Beyond Play Your Process - Game Design and Business Process Model: A Rapid Review

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Abstract. Introduction*: Digital games have been increasingly explored beyond entertainment, including business process modeling. However, assessing how process models have been used in digital game development is necessary.* ***Objective****: This article presents a rapid review to identify and evaluate studies that implement business process models in digital games.* ***Methodology or Steps****: The review covers studies from Jan 2018 to Mar 2024, complementing a 2017 systematic review. The snowballing technique was applied to the paper "The Play Your Process Method for Business Process-Based Digital Game Design".* ***Results****: After filtering 151 articles, 20 were fully analyzed. Findings show that 13 studies use process models for game development, nearly five times more than the last systematic mapping.*
Keywords *Game Design, Play Your Process, Business Process, Rapid Review.*

1. Introduction

The use of games for purposes beyond recreation has become increasingly common over the years assuming crucial importance in education and business training [Papastergiou 2009]. Researches show that games have been used as an education tool in different sectors of the economy such as health [McCammon et al. 2024], [Steenstra et al. 2024], architecture [Örnek 2013], and public services [Classe et al. 2020a], [Janssen et al. 2021a], [Classe et al. 2018c]. Some countries have even started to organize the use of games in industry and education as Brazil, for example, recently enacted Law 14.852/2024, which establishes the legal framework for the electronic games industry [Agência Senado 2024].

This scenario highlights the importance of investment and the creation of methods and techniques that assist in the development of digital games. In this context, this article presents a rapid literature review to identify and evaluate studies associated with using process models combined with digital game design, from the researcher's point of view, in digital game design contexts. It is important to note that this review is not the first one conducted in the field. Classe and Araújo conducted two systematic mapping in order to find research that applied business processes in the context of game design [Classe and Araujo 2015], [Classe et al. 2018a]. Since the last review [Classe et al. 2018a] was conducted in 2017, between the last week of November and the

first week of December, covering the period since 2007, this research covers the period of years 2018 to 2024.

After applying the review protocol, 151 articles were found; however, only 20 received a complete reading and 13 were accepted. Although the resulting number represents almost five times more articles than the last systematic mapping, most of them illustrate applications of a method called Play Your Process (PYP) [Classe et al. 2019] and two adaptations of the same method [Janssen et al. 2021a] and [Ferreira et al. 2022]. The method PYP was one of the first to use business process model as a basis for developing digital games. Its main purpose is to facilitate the understanding of game designers while trying to identify the elements of the business process that need to be represented in the digital game.

The article is divided as follows: section 2 shows the protocol used in this research's rapid review, including the snowballing process. Section 3 shows how the review was executed while 4 presents the results found during the experiments. Finally, sections 5 an 6 provide the discussion regarding the research questions and the conclusion of this rapid review.

2. Rapid Review Protocol

This rapid review covers the period from January 2018 to March 2024 and complements two previous systematic reviews conducted by researcher Tadeu de Classe analyzing studies addressing business process models combined with digital game design in digital game design contexts. The first literature review was conducted in 2015 [Classe and Araujo 2015] and the results show that no research was found on the topic. In 2017, Classe et al. [2018a] conducted a new systematic review and the results still show a lack of literature on the use of digital game design combined with business process models. Of the 3 articles accepted at that time, only one mapped a BPMN proposal to game design.

This article conducts a new rapid review, and this session presents its protocol. This rapid literature review aims to identify and evaluate studies related to the use of process models combined with digital game design, from the researcher's point of view, in digital game design contexts. In addition, this review of the literature aims to analyze the papers that have cited the article "The Play Your Process Method for Digital Game Design Based on Business Processes"by Classe et al. [2019], one of the first to suggest combining digital games and process models in the context of digital game design, to verify what has been done and possible future work in the research field. The following topic presents the research questions (RQ) of this study. It was used for both rapid review and snowballing. The main goal of these RQ was, in addition to the use of process models as a basis for digital game constructions and design, to find room for future research in the field.

- **Research Questions**
  - **RQ1:** Is there research that approaches the use of process models as a basis for digital game construction and design?
  - **RQ2:** What approaches, methods, techniques, and technologies involve the use of process models in digital game design?

  - **RQ3:** Did the document carry out any experiment part of the 'future work' section of the article 'The Play Your Process Method for Business Process-Based Digital Game Design'?
- **Scientific Database Sources and Keywords**
  This literature review contemplated the same scientific databases as the previous ones, ACM Digital Library, El Compendex, Google Scholar (Portuguese), IEEE Digital Library, ISI Web of Science, Science Direct, Scopus and Wiley & Sons. Due to a filtering limitation, only articles in Portuguese were considered in Google Scholar because of the number of results when documents in English were also included. The language Portuguese was chosen because the research is contextualized in Brazilian services.
  This paper considered the same keywords, variants, and synonyms used in the last two systematic reviews: "game design", "process model"and "digital democracy". However, we noticed that the inclusion of the term "digital democracy"didn't influence the number of results while using the scientific databases. The appropriate changes were made to each search string considering the database used to find the articles.
- **Selection Criteria and Data Extraction**
  The selection of papers passed through two phases, the first executing exclusion criteria and the second analyzing the articles that could somehow answer the research questions.
  - **F1 - First Filter (Selection):** the first filter works as exclusion criteria: i) duplicated papers; ii) papers written in languages apart from English or Portuguese; iii) publication's full text unavailable online; iv) papers that carried out a systematic review; v) the keyword context isn't related with game design; and for the snowballing review, we also added the exclusion criteria vi) the paper was already found in the rapid review.
  - **F2 - Second Filter (Acceptance):** after completely reading the remaining papers, this filter was used to define the accepted papers. The accepted articles were those that used process models in the digital game design process (RQ1) or carried out any experiment part of the 'future work' section of the article 'The Play Your Process Method for Business Process-Based Digital Game Design' while also following the exclusion criteria: the publications don't refer to digital games, and ii) the publication didn't associate process model and digital game design.

The platform Parsif.al [1] was used to organize all the information from the articles and select the articles during the review. The platform presents the PIPOC, Population: Articles published in journals or conferences; Intervention: Software Engineering, Business Process, Game Design; Comparison: Limitations, Research gap; Outcome: Identify and evaluate studies regarding the use of process models combined with digital game design, from the researcher's point of view, in digital game design contexts.

3. Rapid Review Execution

This section presents the execution of the rapid review itself. The two subsections below show the rapid review in general and the "The Play Your Process Method for Business

[1] https://parsif.al/

Process-Based Digital Game Design"article snowballing. Both reviews were performed in March 2024.

3.1. Rapid Review

After the research, the review protocol returned 151 papers. The table 1 shows the results and application of filters 1 and 2. The column 'Found' presents the number of articles found in each scientific database, we can see that Google Scholar and Scopus were the bases that returned the most of the papers. The column 'Removed' is the one responsible for showing the results after the first filtering process (F1). In this phase, the filtering removed the articles considering their titles and abstracts. The column 'Included' presents the articles selected for full reading. From 151 papers, 131 were removed and 20 received a full reading. After the second filtering (F2), 13 articles were accepted, the most from the Google Scholar scientific database. The articles accepted were the ones that answered the research questions presented in this article after a complete reading.

Tabela 1. Rapid Review: Results

Scientific Source	Found (Seek)	Removed (F1)	Included (F1)	Rejected (F2)	Accepted (F2)
Google Scholar	46	31	15	5	10
Scopus	48	46	2	1	1
ACM Digital Library	0	0	0	0	0
El Compendex	16	15	1	1	0
IEEE Digital Library	2	2	0	0	0
ISI Web of Science	14	12	2	0	2
Science @ Direct	8	8	0	0	0
Wiley & Sons	17	17	0	0	0
Total	**151**	**131**	**20**	**7**	**13**

The Figure 1 shows in parts (A) and (B) the accepted and included articles respectively. Even though Scopus was the scientific database with most of the articles, we can see in (A) that it represents only 8% of the included articles. Papers from IEEE Web of Science and Science Direct were also not included. In part (B) we can see that 77% of the articles were found in Google Scholar.

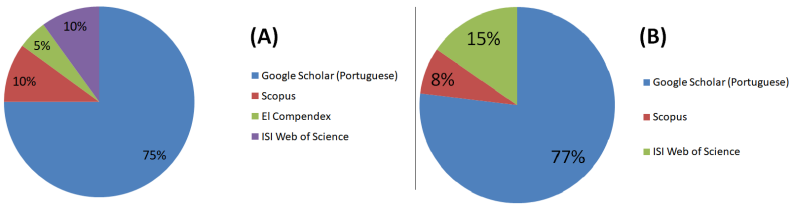

Figura 1. A) Papers selected After The First Filter. B) Paper Selected After the Second Filter.

The Figure 2 presents the PRISMA flow diagram for a better understanding of the rapid review.

3.2. Snowballing execution

As previously mentioned, the article 'The Play Your Process Method for Business Process-Based Digital Game Design' [Classe et al. 2019] was one of the first articles to

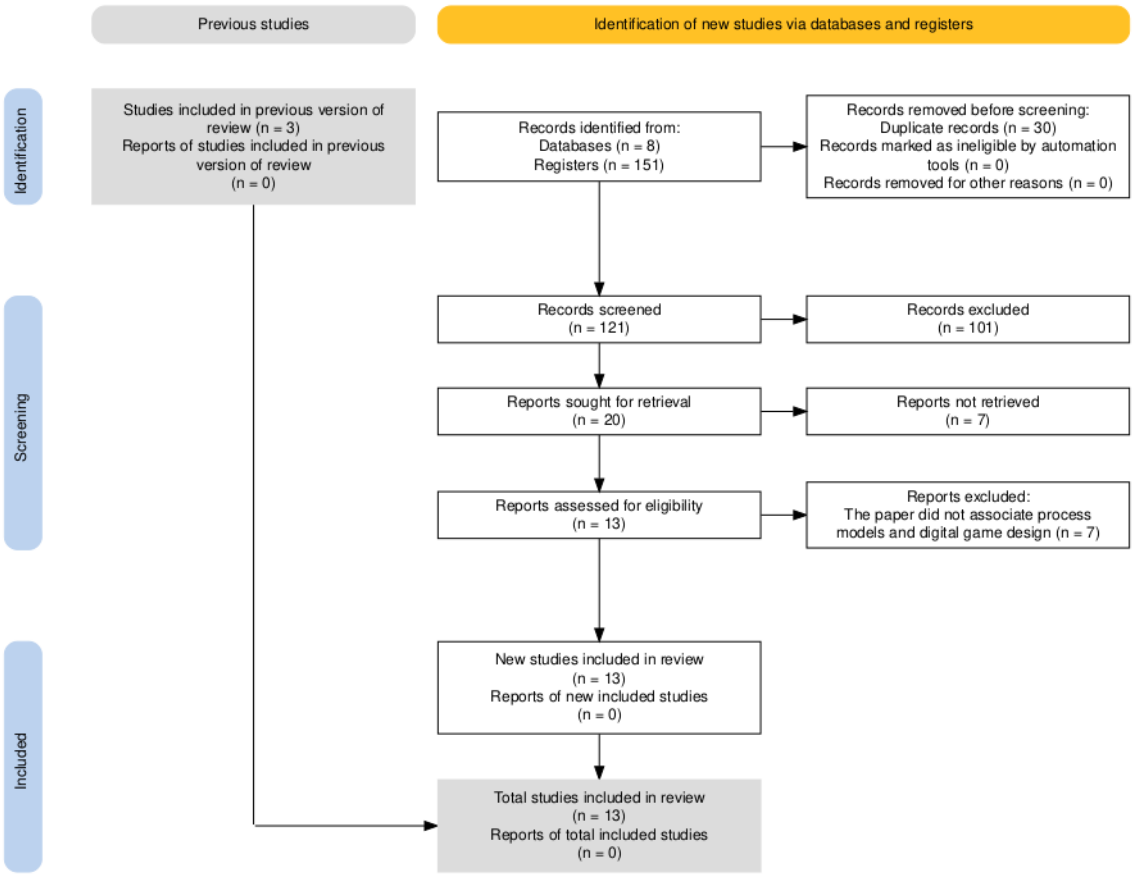

Figura 2. Rapid Review PRISMA flow diagram

present a method that uses process model as a base for developing digital games. For this reason, this systematic review also includes a snowballing review to identify which articles have cited it and verify applications and future work that have been accomplished. The protocol was also released on March 2024 and just the scientific databases Google Scholar and Scopus were used.

Table 2 presents all the results obtained. Column 'Found' presents all the articles found, 39 in total. Column 'Removed' shows the papers that didn't receive a complete reading. In this part, we removed the duplicated articles and the papers already found in the rapid review presented in the last subsection. After fully reading the articles obtained in column 'Included', no articles from Scopus were rejected while less than 50% of the articles from Google Scholar were. In column 'Accepted' we can see that 5 articles were accepted as a result of this snowballing.

Tabela 2. Snowballing the article 'The Play Your Process Method for Business Process-Based Digital Game Design': Results

Scientific Source	Found (Seek)	Removed (F1)	Included (F1)	Rejected (F2)	Accepted (F2)
Google Scholar	29	17	12	9	3
Scopus	10	8	2	0	2
Total	**39**	**25**	**14**	**9**	**5**

In Figure 3 we can visualize the relationship between the articles that were included and the ones that were accepted. As we can see in part (A), most papers were from Google Scholar, however in part (B) the number of articles accepted from Scopus has increased compared with part (A).

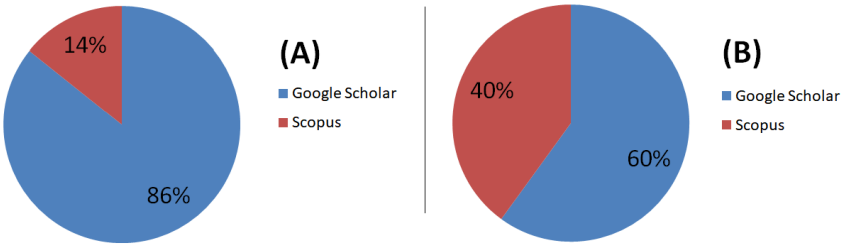

Figura 3. A) Papers selected After The First Filter. B) Paper Selected After the Second Filter.

The Figure 4 presents the PRISMA flow diagram for a better understanding of the snowballing process.

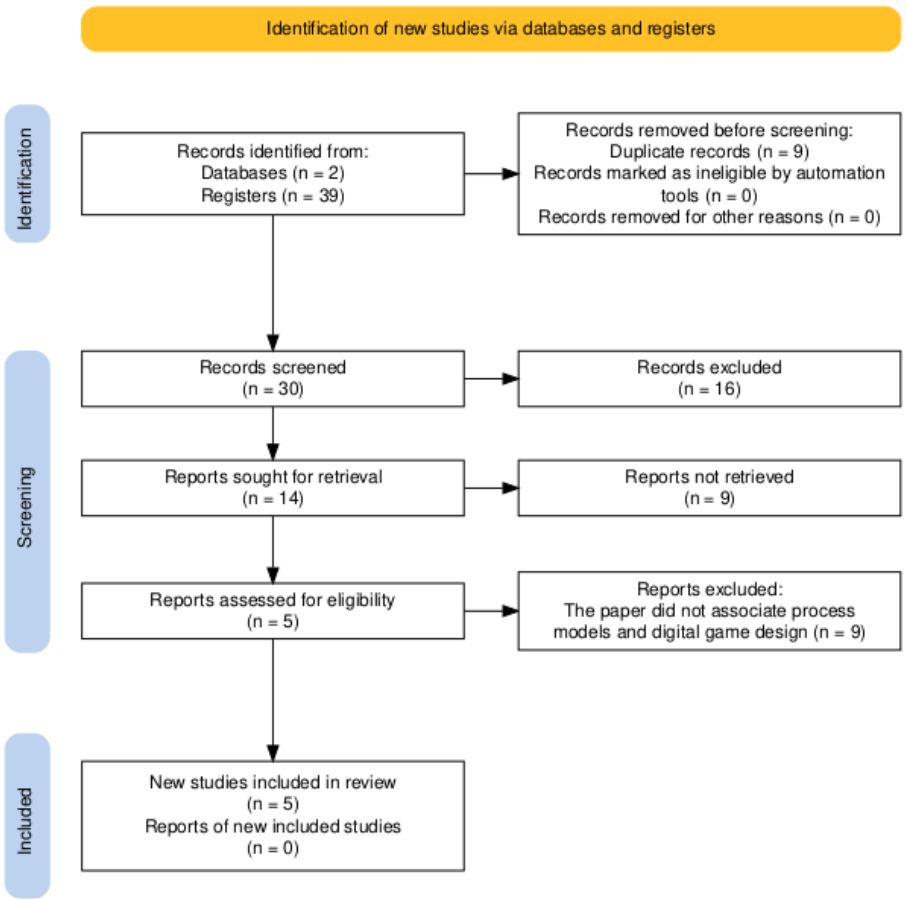

Figura 4. Snowballing PRISMA flow diagram

4. Rapid Review Results

4.1. Rapid Review

Rosenthal and Strecker [2018] use process models as a basis for developing serious game. The paper presents a field study by developing and applying a serious game in a medium-sized German manufacturer. The main goal of the game was to achieve a company-wide comprehensive understanding of the tendering and order management process by the participants. Five hundred employees participated in the study. The game was based on a BPMN model of the company's bidding and order management process, featuring activities, events, roles, and documents. The process model was displayed with placeholders for these elements, with identifiers removed for anonymity. Additionally, the game included 70 short videos attached to the model elements to provide participants with further information. The participants had to identify the business process through the analysis of BPMN. The game is similar to a quiz, but no genre was explicitly informed. Besides that, the authors also did not showed any name for the game.

The article 'Learning VR Game Development Towards Software Basic Profile' [Jirapanthong et al. 2018] focuses on establishing a basic process model profile suitable for software game development, with a case study on a Virtual Reality (VR) game called "Know More Thai,"aimed at teaching Thai etiquette and customs. The game environment is based on 3D modeling of physical reality, with field studies conducted at significant locations in Thailand. Jirapanthong et al. [2018] created the process model to guide developers in game development, ensuring that the process is effective, systematic, and useful, and includes steps and guidelines for making the game, from 3D modeling of characters and environments to integrating sound elements and game programming. The results from the evaluation of the game show that out of 20 questions posed to 12 respondents, the weighted average was 60.2727%, indicating good satisfaction with the use of the profile, considering it useful and systematic. Furthermore, the processes were highly available and reliable, with good accessibility and performance.

The following articles have the author Tadeu de Classe in common. He was one of the researchers to conduct the last systematic mapping who dived into the relationship between process model, digital game designer, and digital democracy [Classe and Araujo 2015, Classe et al. 2018a]. The papers 'The Play Your Process Method for Business Process-Based Digital Game Design' [Classe et al. 2019] and 'Play Your Process - Um Método de Design de Jogos Digitais Baseados em Modelos de Processos de Negócio' [Classe et al. 2020b] introduce the Play Your Process (PYP) method, whose main goal is to systematize and facilitate the digital game design process while providing a better understanding to players of process models addressed in the game. The papers apply the PYP method for designing the adventure games 'Desaparecidos', 'The ProUni Game', 'SUS Card Adventure' and 'Intergalactic Passport'.

The authors Classe et al. [2018b] present in their paper a proposal of a tool called Process Model Game Design that complements the use of PYP method. This tool systematizes the design of games that have a model process as a basis. In addition, it involves several stages: context analysis, process mapping to game elements, drafting the game design document, game project development, prototyping, evaluation, and game publishing. Results indicate that the games developed with the PYP have good quality,

and players showed an increased understanding of the process after playing them. The tool was used for developing the adventure/RPG game 'Desaparecidos'.

The Play Your Process method also suffered some adaptations. The technical reports [Lopes et al. 2023] and [Janssen et al. 2021a] have a significant focus on the business process model represented in the game. Classe et al. [2023] and Janssen et al. [2021a] emphasize the values that the games created using the PYP method transmit to the players and how these values impact them. To do so, the paper 'Projetando Valores em Narrativas de Jogos Digitais Baseados em Processos para Serviços Públicos Brasileiros' [Janssen et al. 2021b] suggests the Play Your Process - with values (PYPwV), trying to show how to incorporate human values while developing games to represent some public service provision. The adventure/ RPG game "Desaparecidos"was also used in this paper to demonstrate the method.

Both Classe and Ferreira [2023] and Ferreira et al. [2022] describe the creation of the Scripting Your Process (SYP) responsible for generating narrative scripts for games. The method complements the PYP method by providing a systematic approach to developing narratives for business process-based digital games based on business process models [Classe and Ferreira 2023]. Classe and Ferreira [2023] did a proof of concept (PoC) using the game "Desaparecidos"to validate the method. The narrative addresses the aspects of the business process, incorporating the process flow from its model into the timeline, representing the actors as characters, while illustrating environments and objects in the story's settings and resources. Ferreira et al. [2022] applied the method to a real business process "To process a work order"of a multinational mining company. After validation, the results show that the narrative was consistent with the business process model.

The last three articles to be presented in this rapid review describe applications of previously described methods. Melo et al. [2023] uses the SYP and PYP methods to develop an adventure/ RPG game representing the internal transfer process at a university aiming to conduct an evaluation, comparing a business process model of a public service represented by BPMN, an interactive narrative, and business process-based digital games [Melo et al. 2023].

Classe et al. [2018c] presents the development of three adventure/RPG games, 'The ProUni Game', 'Cartão SUS Adventure' and 'O Recruta' which represent three different Brazilian public services also presented in the article 'Public processes are open for play' [Classe et al. 2021]. Chagas et al. [2022] illustrate the RPG game 'Morro Novo' developed using PYP method, aiming to train employees on the operational process of managing maintenance occurrence records for large equipment in a multinational mining company.

4.2. Snowballing

After applying the snowballing it was possible to note that most of the articles had the researcher Tadeu de Classe as author or co-author, the creator of the method Play Your Process [Classe et al. 2019], a method that utilizes business process models as a basis for the development of digital games. Only 5 articles were accepted in this review and this section shows a summary of these articles.

Archuby et al. [2023] presents an initial review analyzing methods that have been

used for the development of serious digital educational games. Among them, the method Play Your Process [Classe et al. 2019] is mentioned. Although it does not explicitly mention the use of business process models as a foundation for game creation, the article proposes the methodology Design and Implementation of Serious Games in Spanish (DIJS) [Archuby et al. 2023]. DIJS provides a structured framework that incorporates various elements and stages to ensure the successful creation of digital educational games. The methodology's focus is on balancing entertainment and educational aspects, utilizing strategies from game designers and instructional designers to guide the development process.

The articles 'Jogos baseados em processos de negócio: Aplicação no treinamento de processos de negócio' [Lopes and Araujo 2021] e 'Mediador Game: Um jogo baseado em processo de negócio para treinamento organizacional' [Gomes et al. 2021] complements themselves. In the first article, Lopes and Araújo [2021] suggests a proposal of using Play Your Process (PYP) method [Classe et al. 2019] for developing games for business process training while in the second Gomes et al. [2021] presents the use of PYP for developing 'Mediador Game', a digital game based on business processes to support process training, applied in conflict mediation within the judiciary.

The last two articles also present applications of the method Play Your Process [Classe et al. 2019]. In 'Public Processes Are Open for Play' [Classe et al. 2021], the authors Lopes and Araújo [2021] develop three educational games to disseminate knowledge about the functioning of certain public services to Brazilian citizens: the missing person game, the SUS-card game, and the PROUNI Scholarship game. The games were developed using the Play Your Process method [Classe et al. 2019]. The results obtained demonstrated that the use of the games helped in understanding the functioning of public services related to the dissemination of information about missing persons, the use of the SUS (Unified Health System) card, and the use of the PROUNI scholarship program.

As in 'Public Processes Are Open for Play'[Classe et al. 2021], in the article 'Onde Estamos: Jogo Com Propósito Para Divulgação de Pessoas Desaparecidas' [Classe et al. 2020a], Classe et al. [2020a] presents the development process of the game "Onde Estamos?"which aims to disseminate information about missing people, as well as to show players how the process of reporting a missing person works within the Brazilian public service. The game was also developed using the Play Your Process method. Therefore, it is an application of this method.

5. Discussion

This section presents the discussion obtained from the results of the literature review on the use of process models in digital game design contexts. A total of 18 articles were identified by combining the results of the rapid review and the snowballing process. Among them, only three did not include Tadeu de Classe as a member of the research group.

This research confirms that process models have been used as foundational elements in digital game design, particularly in serious and educational games. Rosenthal and Strecker [2018] demonstrate that business process modeling notation (BPMN) has been used to structure serious games aimed at improving business process understanding.

Similarly, Jirapanthong et al. [2018] proposed a process model for guiding VR game development, ensuring a structured approach for game creation. Additionally, Archuby et al. [2023], although not explicitly focused on business process models, offers a structured framework for serious educational game development.

The analysis of reviewed studies also shows that multiple research works have expanded on the Play Your Process method (PYP), including its adaptation into new frameworks such as PYPwV (Play Your Process with Values) [Janssen et al. 2021b] and Scripting Your Process (SYP) [Ferreira et al. 2022]. PYPwV focuses on embedding human values within game narratives, particularly in public service training, while SYP extends the PYP approach by providing systematic narrative generation for business process-based games [Ferreira et al. 2022] by embedding structured models into game narratives and mechanics. Similarly, the majority of the papers present applications of the method Play Your Process, aiming to share Brazilian public services information with the citizens. Applications of the PYP method in games like 'Mediador Game' for conflict mediation [Gomes et al. 2021], 'Morro Novo' for mining industry training [Chagas et al. 2022], "Onde Estamos?"for disseminating information about missing people [Classe et al. 2020a] and various public service games [Classe et al. 2021] indicate continuous research efforts aligned with the original vision outlined in the PYP article's future work section [Classe et al. 2019].

Furthermore, tools like the Process Model Game Design framework [Classe et al. 2018b] was proposed to facilitate game development based on process models, supporting stages such as game design documentation, prototyping, and evaluation.

The findings also reinforce the applicability of methodologies such as PYP [Classe et al. 2019] as effective approaches to facilitate the digital game design process, while also highlighting variations such as SYP and PYPwV, which emphasize the importance of game narratives and the inclusion of values in digital games.

Despite the comprehensiveness of this review, the study presents limitations that should be considered when interpreting the results. First, the exclusion of grey literature, including theses, unpublished documents, and articles identified during the search but not available for access, may have restricted the identification of relevant studies. Furthermore, the inclusion of only articles written in English and Portuguese may introduce language bias, as research published in other languages could have been inadvertently excluded.

6. Conclusions

The last systematic mapping regarding the relationship between the process model, digital games, and digital democracy resulted in three articles. However, only the article of the authors [Solís-Martínez et al. 2015] considered mapping a BPMN proposal of game design.

This rapid review had 13 articles accepted, but only [Rosenthal and Strecker 2018] and [Jirapanthong et al. 2018] suggest methods that have a business process model as a basis for developing serious digital games. The other articles bring different applications of the method Play Your Process created by [Classe et al. 2019] focusing on Brazilian

public services. Besides the applications, the review also shows two adaptations of Play Your Process method. The method Scripting Your Process [Ferreira et al. 2022] focuses on the narrative presented in the games and Play Your Process - With Values [Janssen et al. 2021a] emphasizes the importance of bringing human values to the development of the games. Both adaptations, however, are strongly influenced by the standard PYP method in most part of its developing process.

The snowballing had 14 articles receiving a complete reading, but only 5 were accepted. All the articles presented Play Your Process applications in different Brazilian public service scenarios.

Even though this review had almost 5 times more articles accepted than the last one, the research shows that there is still a lack of methods that use business process models as a basis for developing digital games. Similarly, the majority of the papers present applications of the method Play Your Process aiming to share Brazilian public services information with the citizens.

Due to all these considerations, there is still room for the development of methods that incorporate business process models. In addition, the Play Your Process (PYP) method can be applied to other fields that share similarities with business processes, such as health games involving clinical process modeling. Additionally, all the games presented in the reviewed articles were adventure or RPG games, which opens up opportunities to explore the use of PYP in different game genres. The integration of other types of diagrams alongside BPMN in business process modeling also presents a promising area for further investigation.

The Use of Artificial Intelligence

This article used the tool Grammarly to correct the text. Besides that, the article used ChatGPT 4o to assist with some translations from Portuguese to English.

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