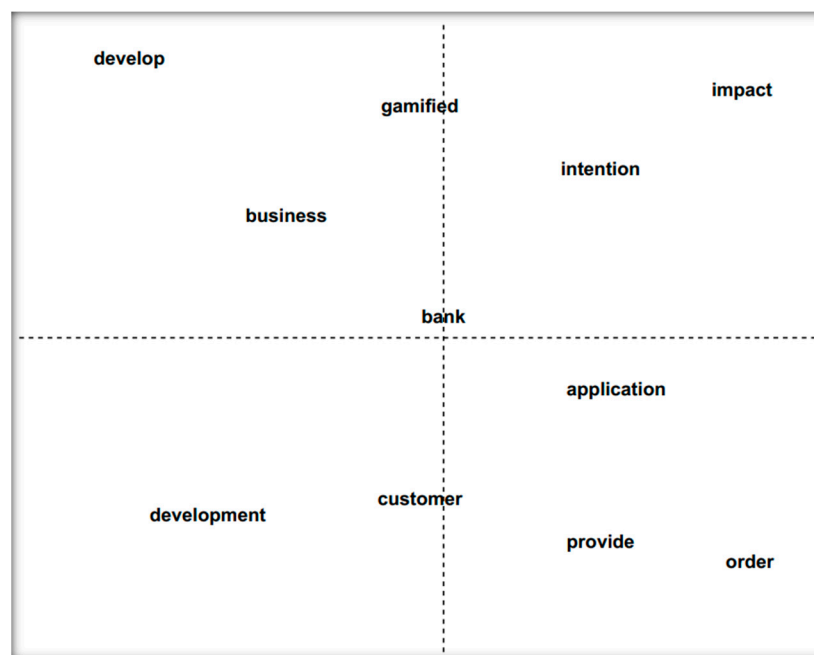
- Class 5 (from abstracts, keywords, and methods) comprises 1.5% of the total analyzed corpus.

The meanings in this class suggest the provision of gamified banking services (bank—80% and gamified—70%), possibly as a business strategy (business—39.29%) aimed at a consumer niche (customer—36%)—Table 4.

Table 4. Class 5—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
bank	noun	8	10	80.00	422.89	<0.0001
gamified	unrecog.	7	10	70.00	322.01	<0.0001
business	noun	11	28	39.29	280.75	<0.0001
customer	noun	9	25	36.00	208.16	<0.0001

The word “bank” relates to all selected words. The resulting concept map—see Figure 7—suggests that the customization of banking services through gamified applications was considered in the articles used in this investigation.

**Figure 7.** Class 5 similarity analysis (bank)—Source: Iramuteq.

- Class 8 (from abstracts, keywords, and methods) comprises 22.35% of the total analyzed corpus.

In this class, the meanings suggest pleasure (enjoyment—83.67%) as a behavioral manifestation (behavioral—83.33%, behavioral—75%, and behavior—50%) and that provides some interaction (interaction—82.35%), which is related to performance (performance—81.82%) and socialization when playing (social—58.95%), portraying the perception of quality (quality—50%) and experience (experience—39.53%)—Table 5.

Table 5. Class 8—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
enjoyment	noun	41	49	83.67	113.12	<0.0001
behavioral	unrecog.	25	30	83.33	66.80	<0.0001
interaction	noun	14	17	82.35	36.04	<0.0001
performance	noun	9	11	81.82	22.73	<0.0001
behavioural	unrecog.	12	16	75.00	26.08	<0.0001
influence	verb	47	72	65.28	84.02	<0.0001
social	noun	56	95	58.95	83.20	<0.0001
quality	noun	8	16	50.00	7.19	0.00731
behavior	noun	17	34	50.00	15.65	<0.0001
experience	noun	34	86	39.53	16.40	<0.0001

The word “enjoyment” related to all the selected words except for the word “quality” because, due to its level of significance (p -value), the software did not consider it in elaborating the concept map. The resulting map—see Figure 8—suggests that enjoyment is associated with social interactions, aspects of performance, behavioral issues, and aspects related to the players’ experience, considering the perception of quality. The word “quality” was associated with perception, with the game itself, with the user, with socialization, with the intention, with the attitude, with the perceived effect, with the ease of use, with the sequence, and with the significance—see Figure 9.

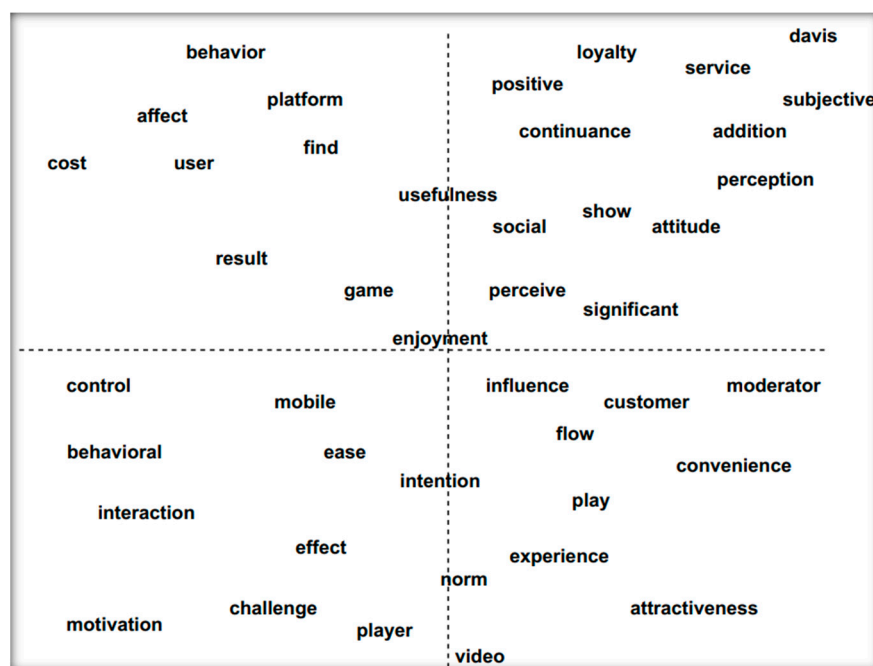


Figure 8. Class 8 similarity analysis (enjoyment)—Source: Iramuteq.

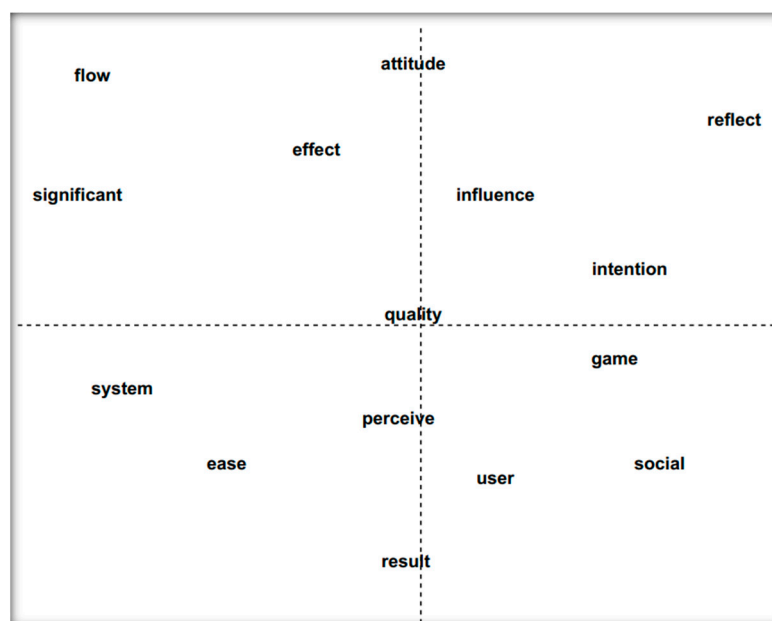


Figure 9. Class 8 similarity analysis (quality)—Source: Iramuteq.

- Class 3 (from abstracts, keywords, and methods) comprises 14.11% of the total analyzed corpus.

This class corroborates the meanings materialized in class 2 and is associated with the methodology of the studies—Table 6.

Table 6. Class 3—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
teach	verb	5	12	41.67	7.64	0.00572
school	noun	8	22	36.36	9.25	0.00235
education	noun	6	17	35.29	6.43	0.01119

- Class 4 (from abstracts, keywords, and methods) comprises 11.99% of the total analyzed corpus.

In this class, the meanings point to the use of digital game attributes by students (student—42.42%) of universities (university—38.89%) with the availability of online resources (online—26.24%). These meanings are related to the methodologies of the analyzed studies—Table 7.

Table 7. Class 4—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
student	noun	14	33	42.42	30.23	<0.0001
online	unrecog.	35	142	24.65	26.24	<0.0001
university	noun	7	18	38.89	12.64	0.00037

- Class 6 (from abstracts, keywords, and methods) comprises 4.74% of the total analyzed corpus.

The meanings in this class suggest the location (college—27.27% and school—18.18%) and the research sample (student—18.18%) as part of the articles considered in this investigation—Table 8.

Table 8. Class 6—Abstracts, Keywords, and Methods.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
college	noun	3	11	27.27	12.53	0.00040
student	noun	6	33	18.18	13.75	0.00020
school	noun	4	22	18.18	9.04	0.00264

Classes 7 and 9 presented words around the methodologies (Likert and Cronbach, for example) without contributing to the present work. The Analysis of Similarity by Word Class allowed the idealization of concept maps through the association of words. The criterion used for this idealization consisted of analyzing the association of all the words selected and contained in a particular class to make the visual representation possible.

The similarity analyses of Classes 3, 4, and 6 presented identical characteristics and were already demonstrated in the analyses carried out for the previous classes (namely Classes 1, 2, and 5).

4.2. Data Mining from Introductions and Conclusions of Selected Articles (Second Stage)

In the second stage of this study, aptly referred to as the second phase, the principal aim was to identify conceptual dimensions employing Data Hierarchization Clustering (DHC) and Confirmatory Factor Analysis (CFA). To accomplish this, a structured textual corpus was established, focusing on the introductions and conclusions of the forty-eight articles under examination. Specific criteria were employed to effectively discern these conceptual dimensions.

Initially, words that exhibited a significance level of $p < 0.005$ were subjected to analysis and were considered for inclusion in the identification process. On the contrary, certain words that were unsuitable for conceptual ideation, including “study”, “theory”, “utau2”, “finding”, “ease”, and “usefulness”, were eliminated from the selection.

Moreover, words were included based on their frequency of appearance within the text segments. Only words that appeared ten times or more in the total text segments were retained for further analysis. Such words were deemed significant in representing the conceptual dimensions present in the corpus.

The corpus, comprising 48 texts, yielded a total of 1446 text segments (TSs). Remarkably, 1434 of these text segments, constituting 99.17% of the corpus, were utilized in the subsequent analysis. The extensive compilation of data and textual content amounted to a notable 52,148 occurrences, which comprised a total of 3687 distinct words. Notably, 3158 words occurred only once, accounting for 3.92% of occurrences, but they constituted a significant 43.60% of all word forms, as illustrated in Figure 10.

```

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|i|R|a|M|u|T|e|Q| - Wed Nov 17 11:03:05 2021
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Number of texts: 48
Number of text segments: 1446
Number of forms: 4683
Number of occurrences: 52148
Número de lemas: 3687
Number of active forms: 3158
Número de formas suplementares: 529
Número de formas ativas com a frequência >= 5: 780
Média das formas por segmento: 36.063624
Number of clusters: 8
1434 segments classified on 1446 (99.17%)

#####
tempo : 0h 1m 53s
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Figure 10. Analysis of introductions and conclusions. Iramuteq.

The DHC revealed eight classes originating from two main ramifications of the analyzed corpus 2—Figure 11—sub-corpus C and sub-corpus D. Sub-corpus C is composed of Class 8, whose TSs represent words used both in the introductions and the conclusions of the articles. Sub-corpus D is composed of Classes 1, 5, 4, 3, 2, 6, and 7, whose TSs represent words used both in the introductions and in the conclusions of the articles.

The data analysis from the DHC is presented below by class and following the content analysis software used. For the choice of (statistically significant) words capable of giving rise to conceptual dimensions, the words that appeared in ten or more TSs of textual corpus were considered—presented in the tables by grammatical form (Form), classification (Type), number—frequency—of text segments that contain the word in the class (Class t.s.), number—frequency—of text segments in the corpus that contain the word at least once (Class total), the percentage of occurrence of text segments that contain the word in this class concerning their occurrence in the corpus (%), chi-square (Chi2), and the level of significance (p -value).

- Class 8 (from introductions and conclusions) comprises 19.74% of the total analyzed corpus.

The meanings for this class suggest something around pecuniary values (million—100% and billion—97.14%) used to affirm growth from both a present and future perspective (growth—84.85% and grow—76.74%) of a given market (market—69.16%) in the digital games industry (industry—62.16%), specifically the mobile games market for mobile phones (mobile—32.64% and phone—47.73%) in online mode (online—26.32%)—Table 9.

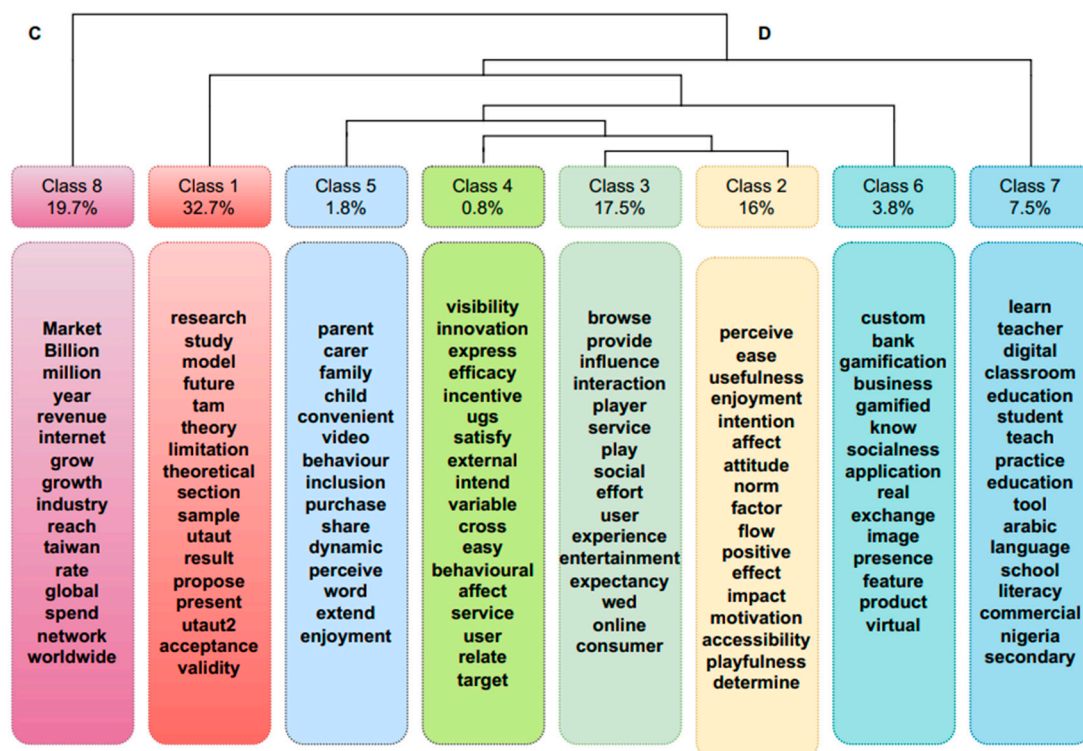


Figure 11. DHC from introductions and conclusions (own work using Iramuteq).

Table 9. Class 8—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
million	noun	30	30	100.00	124.62	<0.0001
billion	noun	34	35	97.14	135.71	<0.0001
growth	noun	28	33	84.85	90.41	<0.0001
grow	verb	33	43	76.74	90.95	<0.0001
market	verb	74	107	69.16	178.31	<0.0001
industry	noun	46	74	62.16	88.67	<0.0001
phone	noun	42	88	47.73	46.38	<0.0001
mobile	noun	125	383	32.64	54.92	<0.0001
online	unrecog.	85	323	26.32	11.40	0.00073

- Class 1 (from introductions and conclusions) comprises 32.71% of the total analyzed corpus.

In this Class, the meanings revolve around cultural aspects (cultural—78.57% and culture—63.64%) related to behavior in practices connected with digital games—Table 10.

Table 10. Class 1—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
cultural	unrecog.	11	14	78.57	13.51	0.00023
culture	noun	7	11	63.64	4.82	0.02815
behavior	noun	53	109	48.62	13.58	0.00022

- Class 5 (from introductions and conclusions) comprises 1.81% of the total analyzed corpus.

The meanings of this class suggest the act of buying digital games (purchase—61.25%), considering aspects of integration (18.71%), and meanings related to pleasure (hedonic—9.3%)—Table 11.

Table 11. Class 5—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
purchase	noun	5	20	25.0	61.25	<0.0001
integration	noun	2	10	20.0	18.71	<0.0001
hedonic	unrecog.	4	43	9.3	13.97	<0.0001

- Class 4 (from introductions and conclusions) comprises 0.84% of the total analyzed corpus.

Here, the word with the highest percentage portrays a ubiquitous gaming service (ugs—24%) related to a behavior type—Table 12.

Table 12. Class 4—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
Ugs *	unrecog.	6	25	24.00	164.51	<0.0001
behavioural	unrecog.	2	23	8.70	17.40	<0.0001
include	verb	3	69	4.35	10.77	0.00103

* Ugs: ubiquitous gaming service.

- Class 3 (from introductions and conclusions) comprises 17.5% of the total analyzed corpus.

The meanings for this class suggest that interaction (interact—68%) with a friend (friend—61.54%) interferes with the performance (performance—54.55%) and enjoyment (enjoyable—53.85%) perceived in regarding entertainment (entertainment—43.75%) and in terms of quality (quality—41.38%) in consumer satisfaction (satisfaction—40.91% and consumer—98.67%) of gaming services in communities (community—37.93%) that allow the materialization of social roles (social—34.94% and role—34.78%) in interactive games for mobile phones (phone—34.09% and interaction—33.33%) that somehow produce effects on behavior (behavior—30.28%) and are used online (online—26.93%)—Table 13.

Table 13. Class 3—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
interact	verb	17	25	68.00	44.93	<0.0001
friend	noun	8	13	61.54	17.62	<0.0001
performance	noun	12	22	54.55	21.23	<0.0001
enjoyable	unrecog.	7	13	53.85	12.00	0.00053
entertainment	noun	28	64	43.75	31.96	<0.0001
quality	noun	12	29	41.38	11.68	0.00063
satisfaction	noun	9	22	40.91	8.48	0.00359
consumer	noun	29	75	38.67	24.55	<0.0001
community	noun	11	29	37.93	8.55	0.00344
social	noun	58	166	34.94	39.53	<0.0001
role	noun	16	46	34.78	9.83	0.00172
phone	noun	30	88	34.09	17.86	<0.0001
interaction	noun	14	42	33.33	7.51	0.00614
behavior	noun	33	109	30.28	13.33	0.00026
online	unrecog.	87	323	26.93	25.68	<0.0001

- Class 2 (from introductions and conclusions) comprises 16.04% of the total corpus analyzed.

In this class, the meanings revolve around cognition (cognitive—66.67%) and enjoyment (enjoyment—65.91%), as these words have the highest percentages. The interpretation

of the set of meanings suggests that some enjoyment covers the process of acquiring knowledge (cognitive—66.67%) at a psychological level and that it provides some interaction and relationship (interaction—38.1% and relationship—38.1%) of behavioral proportion (behavioral—33.33%), which somehow impacts knowledge (knowledge—32.26%) and the role or function being performed (role—30.43%), affecting the experience (experience—21.51%)—Table 14.

Table 14. Class 2—Introductions and Conclusions.

Form	Type	Class s.t.	Class Total	%	Chi2	p-Value
cognitive	unrecog.	10	15	66.67	28.85	<0.00001
enjoyment	noun	58	88	65.91	173.15	<0.00001
psychological	unrecog.	7	15	46.67	10.56	<0.00001
interaction	noun	16	42	38.10	15.63	<0.00001
relationship	noun	16	42	38.10	15.63	<0.00001
behavioral	unrecog.	11	33	33.33	7.50	0.00616
knowledge	noun	10	31	32.26	6.19	0.01285
role	noun	14	46	30.43	7.31	0.00684
experience	noun	44	151	29.14	21.51	<0.00001

- Class 6 (from introductions and conclusions) comprises 3.84% of the total analyzed corpus.

In this class, it is suggested that financial banks (bank—65.38%) consider offering a gamified service (gamification—62.5%), selectively (customer—44.26%), for business purposes (business—34.78%), through commercial applications (application—28.12% and commerce—9.76%)—Table 15.

Table 15. Class 6—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
bank	noun	17	26	65.38	271.98	<0.0001
gamification	unrecog.	15	24	62.50	227.75	<0.0001
customer	noun	27	61	44.26	282.31	<0.0001
business	noun	24	69	34.78	188.23	<0.0001
application	noun	18	64	28.12	107.16	<0.0001
commerce	noun	3	16	18.75	9.76	0.00178

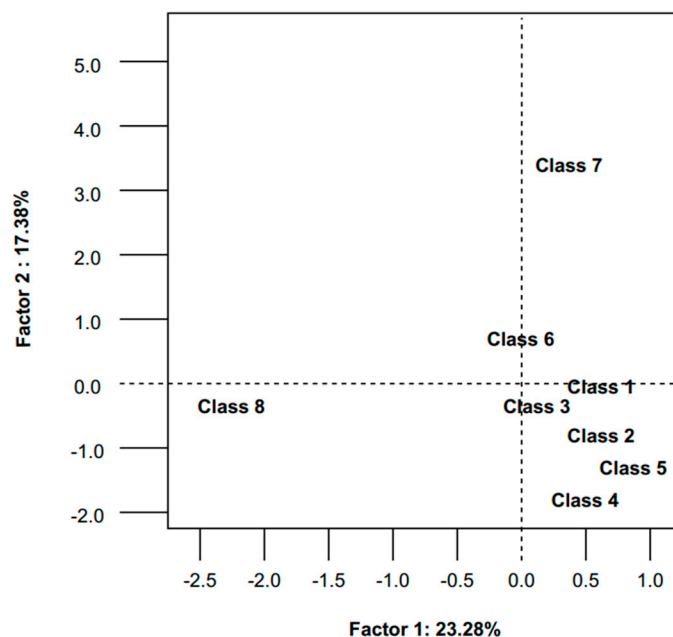
- Class 7 (from introductions and conclusions) comprises 7.53% of the total analyzed corpus.

The meanings in this class are related to the word “classroom”, which presented a percentage of occurrence in the corpus of 100%. The meanings here can be described using digital game resources in the classroom (classroom—100%) as a teaching resource in schools (teach—93.33% and school—90%), impacting student learning and education (learn—78.79%, education—78.79%, educational—69.57%, and student—67.65%) in some way—Table 16.

Considering data mining from introductions and conclusions (Second Stage), the CFA from these DHC allowed us to observe that Class 8 distances itself from the other classes, not representing the dimensions considered in the models of technology use and acceptance. Instead, it represents dimensions that possibly justify and motivate the studies carried out, suggesting that they are words used in the article introductions. Classes 1, 2, 3, 4, and 5 are grouped in the same quadrant, and Class 1 suggests grouping words that indicate the research results. In contrast, the other Classes (2, 3, 4, and 5) represent the dimensions associated with the models (the TAM and the UTAU2), as evidenced in Class 1. Class 7 presents a slight intersection with Class 1; however, it shows a distance from Classes 2, 3, 4, and 5—Figure 12.

Table 16. Class 7—Introductions and Conclusions.

Form	Type	Class t.s.	Class Total	%	Chi2	p-Value
classroom	noun	21	21	100.00	261.67	<0.0001
teach	verb	14	15	93.33	160.24	<0.0001
school	noun	9	10	90.00	98.34	<0.0001
teacher	noun	32	37	86.49	339.97	<0.0001
learn	verb	45	57	78.95	434.72	<0.0001
education	noun	26	33	78.79	246.27	<0.0001
educational	unrecog.	16	23	69.57	129.16	<0.0001
student	noun	23	34	67.65	180.72	<0.0001

**Figure 12.** CFA of introductions and conclusions—Source: Iramuteq.

Class 6, due to its positioning, suggests an association with the words that represent the introductions of the articles and the words that represent the conclusions.

5. Discussion

The present research aims to identify the primary dimensions—concepts and themes—in studies concerning the utilization and adoption of digital games by adults, in which the development or analysis of technology adoption models has been considered. Furthermore, it seeks to expound upon the meanings associated with the identified dimensions and suggest some of these dimensions as potential latent variables for future studies.

• The main dimensions (concepts and themes)

The meta-analysis, conducted to examine the primary dimensions encompassing concepts and themes within selected articles, all of which encompass models of technology adoption associated with the utilization of digital games by an adult audience, has revealed the identification of the dimension of socialization. This dimension has been explored within contexts related to enjoyment, behavior, performance, gaming experience, and perceived quality. Moreover, socialization has also been linked to the digital gaming industry and social practices, particularly online gaming on mobile devices (Classes 1 and 8—abstracts, keywords, and methods, Figures 8 and 9; Class 3—introductions and conclusions).

These findings imply that social practices have garnered the attention of game developers and that the perception of quality in the utilization of digital games encompasses

elements of enjoyment, performance, and the overall gaming experience in virtual environments that facilitate interaction with others, subsequently influencing behavior.

The meta-analysis, conducted by extracting concepts and themes from abstracts, keywords, methods, and introductions and conclusions, has enabled the identification of dimensions related to consumption, entertainment, learning, behavior, teaching, business, satisfaction, culture, and motivation. Additionally, it revealed the prevalence of the dimension of socialization. These results address the research question and meet the essential requirements in meta-analyses [22,24–26,28].

- *The meanings*

Furthermore, the CFA of introductions and conclusions enabled the identification of the words present in Classes 2, 3, 4, 5, 6, and 7, which were also mentioned in the conclusions of the research works. A comparative analysis between the classes generated through the DHC in the two parts of textual mining revealed notable similarities, as follows:

- Class 2 (from abstracts, keywords, and methods) and Class 7 (from introductions and conclusions).
- Class 5 (from abstracts, keywords, and methods) and Class 6 (from introductions and conclusions).
- Class 8 (from abstracts, keywords, and methods) and Class 2 (from introductions and conclusions).

Significantly, Class 1 (from introductions and conclusions) (Table 9) featured words suggesting an association between the behavior and culture dimensions, potentially informing suggestions for future research outlined in the article conclusions.

The CFA results (see Figure 12) highlighted those words from Classes 2, 3, 4, and 5 (both from introductions and conclusions) referenced in the research works' conclusions, often in conjunction with terms related to the TAM and UTAUT2 models. These results yield relevant insights for studies contextualized within the theme of this research and are generated using data mining [49–53].

- *Potential latent variables*

The results, through the meta-analysis applied to the study, present the main dimensions—concepts and themes—evidenced and, based on this, we suggest the gaps for future studies that may eventually be explored, especially as possible latent variables for a new conceptual model to explain the use of digital games by adults. Among the observed gaps that do not exhaust the possibilities for future studies, we suggest four observations (in the use of digital games), the absence of the dimension of satisfaction with life [66], the absence of the stress dimension [12], the absence of the immersion dimension [3], and the absence of the well-being dimension [46,47].

As a limitation of the current study, we emphasize the challenge of selecting 50 articles that align with the predefined inclusion and exclusion criteria. This challenge may be attributed to the chosen publication timeframe, which spanned fifteen years. It is worth noting that a comparable study required a more extended publication window, encompassing 26 years (from 1989 to 2016), to identify a sufficient pool of 50 articles suitable for inclusion in a meta-analysis [37] (Appendix A Table A1).

- *Other findings*

The reading and interpretation of the selected articles allowed for the categorization of these articles, as follows: by central theme and by study topics. Online games and mobile games are the most frequently utilized central themes in studies that incorporate technology usage and acceptance models into their methodologies—Table 17.

In the last five years, there has been an increase in the number of publications on the use and adoption of digital games by the adult population (approximately 44% of the publications used) (Appendix A Table A1).

Table 17. Central themes of the selected articles.

Central Theme	Study Topics	%
Online Games	Adoption, Behavioral, Consumption, Hedonic, Mobile device's use, Social.	37.5
Mobile Games	Behavioral, Consumption, Hedonic, Learning, Social.	35.4
Gamification	Business, Learning.	8.3
Video Games	Behavioral, Consumption, Meta-Analysis.	6.3
Social Games	Behavioral.	4.2
Game Addiction	Behavioral.	2.1
Digital Games	Learning.	2.1
Ubiquitous Game	Consumption	2.1
Virtual Reality Games	Consumption	2.1

6. Conclusions

First, it is important to highlight that in the present study, we use an innovative way to develop a meta-analysis—considering data mining techniques—to explore and identify the dimensions associated with the use of digital games, particularly by adults, and to explore possible (scientific) gaps that could be explored in future studies. Because of the meta-analysis—considering the selected scientific papers published in the last 15 years—our results summarize the main dimensions of the use and adoption of digital games by adults through conceptual models—adopted and validated by different researchers, as authors of the referenced papers—sought to evaluate and explain such use and adoption.

The meta-analysis applied allowed us to answer the research question, “How has the use and adoption of digital games by adults been studied?”. The results presented through the use of statistical resources developed for the analysis of qualitative data demonstrated the same effectiveness when using software specially developed for quantitative analyses to carry out meta-analyses [25,29–33,67].

Our findings provide a relevant contribution not only to the scientific field of digital game acceptance and adoption but also to game developers, highlighting certain characteristics of digital games as perceived by their users. Additionally, our research offers insights into the games industry itself, concerning digital game enhancement, marketing strategies, and the identification of untapped opportunities. This study may also prove valuable to researchers interested in exploring novel approaches to elucidate the use and adoption of digital games through technological acceptance models, particularly in understanding the interrelationship and significance of conceptual dimensions within these models. In this regard, our study sheds light on the socialization dimension when integrated with other conceptual dimensions, suggesting avenues for further research. Moreover, employing meta-analysis techniques allowed us to thoroughly explore these dimensions. For future investigations into adult engagement with digital games, we propose exploring satisfaction with life, stress levels, immersion experiences, and overall well-being as latent dimensions to be integrated into new conceptual models.

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Informed Consent Statement: Not applicable.

Data Availability Statement: All research data can be accessed through reputable platforms such as Google Scholar, Web of Science, EBSCOhost, and IEEE Xplore.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. The 48 articles.

Paper	Authorship	Thematic
Global Youth and Mobile Games: Applying the Extended Technology Acceptance Model in the U.S.A., Japan, Spain, and The Czech Republic	[68]	Behavior in adoption of mobile games in all cultures (proposition of theoretical model)
Consumer Behavior in Online Game Communities: A Motivational Factor Perspective	[69]	Customer loyalty in the context of online communities (theoretical model proposition)
Determinants of Adoption of Mobile Games Under Mobile Broadband Wireless Access Environment	[70]	Adoption of mobile games in wireless and broadband access environments (proposition of a theoretical model)
Antecedents and Outcomes of the Flow Experience: An Empirical Study in the Context of Online Gaming	[71]	Perceived pleasure and the behavioral intention of use (theoretical model proposition)
The Analysis of Service Acceptance Framework for Social Games Based on Extensive Technology Acceptance Model	[8]	Behavior of players in social games (systematic review)
What Drives People to Continue to Play Online Games? An Extension of Technology Model and Theory of Planned Behavior	[72]	Opinion of users of online games about the experience of flow, human–computer interaction, social interaction, and perceived pleasure (proposition of a theoretical model)
Applicability of the UTAUT Model in Playing Online Game Through Mobile Phones: Moderating Effects of User Experience	[73]	Consumer intention to play online through mobile phones (theoretical model proposition)
Exploring the Impact of Use Context on Mobile Hedonic Services Adoption: An Empirical Study on Mobile Gaming in China	[74]	Perception of hedonic use of mobile games (theoretical model proposition)
Customer Acceptance of Playing Online Game on Mobile Phones	[75]	Use of games for mobile phones (proposition of a theoretical model)
How to Attract Chinese Online Game Users: An Empirical Study on the Determinants Affecting Intention to use Chinese Online Games	[76]	Adoption of digital games (proposition of a theoretical model)
Using the Technology Acceptance Model to Evaluate User Attitude and Intention of Use for Online Games	[77]	Acceptance of online games based on the quality of aggregated services (theoretical model proposition)
Analyzing Behaviors Influencing the Adoption of Online Games From the Perspective of Virtual Contact	[78]	Adoption of online games (proposition of a theoretical model)
Gamers Just Want to Have Fun? Toward an Understanding of the Online Game Acceptance	[79]	Acceptance of online games (proposition of a theoretical model)
Understanding the Effect of Flow on User Adoption of Mobile Games	[80]	Adoption of mobile games (proposition of a theoretical model)
Acceptance of Game-Based Learning by Secondary School Teachers	[81]	Acceptance of commercial video games as learning tools in the classroom (theoretical model proposition)

Table A1. Cont.

Paper	Authorship	Thematic
Factors Affecting Chinese Ubiquitous Game Service Usage Intention	[82]	Intention to use Ubiquitous Game Service (theoretical model proposition)
Understanding Users' Continued Use of Online Games: An Application of UTAUT2 in Social Network Games	[83]	Intention to use social network games (proposition of a theoretical model)
Determinants of Acceptance of Mobile Games Through Structural Equation Modeling	[84]	Use and acceptance of mobile games (proposition of a theoretical model)
The Adoption of Mobile Games in China: An Empirical Study	[85]	Adoption of digital games (proposition of a theoretical model)
Determinants of Player Acceptance of Mobile Social Network Games: An Application of Extended Technology Acceptance Model	[86]	Use of social network games (theoretical model proposition)
Exploring Key Determinants of Gamer Behavior for Somatosensory Video Games: An Application of the Extended Technology Acceptance Model and Game Flow Theory	[87]	Use of somatosensory video games (theoretical model proposition)
The Moderating Effect of Reference Group on Online Game Loyalty: Focused on Hedonic Information System	[88]	Online games from the perspective of hedonic information systems (proposition of a theoretical model)
Mobile Game Adoption in China: the Role of TAM and Perceived Entertainment, Cost, Similarity and Brand Trust	[89]	Adoption of mobile game (proposition of a theoretical model)
A Study of Downloading Game Applications	[90]	Factors that influence the use of game applications (theoretical model proposition)
Business Simulation Games With and Without Supervision: An Analysis Based on the TAM Model	[91]	Business Games (theoretical model proposition)
Playing Seriously e How Gamification and Social Cues Influence Bank Customers to Use Gamified E-Business Applications	[13]	Business Games (theoretical model proposition)
The Effect of Flow Experience and Social Norms on the Adoption of Mobile Games in China	[92]	Adoption of mobile game (proposition of a theoretical model)
Exploring the Hype: Investigating Technology Acceptance Factors of Pokémon Go	[93]	Acceptance of mobile game technology (theoretical model proposition)
Understanding Behavioural Intention for Adoption of Mobile Games	[94]	Intention to adopt mobile games (proposition of a theoretical model)
Video Game Acceptance: A Meta-Analysis of the Extended Technology Acceptance Model	[43]	Acceptance of digital games (systematic review)
A Modified TAM for Predicting Acceptance of Digital Educational Games by Teachers	[95]	Use of video game resources in the teaching–learning process (model idealization)
The Technology Acceptance Model for Playing Mobile Games in Indonesia	[96]	Use of mobile games (proposition of a theoretical model)
Analysis of Critical Factors for Social Games Based on Extended Technology Acceptance Model: a DEMATEL Approach	[9]	Use of social games (proposition of a theoretical model)

Table A1. Cont.

Paper	Authorship	Thematic
Examining Situational Continuous Mobile Game Play Behavior from the Perspectives of Diversion and Flow Experience	[97]	Adoption of mobile games (proposition of a theoretical model)
Analysing the Acceptation of Online Games in Mobile Devices: An Application of UTAUT2	[98]	Acceptance of online games (proposition of a theoretical model)
The Integration of Video Games in Family-Life Dynamics: An Adapted Technology Acceptance Model of Family Intention to Consume Video Games	[10]	Use of video games within the family (proposition of a theoretical model)
Online Video Games Adoption: Toward an Online Game Adoption Model	[14]	Use and adoption of online games (proposition of a theoretical model)
User Continuance in Playing Mobile Online Games Analyzed by Using UTAUT and Game Design	[99]	Acceptance of Online Mobile Games (theoretical model proposition)
A Questionnaire-Based Approach on Technology Acceptance Model for Mobile Digital Game-Based Learning	[100]	Use of mobile games in learning (model idealization)
Technology-Enhanced Teaching: A Technology Acceptance Model to Study Teachers' Intentions to Use Digital Games in the Classroom	[101]	Use of digital games in learning (proposition of a theoretical model)
Using the Technology Acceptance Model to Evaluate Behavioural Intention to Use Mobile Games—A Case of Pokémon GO	[102]	Use of mobile games (proposition of a theoretical model)
Factors Affecting Woman's Continuance Intention for Mobile Games	[103]	Intention to use mobile games (proposition of a theoretical model)
A Posteriori Segmentation of Personal Profiles of Online Video Games' Players	[104]	Segmentation of users of online games (proposition of a theoretical model)
Adoption and Continuance Intention Model of Applying Telemedicine Technology in Digital Games Addiction	[53]	Use of digital games in a situation of addiction treatment in such games (model idealization)
Proposing a TAM-SDT-Based Model to Examine the User Acceptance of Massively Multiplayer Online Games	[15]	Acceptance of simultaneous multiplayer online games (theoretical model proposition)
Exploring the Factors Influencing Consumer's Attitude Toward Using and Use Intention of Virtual Reality Games	[105]	Use of games with virtual reality (proposition of a theoretical model)
Relationship Between Perceived Ease of Use, Perceived Usefulness and Motivation Opportunity Ability Theory in Online Gamers Know-How Exchange	[54]	Market research in online games (proposition of a theoretical model)
Mobile Games Adoption: An Extension of Technology Acceptance Model and Theory of Reasoned Action	[106]	Intention to use games for mobile phones (proposition of a theoretical model)

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