PYP4Training - Ludifying Business Process Training

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Abstract. Process training is an important activity in the business process management lifecycle, when the organizational actors must be taught in how to perform existing or redesigned work processes. Process training is a continuous activity performed whenever processes are significantly changed, innovations are introduced or new professionals are integrated to the organization. Due to their motivational nature, games have been seen as alternatives to support process training in organizations. However, the approaches to design games for ludifying process trainining in organizations, presented in the literature, are incipient in methods and results. This research proposes the development of a particular type of games, defined as Business-Process-Based Digital Games (BPBDG), and its potential application in process training. Using Design Science Research, we conducted the first research cycle by exploring the development and application of BPBDG for process training in an organization in the judicial sectorThis is to inform you that as the Institutional email address of the corresponding author is not available in the manuscript, we are displaying the private email address in the PDF and Springer-Link. Do you agree with the inclusion of your private e-mail address in the final publication?. The results of this design cycle demonstrated that the game has playability and learning potential from the perspective of the process expert and point out for further research steps.

Keywords: Business process training · Serious digital games · Business process-based digital games · Play your process

1 Introduction

In an increasingly connected world, digital technologies have been one of the main drivers of change in organizations in the search for greater efficiency and effectiveness in their business processes and leading to a complete change in the

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way an organization works [21]. Organizations that apply BPM [6] to face this challenge need to frequently train their professionals to institutionalize new processes and process changes [1]. Process training is an important activity in the business process management lifecycle, when the organizational actors must be taught in how to perform existing or redesigned work processes. Process training is a continuous activity performed whenever processes are significantly changed, innovations are introduced or new professionals are integrated to the organization. Process training is considered an important activity in the BPM lifecycle, where processes designed for the organization are effectively institutionalized, and professionals learn and execute business processes [6,27].

Serious games [25] can serve as complementary learning and training tools, acting as triggers to engage people in specific purposes, and in developing new knowledge and skills, accompanied by tension and joy and a feeling of being different from everyday life [9]. Serious games have the potential to improve the efficacy of formative programs, to increase organizational productivity, and to solve problems [20]. However, recent litterature reviews [13,14] show that approaches of game design for business process training in organizations are still incipient in methods and results. This research work aims at exploring ideas for ludifying the activity of training actors in organizational processes. Although the term *gamification* is broadly used to refer to approaching real situations as games, the research field differentiate this concept from others. In our research, our aim is to *ludify* (to recreate the work environment and process execution into a virtual and magic world, where work and fun can be balanced, as described by [9]), and not to *gamify* (to include game elements - points, badges etc. - in work activities to stimulate human motivations, as described in [5]).

Previous research [16] argues that serious games (or games with purpose [26]) can make the actors (executors, customers, managers, etc.) involved in a business process understand the functioning and characteristics of these processes, including opportunities for improvement and innovation. [4] defined a specific genre for games for this purpose, called Business-Process-Based Digital Games (BPBDG). These are games capable of presenting business processes playfully and engagingly, allowing players to understand how the processes work. Their players can also develop an awareness of the goals, challenges and characteristics of the organization's business processes. The same research proposed a business-proces-based digital game design method - Play Your Process (PYP). This method comprises steps for designing this game genre from a business process model [4].

The Business-Process-Based Digital Games concept and the Play Your Process method can be promising approaches for building games for training business processes. In its original proposition, the PYP aimed to build games focused on understanding business processes by customers or consumers of the processes and not for training actors in the business process execution. Therefore, our research question (RQ) is defined as: **How to build Business-Process-Based Digital Games for business process training?**

In this article, we evaluate the application of PYP to build BPBDG for process training and observe opportunities to improve the method specifically for

this purpose. The research is based on the Design Science Research methodology [7], where we present the first cycle of its execution, exploring the application of PYP in the construction of the Mediator Game (Jogo do Mediador, in portuguese), a game for training the selection process of conflict mediators in the judiciary, and its qualitative evaluation by a specialist in this process.

The article is organized as follows: Sect. 2 presents the concepts that underlie the research. Section 3 discusses related work. Section 4 presents the research design. Section 5 describes the conception of the PYP4Training method and its demonstration in the game design of the Mediator Game. Section 6 presents the limitations. Finally, in Sect. 7, final considerations are presented.

2 Background

2.1 Business Process Training

Training comprises necessary actions to change attitudes, increase knowledge or acquire skills necessary for the adequate performance of human capital in organizations [1]. For Kirkpatrick [11], at least one of the following items - knowledge, skills and attitudes - must be modified so that the change in the professional's behavior at work needs to be considered. Given the growing competitiveness, professionals need to be frequently updated regarding changes in the way the organization works. In this scenario, the traditional forms of training, such as lectures or readings, may not be enough [10]. It is necessary to create and develop an internal culture favorable to learning and committed to the organizational changes. The training objectives go beyond improving the performance and competence of professionals through knowledge, skills and attitudes. They should establish a high degree of motivation and outline the individual responsibility of all parties involved [1]. The human factor is essential for successful business processes [1]. Process training can ensure that all parties involved in the business process can acquire competence in execution and awareness of the relevance of the organizational process.

The classic references of BPM rarely address process training. Although the authors say that training is a critical phase to be considered in organizational management, they do not much explore how to do it [6,27]. No matter how well business process modeling and implementation activities are technically executed, the human component strongly impacts the execution. Thus, professionals must have the training and acquire the necessary competencies and skills to execute the processes as expected.

2.2 Business Process-Based Digital Games

Serious digital games are games that engage the user and contribute to the achievement of a defined purpose [25], that is, games in which there is a secondary objective (the main one is the challenge and the fun) of teaching something to the player, and not intended simply for entertainment [25]. Serious games have also

been explored in organizational process management [13]. In this context, this research is interested in the game genre called Business-Process-Based Digital Games (BPBDG). BPBDG are serious digital games that present a business process in a gamified way and allow players to understand and learn how the process works in a fun and engaging way and develop reflections regarding its need, practice, values, challenges and limitations of execution [4].

This specific game genre implements the conceptual elements presented in a business process model as game elements, based on a conceptual mapping between these elements [4]. This mapping considers specific game genres, for example, the adventure game genre. In this way, actors, activities, rules, resources, events etc., in a process model can be mapped respectively as characters, tasks, rules, resources, events etc., in an adventure game, during game design.

2.3 Play Your Process

The Play Your Process (PYP) is a method of designing digital games based on business process models. PYP guides the designer in building games based on business processes, from conceptualization to evaluation, through iterative steps, based on information obtained from business process models [4]. The steps for executing the method are 1) Context Study: It consists of the understanding of the entire design team about the business process to be implemented in the game. 2) Mapping of process elements to game elements: This step aims to map the elements that will be used in the digital game design from the business process model. 3) Game design: This is a game designer's creativity step, which will define the usual aspects expected for game design in general. The stage is based on Schell's game design vision [24]. 4) Development and prototyping: The development stage comprises the coding of the game in an environment. 5) Validation: The validation step proposes that the games must undergo three evaluations. The first evaluation is with the design team, the second is conducted with the process managers, and the third is conducted with the process actors. 6) Packaging: This step comprises the delivery and publication of the game.

3 Related Work: Serious Games for Process Training

The surveys carried out and reported in the literature (by the authors [14] and by other BPM researchers [13]) showed that the use of digital games for process training is still little explored scientifically and has gaps on how to design and demonstrate the effectiveness of games for process training in practice. Some authors claim that games are an essential mechanism for learning and training the process modeling activity [12,22,23]. For Moller and Hansen [17] and Santorum [23], simulation games are widely used for business modeling, learning and process training, and they propose in their studies an approach to improve and understand the business process to motivate stakeholders to create, share, collaborate and maintain business processes in an orderly and straightforward way

with a simulator. Lainema and Makkonen [12] emphasize the need for training models to understand and represent the business process by game participants.

A good part of the analyzed studies has as objective the use of games for learning BPM and/or modeling business processes in educational and organizational environments. Very few works focus on applying and evaluating serious digital games for process training in organizations, i.e., training staff in how to perform existing or new/redesigned business processes using games.

In our research, we intend to demonstrate the possibility of building, using and evaluating BPBDG as an innovative way to process training in organizations. We are not targeting educational settings in BPM and/or organizational management learning for students. We are not also targeting simulation environments, where the real world is digitally reproduced for training purposes. Actually, we are proposing a very specific game genre which turns a business process description into an adventure game.

4 Research Design

The work was based on the epistemological-methodological framework of Design Science Research (DSR) [7]. The DSR presupposes formative research of the construction of an artifact based on design cycles. The starting point of research based on DSR [7,18] is the definition of the problem and specific context. Process training is our problem in context: the institutionalization of business processes can be hampered by the low knowledge about the process, the fragility in developing skills to execute the process, and the low engagement necessary to train the actors of a process.

Therefore, this research aims to propose an innovative way of conducting process training in organizations that facilitates the development of skills and engages process participants, in this case, using BPBDG. The primary artifact - a business process-based game design method for processes training (PYP4Training) - will be designed based on behavioral conjectures to solve the problem in context: (1) people can learn from games [15], (2) people engage in learning when using games [9], (3) people understand the process of using digital games based on business processes [4,16], (4) people can develop competencies in business processes during training (knowledge, skill and attitude) when using games [11].

The primary artifact (method) and the secondary artifact (games) will be acceptable to solve our research problem if: the method allows the development of games based on business processes for training the business process, and the games prove to be fun for professionals (players) and be able to promote understanding of the process, as defined by the organization. An empirical evaluation with managers and the target audience should answer the following questions: (1) Does the use of use digital games based on business processes designed by the method allow people to learn during process training? (2) Does the primary artifact enable the design of game training based on business processes? (3) Are the games generated by the solution enjoyable to be used and help players understand and learn the process?

5 PYP4Training Design

This section introduces the first design cycle of PYP4Training, based on PYP in its current version (Subsect. 2.3) and its application for developing a BPBDG for training processes in organizations, particularly in conflict mediation in the judiciary sector. The aim was to build a BPBDG with the potential to train the actors in the process, evaluating the PYP's capacity to build this game. Given that the PYP was not built for this purpose, the contribution of this cycle is to present the PYP adaptation points to advance the PYP4Training design in future cycles. The following sections show the execution of each step of the method for building the game.

5.1 Study of the Context

The Judicial Centers for Conflict Resolution and Citizenship (Os Centros Judiciários de Solução de Conflitos e Cidadania in portuguese [CEJUSCs]) are judicial units of the first instance, preferably responsible for conducting and managing conciliation and pre-procedural and judicial mediation sessions[1]. The conflict mediation process includes scheduling a mediation session at one of the CEJUSCs, where the parties can resolve the existing conflict. Then, the mediator explains the process, listens to the conflict between the parties, and helps them reach an agreement to resolve it. For the construction of the BPBDG, the "Pre-Procedural Mediation Process for Conflict Solutions" (Processo de Mediação Pré-Processual de Soluções de Conflitos in portuguese) was selected. The objective of the process is to generate the scheduling of a mediation session between the conflicting parties and the selection of mediators to help the mediation.

The process was analyzed by the designers and in brainstorming with the participation of the process specialist. The analysis highlighted the importance of addressing the training of actors who take on the secretariat role, as the turnover for providing this service is high. In this way, the cut of the process used for the game's development corresponds to the activities of selection of mediators performed by the secretariat, as shown in Fig. 1.

5.2 Element Mapping

This step aimed to map the elements that will be used in the digital game design from the business process model. The mapping of elements followed the guidelines defined in the PYP and was carried out with the support of a computational tool [3] From this mapping, a first version of the GDD (Game Design Document), a document that presents in detail all the characteristics of a game [8], was created. The mapping result is shown in Table 1.

[1] https://www.tjrj.jus.br/web/guest/institucional/mediacao/cejusc.

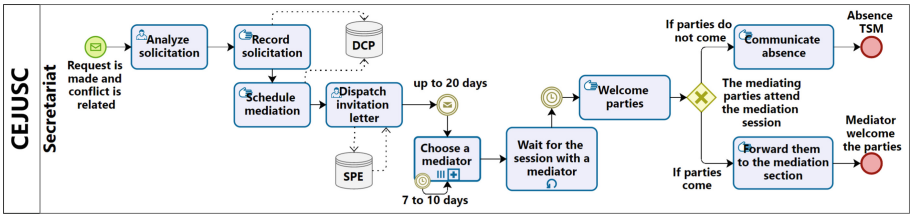

Fig. 1. Pre-procedural mediation process

Table 1. Mapping process model elements to game design

Process model elements	Game elements	Mediator game elements
Participants (lanes)	Player	Secretary
	Characters	Receptionist, Mediators, Intern (Narrative)
Events	Plot: Start event	The notification of request is made and the conflict is reported
	Plot: Failures	Absense TSM
	Plot: Solution	The mediator welcome the parties
Environments/places (lanes or black box)	Game world	Office
Gateways	Rules	R1: If parties do not come, it is required to communicate the absence.
		R2: If parties come, it is needed to forward them to the mediation section.
Process' instances	Story	The story begins when there is a conflict, and the citizen looks for a CEJUSC to help solve it.
	Narrative	The citizen relates a conflict and creates a solicitation message. Then, the secretary analyzes the solicitation and gives it the right way.
Activities (tasks and subprocess)	Tasks	Analyze solicitation, Record solicitation, Dispatch invitation letter, Choose a mediator, Wait for the session with a mediator, Welcome parties, Communicate absence, etc.
	Feedback	All information that is generated inf each activity
Process' flows (sequence, information, or Messages)	Interactions	Player performs task (action - mechanic)
		Player access information/systems (action - mechanic)
	Rules	Sequence: DPC records information - DPC schedules mediation >SPE
Goal	Goal	The goals are to choose the right mediator and to welcome parties

5.3 Game Design

In the game design stage, the designers brainstormed to deepen the initial GDD with ideas and concepts regarding the theme, mechanics, and dynamics, to build the game's first version. As a result of this step, design decisions were made, such as positioning the player as one of the actors in the process - the secretary - since this actor/character is the primary target audience of the training. The game comprises the execution of the activities foreseen in the process model. After the secretary becomes aware of the request and analyzes it, scheduling and summoning begin via sending an invitation letter by e-mail. The conflicting parties are received and forwarded to the mediation room on the scheduled date.

The designers chose to create an office environment for the game setting and Q&A dynamic for this activity. It is necessary to answer a quiz after executing the dialog about the necessary information (process rules) and the generated information (feedback) of the activity, as shown in Fig. 2(A). In this way, the

player gets immediate feedback on the knowledge acquired about the analysis request activity. The activity to select mediators (the game mission) has the purpose of selecting the mediators who will participate in the mediation sessions on a day and time scheduled by the Court with the parties (Plaintiff and Defendant). To complete the mission, the player must talk to characters who are candidates for mediation and answer a quiz about the information needed for the selection. The mediator is selected based on his experience, knowledge of the subject at hand, and availability. Figure 2(B) illustrates the dialogue between the mediation secretary and the candidate.

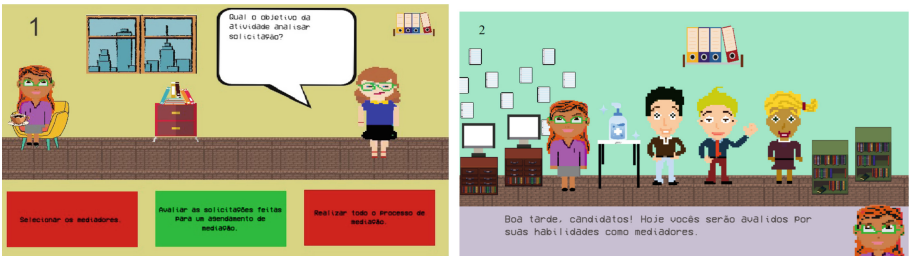

Fig. 2. (A) Task of analyze solicitations (in portuguese). (B) Choose of the mediator (in portuguese).

5.4 Development and Prototyping

The technology for implementing the game was software Construct 3. The narrative was developed in an ad-hoc way. Game mechanics and aesthetics were implemented based on the GDD.

5.5 Validation

The validation step proposes three evaluations: evaluation by the design team, evaluation by the process manager/owner, and evaluation with the process actors. The evaluation of the Mediador Game by the design team comprised technical game design issues and will not be detailed in this paper. Taking into account that the purpose of this research cycle was mainly to explore how the PYP method would produce a business process-based digital game with potential to training a business process in this organization in particular, we concentrated our focus on the assessment with the process manager. Since we could not, int his research cycle, guarantee yet that the game was suitable for training, we did not evaluate the game with the process actors.

Qualitative research was conducted with the process manager and had the following objective [2]: O1) Analyzing the digital game Mediador Game; to evaluate the perception of usability, game experience and learning process according to the MEEGA+ (Model for the Evaluation of Educational Games) evaluation

model [19]; from the process manager (player) point of view; in the context of conflict mediation. The game was evaluated for its training potential qualitatively and in the expectation of the business specialist who knows the challenges of training the process in the organization.

This study was conducted in May 2021. The research participant (player) is a man over 50s. He does not often play digital games. He has experience in Process Management and related projects in the Judiciary in Conflict Mediation concerning Alternative Means of Conflict Resolution (Meios Alternativos de Resolução de Conflitos in portuguese). The study was based on the evaluation of the game through the measurement instrument (questionnaire) of the MEEGA+ model [19] adapted to include the learning evaluation of the process implemented in the Mediator Game.

The form available in the MEEGA+ method was used, containing 35 fixed items (33 of player experience and 2 of short-term learning) and 6 exclusive questions to verify the game's learning objectives, totaling 41 questions. The learning objectives considered for digital games based on business processes for structured process training in the MEEGA+ model are presented in Table 2.

Table 2. Learning perception items

	Dimension	Code	Description
Learning perception	Short-term learning	ACP1	The game contributed to my learning about the mediator selection process
		ACP2	The game was efficient for my learning compared to other sources of information (CEJUSC website)
	Learning goals	OBA1	The game contributed to my learning about what to do when the process starts
		OBA2	The game contributed to my learning about when the process ends.
		OBA3	The game contributed to understanding the sequence of necessary activities to execute the process
		OBA4	The game contributed to my learning about how the process activities end
		OBA5	The game contributed to the learning of the actors in the process
		OBA6	The game contributed to my learning about important decisions

The evaluation process considered the steps presented in Table 3. The execution of the Mediator Game evaluation study took place online. For the application of the experiment, the Free and Informed Consent Term (ICF) was made available. The questionnaire was made available by e-mail so that the process manager could answer it.

The analysis and interpretation of results werre conducted as suggested by the MEEGA+ model: usability, player experience and learning process. Questions with a rating above 0 (neutral) were considered positive perceptions. The player experience rating was generally positive across the board. Regarding usability aspects, the game obtained a result of disagreement for aesthetics (Texts, colors and fonts match and are consistent), learnability (I needed to learn a few things to be able to start playing the game.), operability (The rules

Table 3. Game evaluation steps

Step	Description	Time
Training	The participant receives the basic training (video or supervised play) highlighting game rules and gameplay	8 min
Game execution	Participants play the Mediator Game in one or more matches. Each match has about 10 to 20 min	10 to 25 min
Evaluation questionnaire	Participants must answer the evaluation questionnaire afteplaying the Mediator Game	5 to 20 min

of the game are clear and understandable). The player demonstrated neutrality for the dimensions and satisfaction (Learning to play this game was easy for me). Social interaction (I was so involved in the game that I lost track of time) and relevance (I'd rather learn from this game than an otherwise (another method). Short-term learning aspects and learning objectives were evaluated regarding the perceived learning quality factor results. The items were evaluated as positive, obtaining a result of an agreement for all items. The sequence of actions within the activities necessary for the mediation process was surprising for the specialist. Besides, it allowed remembering the older games and the perception of how to mediate conflicts. It is understood that the player's perception of the Mediator Game was, in general, positive and may indicate a good acceptance of the game as a support tool for training organizational processes. However, for future applications of the questionnaire that aim to use games to evaluate training processes, a written explanation is recommended and submitted to the player better to evaluate aspects of player experience such as usability.

5.6 Packaging

The game was published on the research group's website[2].

6 Limitations

In this investigation cycle, the objective was to propose the construction of BPBDG for training and to evaluate the effectiveness of the application of PYP in its current version without considering more in-depth training aspects, which will be discussed in the subsequent design cycle of the artifact. As a secondary artifact in our research, the Mediator Game is a quite simple game prototype, based on a process model with low complexity and its development was not conducted by professional game artists/designers. Another limitation of the results is that only one participant performed the evaluation, and it had to be so, because the process had only one manager. Although these results cannot be generalizable, they are sufficient as insights for the next design cycle. Finally, the game evaluation was conducted remotely imposed by the COVID-19 pandemic. An explanatory remote game session was performed about the rules and how to play the game to help the participant understand it and minimize obstacles while playing the game.

[2] http://joccom.uniriotec.br/games/mediador/.

7 Final Remarks

As research findings, from the insights produced with the evaluation, the first cycle of the research pointed out relevant issues for adapting the Play Your Process when explicitly applied to the development of games that offer training. For process training, we realized the importance of detailing the initial steps of the method to define the training/learning objectives in skills to be developed by the player, the construction of narratives based on process instances, mapping the narratives with the training/learning objectives, the evaluation of player learning and especially the impact of training on the organization.

The results of this research and its future steps intend to contribute scientifically to the BPM area, presenting a method that systematizes the construction of games for training processes in organizations. For the next steps of this research, a new cycle of the investigation will be conducted to adapt Play Your Process to meet the issues identified in this cycle, as well as its application in the design of a BPBDG for training a process in a partner company and the validation of the conjectures not evaluated in this cycle. We also hope to have the opportunity in the future to explore more processes and game designs in different contexts.

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