# Exploring the use of participatory design in game design: a Brazilian perspective

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## *Abstract*

*This paper reviews the current body of literature on participatory design (PD) for game design, including participatory design elements, participatory design in education, and the current challenges that game designers and developers encountered. This paper also contains the findings of a survey among game designers in Brazil (N=29) concerning their use of participatory design techniques during the design process in their studios. The survey results show that playtesting is the most common technique that they utilise in order to improve player experience. Several of the respondents admitted that they have considered player participation during other stages of game development. This paper is concluded with a critical overview of the role of participatory design in game design and potential uses for games for learning. The literature and survey-based findings in this paper may be of benefit to game design scholars and designers who are intent on critically analysing the use of participatory design in the game design process.*

**Keywords:** *Participatory Design, Game Design, Co-Design, Brazil, Game Development, Player Experience, Game studios, Learning;*

## 1   Introduction

With the popularity of the use of games for different purposes that go beyond entertainment, scholars and practitioners have been paying attention to techniques that could enhance player experience. This scenario illustrates the potential of applications of games in several industries. The game industry is booming and growing with the global videogames market being worth around US$128.5 billion [1]. It is also expected that by 2022, the global games market will grow to US$196 billion and that Latin America is now the fastest growing market in the world [2]. On the other hand, the serious games market (game designed for non-entertainment purposes), is expected to be worth US$9,167 million by 2023 and Latin America is one of the areas that would see more growth [3]. This means that although there is a very promising scenario, the serious games market is still yet to mature. As an entertainment and non-entertainment sector, the continued growth of the videogame industry is contingent on player experience. In order to understand the principles of player experience, it is crucial to explore the most effective design methods and methodologies that address relationships between players, and game design. Player experience happens through a connection between players and games, and this can be different to each person, since it can be subjective [4]. Player experience is the core of game design. This is why a *playcentric* approach is essential for successful game development [5] as the *playcentric* approach solely concerns experience. The *playcentric* approach is about designing games with intentions, and thinking about the way in which players will interact with the games in a meaningful way, including the reasons for their choices and their emotional attachment with the game content [5]. This approach has been common in game design for many years

as it focuses mainly on designing the game around the player, similar to the user-centred design approach (UCD). In game design, the player is regarded as being more than simply a "user". For instance, traditional usability techniques utilised in UCD have been revamped in order to fit the needs of the gaming industry and player experience; this has required more structured usability tests based on playability [6]. In addition, conceptual models and frameworks such as MDA (*Mechanics-Dynamics-Aesthetics*) [7] and DPE (*Design-Play-Experience*) [8] have been designed in order to understand this relationship between players and designers, with the former being an extended version of the MDA in order to tackle serious games. Both models show a linear relationship between designers, the game and the players, whilst in participatory contexts, it is expected that this relationship is continuous [9]. Another requirement is the participation of the player in the design process. According to Banks [10], players not only play games, but also "create" them; that is, players contribute to gameplay. The same concern towards collaboration within the game design process can be viewed by participation-centred game models [11], [12]. This creates a paradigm of participation that requires more investigation from a game design perspective, and which demands further research into Participatory Design (PD) in game design [9], [13]. For instance, there is limited knowledge on the possible implications of PD in game design not only from an academic perspective, but also within the game industry. According to Wanick and Bitelo [9], PD techniques can be utilised during the conceptualisation stage and during tests with different stakeholders and for different purposes, but to date there are no guidelines addressing the use of PD in game design. As also mentioned in Wanick and Bitelo's study, most of the techniques of PD in game design were utilised in educational contexts, particularly during the learning process; this would also differ according to the audience. For instance, Khaled and Vasalou [14] have applied PD in the development of educational games for children as co-designers. In fact, PD appears to be a popular method for the design of educational games but issues still remain, such as the integration of the pedagogical content within the process [15]. Although Wanick and Bitelo's 2017 paper [9] reviews current research concerning PD in game design, the authors did not explore the ways in which practitioners utilise these techniques during game development. Thus, the purpose of this paper is to address this knowledge gap by exploring the perspectives of game designers and developers on the use of PD in their current development process, as well as to provide recommendations on best practices involving PD techniques. In this paper, there is a specific focus on Brazilian game studios.

Latin American countries are making a significant impact in the global game industry, in which the leading Latin American games market is Brazil [16]. In fact, according to McKinsey&Co [17], 2020 is the year of opportunities for Brazil, with Wildlife Games as the largest mobile-gaming company in Latin America. Brazil has also the 13th largest market in the world, with around 75.7 million players [18]. It is also expected that Latin America will comprise 4% of the games market by 2021 [19]; this number is still low if compared to China or the US. However, in Brazil the number of game studios is growing. According to a report published by BNDES in 2014 [20], more than 70% of Brazilian game companies had been launched in the preceding 5 years, and 74% of Brazilian game companies were small-size studios. There are 375 game studios in Brazil and in 2018, 1,700 games were produced, with a revenue of US$ billion [21]. Despite this promising trend, game studios in Latin American countries generally suffer from lack of investments and support [22]. It is hoped that this study might provide insights on the use of methodologies to improve player experience and potential contexts for employing PD techniques.

Considering this, this study has been guided by two research questions:
- What PD techniques are utilised by studios/game design companies?
- How do Brazilian game design studios use participatory design techniques?

In order to address these questions, two main objectives for this study were set:
1. To explore the more appropriate stages of game development in which participatory design can be applied; and
2. To identify which design methods and techniques are being used in Brazilian game studios.

In order to address the first objective, the current body of literature in PD in game design was reviewed in a search for patterns and techniques that game design studios of different sizes can use. Next, with the aim to tackle the second objective, an open-ended survey with game design designers from Brazilian game design studio was conducted.

This paper makes two contributions to the field: one is the review of the current body of knowledge on the use of PD in game design; and, the second is an insight into the attitudes and perceptions of Brazilian game developers and designers from studios towards the use of PD techniques. With this, this study extends the work of Wanick and Bitelo [9] and Ismail et al. [15], bringing an overview of practitioners on the attitudes and the use of PD in game design processes. Based on these findings, six recommendations are provided: 1) the exploration of community-driven participation, 2) the development of a project-driven player research, 3) the use of other techniques besides usability testing and player feedback, 4) the utilisation of a low-budget general player research, 5) establishing a toolkit of PD research techniques that different studios can use, and 6) the development of a value-centric approach to PD in games research.

The paper is organised as it follows. First, a review on participatory design techniques and research within the area of game development and educational games is undertaken. This is supported by a structured methodology section with a detailed explanation on how the survey was designed. After that, the results are presented through a discussion and the list of recommendations emerged from this study. Lastly, this paper finalises with a conclusion section, including a discussion of the limitations and suggestions for further research.

## 2    Participatory Design

Participatory design (PD) was developed in Scandinavian countries during the 1970s and 1980s in order to promote democratic relations between workers and developers [23]. This was mediated via workshops and action research techniques, with the utilisation of tacit knowledge to promote good working relations. Tacit knowledge concerns practical skills and it tends to be difficult to document, since it can be implicit (*ibid*). Thus, by utilising action research techniques in workshop formats, stakeholders could participate during the design process, bringing different layers of expertise and knowledge to the final outcome. PD is not only limited to the workplace and it can be employed in different contexts [24]. One of the biggest challenges of PD and the development of new technologies is the understanding of user participation in the design process. Are the means by which digital products are created reflecting user needs, or is it the user who changes technological development? It is in this context that discussions about individuals and technologies emerge, moving towards a wider understanding of the influence of context and values [25]. PD blurs the line between designers and users. For instance, Muller and Kuhn [26] situate techniques according to the production stage (early or late) and the role of designers and users. Techniques such as ethnographic methods are situated during the early stage of development and with less participation from users, whereas customisation has more active participation from users and can be employed in the late stage of development. Thus, the variables related to PD extend to context and the position of users and designers; this marks a good starting point for a discussion about the roles of participants and designers.

In PD, there is no single method to be followed, and many activities can be employed [27]. That which is questioned and applied in PD is knowledge, something that can be shared among researchers, practitioners, designers, users and participants. Thus, the involvement of all stakeholders in the process should be crucial in order for participatory activities to take place. According to Khaled et al. [27], techniques should be aligned with the perspective of the stakeholders. For instance, establishing a shared vocabulary around the techniques could be an effective strategy, particularly if one of the PD techniques is the use of a game [28]. Other techniques might involve the identification of current problems,

or promoting a collaborative discussion around the issues in a democratic manner through co-creation [29]. Therefore, PD is more than a set of methods; it is the choosing of techniques that makes PD participatory by nature [27]. This creates new challenges for designers, such as the understanding and management of values and knowledge. For instance, participants might question their own values whilst participating in workshops [30]. Thus, there is an evident challenge for game designers and developers to understand the nature of PD and what aspects of PD that could be applied in game design. For this reason, it is crucial to understand what type of research methods and methodologies have been employed in game design in order to situate PD within game design research that could impact learning.

## 2.1   Participatory Design and Learning

Participation and learning have been addressed through different perspectives that are similar to the designers apply PD approaches. As for instance, as Lambert [31] mentions, power relations might happen within the learning environment even when the context is said as "participative" (where students are co-creating and being active learners). At the same time, technology can enhance active participation of learners. For instance, although educators might be "experts" in a subject, in a participative environment students can decide the boundaries between learning and fun [32].

The same as mentioned in PD, students sometimes are considered as "users" and this perspective does not favour active participation. Thus, approaches that include the participation of students as design partners and collaborators are more appropriate to support this scenario [33]. This shows that PD activities would imply having a power relation between educators and learners. Pedagogically speaking, if aligned towards a more participatory nature, PD can also support Freire's pedagogical thinking towards learning as a political activity, in which it is necessary to look for a dialogue [34]. Hence, PD and learning complement each other. PD in educational game design can be a powerful method. As highlighted in Ismail et al.'s [15] review, PD has been used with different audiences (e.g. children, students, disabled) and by using PD in educational games, it is possible to identify the requirements or needs of the usability and playability of the game for specific players. Therefore, the cooperation and co-creation of the game is an alternative to improve the design of the educational game; however, there is still little understanding about the effectiveness of the learning experience itself within the process. Barendregt et al. [35] study also showed that PD and learning can be fun and evoke children participation, but that the learning goals need to be implemented together with the activities. Thus, the goals of the technology and the learning tend to blur and this can be confusing for both learners and educators. As much as PD can be extremely valuable for learning activities, it is still important to understand which methods can be used within this approach and if companies apply this type of method within their practices.

PD can also influence the way game activities are designed. For instance, Zimermann, Pacheco and Padovani [36] report on a participatory design activity with children where the proposal was to build a board game with the theme of urban pollination through stingless bees. The study describes the experiment and concludes that by placing the student as the protagonist of his own knowledge, involvement in the whole process becomes more effective and efficient. Another approach brings the perspective of the pedagogical philosophy of *student-centred learning* [37]. In this study, data are presented that describe successful experiences generated by self-motivated students around a common interest. The results point to a more comprehensive look at pedagogical practices where there is an invitation to reflect on how learning occurs when the relationship between students and teachers is renegotiated. On the other hand, other studies [38]–[40] use the concepts of Game Design and Gamification to develop more dynamic teaching-learning initiatives, providing guidelines and frameworks for the adoption of such techniques in different contexts and levels of education. However, little is known on how game studios could implement such methodology.

Approaches mentioned in Ismail et al.'s [15] and Wanick and Bitelo's review [9] were the evaluation of user experience, usability testing, the evaluation of products and prototyping/mockups, the use of cultural probes and cards.

## 2.2    Game design research

Games are interactive and participatory systems with objectives, consequences and outcomes [41]. That is, games depend on the interaction guided between the player and the design of the game. Thus, the integration between the player and the game is crucial. There is no game without a player. This makes game design a *player-centric* discipline [5], and so the architecting of more compelling experiences for players is expected. Players can have different motivations to play a game, which is usually grounded in demographic, psychographic and behavioural segmentations aspects. These can be explained through the use of player traits, motivations and player types [42]. Another area in which game design research with a *player-centric* approach is applied is when designing games for people with special needs. For instance, collaboration is an appealing approach when dealing with diverse audiences [43]. However, the integration of player participation during the process of design is a complicated process. If games depend on players, then designers should be looking at understanding how players would interact with games. In game design research, methods and methodologies have been employed to improve the player experience, particularly looking at flow, emotion, fun and physiological responses [44]. In view of this, much of game design research has been focused on how designers and developers can provide the best experience for the player.

## 2.3    Games User Experience and Games User Research

The constant search for ways of improving player experience has transformed game studios processes, companies and game design research, and has led to the emergence of the games user research (GUR) field. In a workshop conducted in 2013, Mirza-Babaei, et al. [45] underlined the methodologies utilised in both academia and industry. They argued that the focus of GUR and GUX should extend beyond usability. For instance, if frustration is part of the intended outcome of a game, then it should be considered as an expected outcome [45]. This differs from usability tests in general, since the objective of most usability tests is to decrease "friction" and user frustration. The fields of both GUX and GUR have been evolving, and methods may vary. Play and playability, together with subjective player experience, can be measured in several ways, such as questionnaires [46], biometrics [47] and monitoring of physiological states of the player [48]. There is much that can be measured and understood through different methods, depending on the stage in game development. For instance, according to Vita [49], methods involved in the concept stage could involve group and individual interviews, focus groups, player journey maps, and affinity diagrams; whereas, during the elaboration stage, other methods could be employed, including paper prototype testing, game blueprint, interviews, lifecycle maps and semantic scales. In the tuning stage (shortly prior to game launch), methods such as semantic scales, heuristic evaluation and usability testing tend to be utilised (*ibid*). Other methods might include the analysis of cause-effect relationships within gameplay analytics and data visualisation [50]. Challenges that researchers and designers encounter are mostly enhanced by the measurement of "fun" and the development of gameful applications considering onboarding processes, which could be enhanced by personalisation and intelligent algorithms [51]. Still, player participation within this process is less considered in GUR. Zammito [52] has published a comprised resource with GUR undertakings for each stage of game development, but most of the methods mentioned do not look at player collaboration and participation with more depth.

Matching stages and methods might be useful for UX in game design; however, there remains a lack of clarity on how PD can be employed. Thus, it is important to consider the relationship between designers and players, in which PD plays a huge part.

## 2.4 Participatory Design in Game Design

Co-creation in games can be studied through the lens of the players. For example, players can contribute to the creation of game content, particularly outside the game world through communities [10]. This action has a strong relationship with fan cultures, bridging the gap between audiences and games through participation. With this, community building becomes an important element that might influence the design of a game. As mentioned before, another way to see PD in game design is the presence of the player during the process of game development. That is, the influence of the player during early stages of game design. This can be studied through games user research methods.

With co-creation and PD culture in game design, one of the biggest challenges is the management of knowledge. Professionals and amateurs share different skills and commitments, all of which must be managed [10]. Banks [10] gives the example of the 3D game simulator *Trainz* (www.trainzportal.com); in the game, players can develop their own locomotives, but they can also share their creations with other members of the community. This has allowed game designers to build a large community of players around the game, one that is supported by avid followers from forums and social media groups. This co-creative aspect was also mentioned by Vita [49]; it relies on participation of players in the development of games for customisation and personalisation of content (e.g. players could suggest or create characters and features that fit their expectations), as well as on collaboration. Although these are possibilities, there is still no official guidance on how to integrate players in the participation process, particularly for the design of educational games [15].

Wanick and Bitelo [9] have mapped the literature in PD in game design. They have identified that in different stages, there should be different PD techniques involved in the design process such as cultural probes and storyboarding development in the conceptualization phase, low-fi paper prototype during the prototyping stage and groups discussions and interviews in the testing phase. Purposes of the use of PD for educational games were also discussed in Ismail et al.'s review; the authors found that PD has been employed to evaluate products, usability testing, user experience testing and mockups. On the other hand, there is a limited body of literature covering current research in the area and little evidence of the use of PD in the game industry; most of the methods are used by teachers in the classroom or researchers looking at particular audiences [9], [15].

Current literature on participation within game development have been also addressed through the lens of participation-centred game alternatives, focusing on player experience [11], [12]. Although Pereira et al. [12] have not mentioned PD as a methodology in this case, participation has been brought into discussion as part of the player experience that should be considered as an instrumental element of game design (in the beginning of the design process).

As a design research method, PD has been employed as a means of guiding the development of serious games [14], [27], [53]. Khaled and Vasalou [14] incorporated PD techniques, such as storyboarding and brainstorming, in order to develop a common vocabulary between stakeholders, players (children) and designers. For serious game development, PD may be applicable depending on the nature of the game and the audience. For instance, PD can be also used to integrate new game mechanics and learning understanding for isolated populations, such as indigenous communities [54]. Participatory approaches to game design have been also applied when designing games for people with special needs such as disabilities and impairments in different age groups. For instance Gerling, Linehan and Mandryk [43] presented four case studies with different special needs audiences using co-design as a GUR methodology and found one of the difficulties on implementing PD was communication and the understanding of the tasks. This shows that as much as PD can be useful for game designers, it might be very demanding. Also, there remain considerable challenges regarding knowledge management and the costs on this type of approach, which need to be addressed. In addition, there have been few studies into

the applications of PD in game development from the industry perspective; most studies are undertaken through a research-based approach for the design of serious games, and not exactly games for "full entertainment" purposes.

Another point to mention is that academics and practitioners may have different goals. As mentioned by Medlock [55] in his description of the RITE (Rapid Iterative Test and Evaluation) method, design and research "meet" in the same place and academics, and practitioners may see validity through different lenses. Practitioners are more concerned with profit when determining whether or not a technique is beneficial. Although consultation could yield useful feedback, which in turn could lead to an improvement in the quality of a game, practitioners seldom make design decisions (sometimes) based on consultation with players. Medlock [55] states that RITE has elements of PD, such as the inclusion of participant feedback, which dictates changes in the game through different stages. The RITE method differs from general usability tests in that it allows practitioners to run tests in parts and with many participants in, e.g. a one-week schedule.

It is also important to mention that PD has a lot of challenges as a methodology. According to Wanick and Bitelo [9] the intricacies between players, developers and experts can culminate with a management of power tension and communication strategies. However, they did not investigate the actual use of PD techniques within the game industry, particularly in developing nations and growing gaming markets such as Brazil, and these strategies have not been discussed with more depth with practitioners. Thus, this paper aims to address this gap.

## 3    Methodology

This paper contains an analysis of PD opportunities for Brazilian game development companies. Brazil has a growing gaming market, and to date there have been few studies on the techniques that Brazilian studios utilise. Although this is not an analysis of cultural aspects at a national level, this study provides insights regarding socio-economic elements of Brazil, including investments in the area of game development.

### 3.1    Survey design and protocol

An online survey was designed in order to investigate the main techniques that game developers and designers utilise in Brazil (see Appendix). Figure 2 summarises the game studio capabilities investigated in this study. The questions were open-ended questions, and addressed various themes relating to PD techniques and other techniques in games user research. The survey was designed in Brazilian Portuguese and the translated version is in the Appendix section of this paper. All responses were anonymous. Ethics were approved for this study under ERGO ID 40108. The survey was divided into the following sections:

### 3.1.1    (a) General information about the company and team size
There is an assumption that company size can have a significant influence on the choosing of UX methodologies. The size of a game studio can affect the overall design game design process. For instance, when considering user experience (UX) and UCD methodologies, it should be noted that large studios such as Ubisoft generally have in-house playtesting labs and teams, whereas indie companies might not be able to afford the same type of resources [56]. However, all studios need to retain a standard process of games user research, in order to convey consistency within their own organisations [57]. It should also be noted that 74% of Brazilian game studios are small in size [20]. Questions about the type of game developed by the studio was not included in order to keep the study in an exploratory level.

### 3.1.2 (b) Information about team roles

The survey included questions about team roles and their participation in the game development process. These questions were added in order to gain insights on the overall distribution of work and to determine whether the research process includes staff management. Since PD involves different stakeholders [27], it is necessary to find out which people are involved in the design process, and the roles they perform in that regard.

### 3.1.3 (c) Information about current games research techniques utilised during each stage of game development

In order to understand whether designers utilise participatory techniques across the game development process, a question has been included about which techniques they currently use. This information is useful since studios generally employ processes during the three stages of research (the pre-test, test and post-test stages) [57]. These are consistent to the three stages mentioned by Adams [58]: concept, elaboration (i.e. refinement of the main concept with prototyping tests), and tuning (the "final" stage and production).

### 3.1.4 (d) Possible opportunities for integrating more users/players in the design process

In this section, respondents were asked to reflect on the integration of players in each stage of the game development. The objective of this section was to identify any potential use of PD within game development.

The survey contained 6 open-ended questions, and the respondents were asked to give examples and explain the processes that they have adopted in their game studios; with that, it was intended to have an idea of possible informal techniques that the studios undertake. The survey was distributed among 104 Brazilian game studios via email. Companies were not separated by types of products developed (entertainment, non-entertainment) since this is an exploratory study and it was necessary to capture a broad overview of the market. The response rate was 28%, which could be considered a representative sample (a total of 29 participants from 29 different game studios completed the online survey).
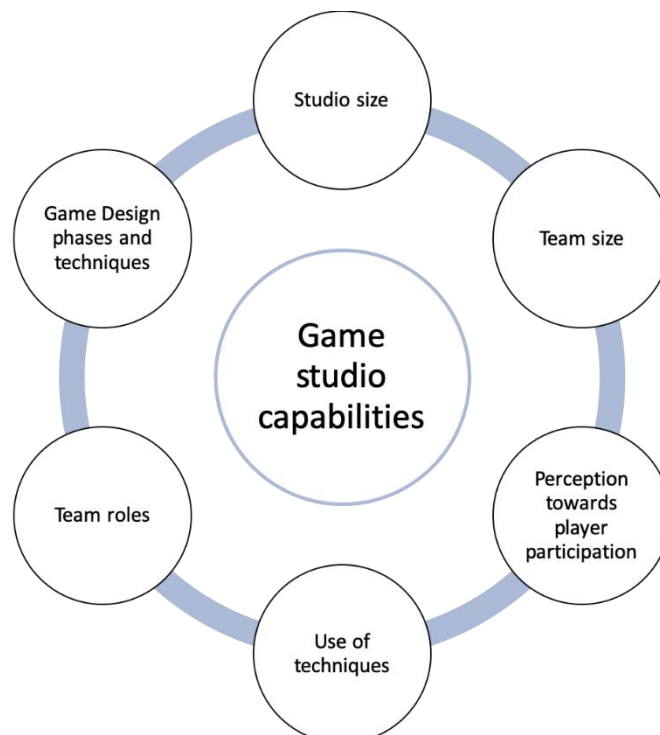


**Figure 1.** *Game studio capabilities investigated in this research, regarding the role of PD in game design (designed by the authors)*

# 4    Results

Among the 29 respondents, 16 of them reported that their company size comprised fewer than 10 people; 10 of them worked for companies with more than 10 people but fewer than 30 people, and 2 respondents were part of a company employing more than 30 people but fewer than 100; only 1 respondent worked for a company employing more than 100 people. Therefore, most of the companies represented by the respondents are small game studios. The average size of the company was around 18 people. It is possible that companies of a small size do not have sufficient finance for investing in research techniques that are employed by AAA companies such as Sony and Nintendo. As mentioned, according to the BNDES report [20], more than 70% of game studios in Brazil are small-size businesses.

Game design team sizes will also vary. Among the companies represented by the respondents, the average team size is around 5 people, and the largest team size is 80. The size of a team will depend on the size of the company and the size of the project. Of the respondents, 4 mentioned that the team size varies according to the scope of the project, ranging from 5 to as many as 80 people, depending on the company's resources. The 6 participants employed by companies with team of below 10 people said that the companies utilise all the resources in the game development team (e.g. if the company employs 4 people, all 4 are involved in the game development).

## 4.1    Team roles

According to the respondents, the game studios in which they work generally divide their teams into artistic and technical groups. In the technical area, functions usually include project management, marketing, game design and programming. In some cases, a team member might perform two or more functions. In the artistic area, the job titles listed by respondents include generalist artist, 2D artist, 3D artist, illustrator, graphic designer, sound effects artist, and soundtrack designer.

## 4.2    Stages

As shown in Table 1, all the studios represented by the respondents involve the end-user during the testing phase. However, only 31% of the studios allow for user participation at the pre-production stage. As mentioned by one of the participants:

*"We only bring the end user at the time of testing, when the game already looks like a product. Before that, we tested the game with co-workers and relatives and friends, who understand that the product* [is] *still in low fidelity."*

**Table 1.**  *User participation in each stage of the game design process: numbers and percentages of game studios.*

| Pre-production | Production | Testing phase (alpha, beta) | Launch |
|---|---|---|---|
| 9 | 12 | 29 | 6 |
| 31% | 41% | 100% | 21% |

As shown in Table 1, only 6 of the 29 game studios allow for player participation during the launch stage. The respondents did not give any specific reasons for this. It may be speculated that in the launch stage the game is deemed ready for shipping, and so any further changes would be too inconvenient; perhaps only enhancement of specific features might be possible [58].

### 4.3    Current games research techniques

Of the 29 studios represented by the respondents, only 20 are reported to be using some kind of game research technique (see Table 2). Their game research techniques include collecting user feedback on prototypes, and beta-game valuation. Since this was an open-ended question, respondents were not asked to choose from a list of methods. Three different methods were mentioned, as shown in Table 2.

**Table 2.** *The use of techniques during the design process.*

| User evaluation | User research | Monitoring without the user noticing (code/multiplayer online) |
|---|---|---|
| 17 | 2 | 1 |

### 4.4    Opportunities to integrate participatory design in game design

Figure 2 summarises the responses about the opportunities to integrate PD in game design. The most common technical words used by the respondents in this question include "production", "project" and "feedback", an indication that PD could be implemented at least in these three areas.



**Figure 2.** *Word cloud of terms mentioned by the respondents*

According to the respondents, PD applications vary depending on the games project. For example, one remarked:

"[PD varies] *according to the size and complexity of the project. Having the users at the beginning of the project would be nice, but not always this is feasible, either because there is no object for the user to interact, and / or time and budget for this. Each project must have some type of inspection / usability test."*

Also, one of the studios mentioned that they have used social media and forums in order to gather data from players:

"*We use Twitter, Discord and Reddit to collect suggestions on things* [where] *we have a lot of doubts."*

This could be helpful for developers since building communities around games is a way of conveying participation in the game development process [10]. Another aspect that

belongs in the category of community-driven insights is crowdfunding. One of the respondents mentioned:

*"I see a bigger space for the player in advertising campaigns or in a controlled way, as usually happens in Kickstarter."*

More evidence that PD could be implemented during specific stages is represented by the following quotation:

*"From conception to final tests, (player) participation is fundamental - at the beginning to validate concepts, and in the end to check the product adherence to the needs of the player."*

This alone indicates how PD can be a strategy that is intrinsic to each project since player participation may be permitted during each game development stage, albeit in different ways.

On the other hand, respondents also identified possible challenges restricting the use of PD in game design development. At least 3 respondents mentioned negative aspects of PD, relating mainly related to knowledge and company size. For instance, one mentioned that small studios might struggle with the "openness" of the design process for all players:

*"As the player does not have a market view of the product (and) usually does not even see* [it] *as a product, I do not believe that a bigger opening for players in the design process is very healthy for small businesses. Moreover, projects usually have defined deadlines and budgets, which makes possible decisions of the player more infeasible; besides the possible case of working with a publisher."*

Thus, the deployment of PD depends on the project, team/studio size and development stage.

## 5    *Discussion and recommendations*

The results show that the size of a game development team depends on the project. This is difficult to generalise, and most choices being made by the game companies depends on the project. This is consistent with Tisserand's [57] argument that it is possible that each choice of method might be related to a process that is followed by the game studio team. It should be mentioned at this point that the respondents did not convey much information on budgeting for game development; this is an issue that should be investigated in further research. Wanick and Bitelo [9] also identified that PD techniques vary during different stages of development; however, they did not provide detailed descriptions of techniques. It might be that the studios part of this study do not have an established protocol for games user research and therefore some decisions might be undertaken without a structured study.

In the survey, the respondents were asked whether different PD techniques could be incorporated into game development.

The respondents were of the opinion that there is evident potential for implementing PD techniques during different stages of the game design process, that PD need not be restricted to one stage only. Thus, PD could be employed throughout a game development project. The respondents did not mention specific PD techniques, although they did refer to the participatory nature of including players within the game design process. It might be that participants were not fully aware of the terms related to PD. However, this also shows an opportunity to raise awareness about the method and possible opportunities that this approach might provide them. Aspects mentioned by the respondents include the use of communities such as social media and crowdfunding websites for testing ideas. On a more negative note, many respondents claimed that the "openness" of the design process to players might be difficult to manage, particularly with regards to intellectual property, creativity and sense of ownership. This aspect is crucial in PD in general, since tacit knowledge is hard to manage and it should be interpreted via a constructivist approach [23]. Therefore, it is expected that the results from this paper could help these studios to

understand the challenges and opportunities related to player participation within the game development process (particularly for educational games).

Based on the responses of the survey, the following recommendations for researchers and practitioners on the use of PD techniques in the game design research process are prescribed:

### 5.1 (a) Explore community-driven participation

One option is to integrate player-driven innovation using co-creative engines. As mentioned by Banks [10], new technologies could reshape co-creative aspects between developers and players and allow the development of communities around the game. This could substantially improve the prospect of a game becoming successful. For instance, development of a community could be included as a design element during the development process. Crowdfunding can be also an opportunity for designers to explore co-creation and participation in the game design process. For learning practices, it might be useful creating a community around a specific subject, as a community of practice, to reinforce peer-learning and peer-feedback. Social media would be a key component in this aspect.

### 5.2 (b) Develop project-driven player research

According to the game developers surveyed in this study, PD techniques utilised during user research and playtesting might vary depending on the complexity of the project. For instance, studios might have projects requiring different types of investments, and might require low-budget user research. Although the level of player participation was not measured in this study, it is possible that, in future studies, researchers and practitioners could map out possible PD methods according to the project size. In order to do so, a game studio should measure the "complexity level" of the project in order to balance resources (e.g. budget, research team), time and expected return of investment. This is similar to the idea of having a "process" within the studio, established as a game studio "culture" [57]. This could also reinforce the adoption of serious games in the game portfolio, if there is an interest to enter this market.

### 5.3 (c) Go beyond usability testing and player feedback

Playtesting, user feedback and monitoring of user behaviour were identified as the main techniques being utilised by the game studios involved in this survey. Interviews, focus groups, co-creation techniques and expectation maps were not mentioned. User testing and feedback share similarities with conventional usability testing [59]. In games user research, it is important to consider a "player-centric" approach [5], [49], in which emotions, affinity mapping, player participation, fun, flow and engagement are key aspects. Therefore, it is recommended that studios utilise a mixed-method approach, including methods such as psychophysiological methods, but also interviews and participation [60]. These should be communicated with all members of the development team (*ibid*).

### 5.4 (d) Promote low-budget, general player research

McAllister and Long [61] mention that, depending of the level of UX "maturity" of the studio, either a low budget or no budget should be dedicated to player research. However, in Brazil most game companies are of a small size and have low budgets, and so it is possible that mature UX methodologies and PD techniques could be integrated in a low-cost project. This might involve resource costs, training, remote testing and other techniques [62].

## 5.5 *(e) Establish a set or toolkit of participatory design research techniques*

Respondents did not mention which sets of techniques their studios utilise in the user research stage; they only mentioned the use of user feedback and usability tests (usually related to playtesting). A set of techniques could be implemented according to the different stages of game development. In fact, more can be done to include research processes in game development. This recommendation also echoes Ismail et al.'s [15] conclusions and future work suggestions. Tisserand [57] also recommends that researchers need to consider time management, people management, standardization of methods, and training. The development of a toolkit of PD techniques could prove invaluable to game designers willing to include players in the game development process. It is possible that future research in the area could explore the use of technology and artificial intelligence in order to automate and aid researchers in their understanding of findings, and to promote better player conversion and retention [59].

## 5.6 *(f) Develop a value-centric approach to PD in games research*

"Games embody values, from the moment designers create the game concept to the stage in which players interact with the game." [63] It is through this interaction that players and designers meet. Looking at game design from the perspective of PD highlights the opportunity to study values as well. Values are intrinsic elements of PD [30] and more importantly, this can also provide ways to manage "knowledge" from all stakeholders involved in the process. This could be extremely useful when dealing with different audiences, since PD can be help designers tailor experiences for different players, such as students with disabilities [15].

The recommendations mentioned here at not limited and could be expanded. As mentioned by one of respondents in this study, it might be that the involvement of players in the creative process might affect the intellectual property of the game, as too much "participation" might not be conducive to the design of the game. Thus, it is also important to determine the necessary level of participation before deciding on the most appropriate methods for game design research. Also, it might be worth considering if studios could cogitate having different models for games user research (GUR). As mentioned by Zammito [52], studios may wish to choose having a decentralised, centralised or hybrid models of GUR organisation within their companies; this might reflect the type of culture that the studio is organised. Hence, further research in this area could be also beneficial.

It is also important to mention the limitations of the study. As much as analysing Brazilian studios was an opportunity highlighted in the paper, it can be also a limitation since countries with more mature markets might have a higher level of awareness and incentives to undertake player research. However, comparative studies could help to bridge this gap. Another aspect to mention is that although the study has been designed to carefully address participation within the game design process, the reasons for the adoption of player participation by the studios could be expanded. In-depth interviews and observations could be conducted to explore reasons studios might have to embrace (or not) player participation. Also, a cross-cultural study could help to explore these reasons with more depth. For instance, trust, privacy, security and accessibility, which can be culturally-dependant [64], could be possible reasons or moderators of this adoption.

## 6 Conclusions

This paper has explored the role of PD in game design through two research questions: *1) What PD techniques are utilised by studios/game design companies?* and *2) How do Brazilian game design studios use participatory design techniques?*. In light of these questions and the research objectives posed in the introduction, a literature review on the

current body of research in PD in game design was undertaken (related to objective 1) and a survey with Brazilian game studios was conducted (related to objective 2). In the literature review, the use of PD in research in game design was examined. To date there have been few studies on the perceptions and current application of PD in game design in the game industry (namely in Brazil). In an effort to investigate the relationship between game studio size, team roles and current DP techniques, a survey was conducted among game studios in Brazil; 29 studios responded, which account for 28% of the current number of studios in the country [20]. According to the respondents, PD could be used to convey player participation, and to gather insights about gameplay and public acceptance of the game. However, there remain many challenges, including how to manage knowledge emerging from designers, players and stakeholders, an aspect highlighted by Wanick and Bitelo [9].

On the basis of the literature review and survey findings, six recommendations on the use of PD in game design have been proposed: 1) development of a value-centric approach, 2) the development of a toolkit, 3) the use of low-budget techniques, 4) the use of other techniques that "go beyond" usability testing, 5) the development of a project-driven player research, and 6) the use of community-driven participation. The sixth could be particularly beneficial to Brazilian game designers since social media is highly popular in Brazil (where more than 60% of people have at least one social media channel account [65]). Thus, the use of crowdfunding or social media channels such as Facebook and WhatsApp might be a useful way of including players in the design process. However, one major challenge is the management of social media account users' behaviours. This can be addressed in future research.

It is important to mention that the six recommendations provided in this study can be also extended to the adoption of PD in game studios that design education and serious games. Since PD tends to be used within educational contexts [15], the perceptions and use of PD as a methodology by game studios could present a potential strategy for companies to enter the market. However more studies are needed in order to address the costs of running a PD session and if game studios would be keen to increase participation in the educational games market. Although there is an expectation that the serious games market will increase by 2013 [3]; the growth is still timid if compared to entertainment games.

The main contributions of this paper are the overview of the current literature in PD in game design, and the perceptions and opinions of designers with regards to PD among Brazilian gaming studios. This paper addresses a distinct knowledge gap on the opportunities and risks of applying PD in game development, namely in studios in Brazil. It also presents practitioners' insights about knowledge management and how designers should plan for the inclusion of players in the design process from the beginning of the game development process. It is also important to mention that according to the literature review, most of the work using PD has been done for research reasons, and the games developed were in the category of serious games. Thus, this reinforces the idea that PD can be employed for games with specific purposes (e.g. education, health, etc.) and audiences. However, this needs more clarity. As the industry matures, it is possible that more studios willing to enter the serious games market could consider PD as part of their UX strategy, particularly if developing games for education and health for different populations. In this particular case, Brazil was the main context of this study; however, the recommendations presented in this paper could be extended to other countries. For that, future research is suggested.

The management of player participation in game design research is a field that requires further research. Future studies should focus on the relationship between budget management and PD techniques, the combination of project-driven strategies, and the management of emerging knowledge from players, designers and stakeholders. The exact nature of these relationships may vary significantly among different countries, teams and studios. Also, future research could address how PD could be triangulated with different types of datasets, including historical data [50] and Artificial Intelligence (AI) in order to possibly decrease the costs of running a session or time spent on running a workshop. Yet, the opportunities to implement PD within the game industry are still vast. For the

development of educational games, further studies could tackle the different learning approaches that PD could evoke, merging academic and industry interests.

## *Appendix*

**Table 3.** *Questionnaire\**

| Questions | Measurement |
|---|---|
| 1) How many people are in your studio / company? | Studio size |
| 2) On average, how many people are involved in a single game development project in your studio? | Team size |
| 3) What are the roles and responsibilities of each team member? Can you give examples? | Team roles |
| 4) In the development of your game studio, in what moments of the project (GDD definition, pre-production, production, testing, etc.) do you include the participation of users? Give examples. | Game Design phases and techniques |
| 5) In what way and in what project phases do you think game designers could involve more players in game design? | Perception towards player participation |
| 6) Do you use any process or technique in which the player participates in the design decisions of a game? If so, which one? Can you give an example? | Use of techniques |

\* Translated from Brazilian Portuguese

## *References*

[1]     UKIE, "The game industry in numbers | Ukie," 2017. https://ukie.org.uk/research (accessed Aug. 07, 2017).

[2]     Newzoo, "Newzoo Global Games Market Report 2019," 2019. [Online]. Available: https://newzoo.com/Insights/Trend-Reports/Newzoo-Global-Games-Market-Report-2019-Light-Version/.

[3]     Allied Market Research, "Serious Games Market Size, Share and Industry Analysis, 2023," 2017. Accessed: Mar. 29, 2020. [Online]. Available: https://www.alliedmarketresearch.com/serious-games-market.

[4]     W. IJsselsteijn, Y. De Kort, K. Poels,  a Jurgelionis, and F. Bellotti, "Characterising and Measuring User Experiences in Digital Games," *Int. Conf. Adv. Comput. Entertain. Technol.*, vol. 620, pp. 1–4, 2007. https://doi.org/10.1007/978-1-60761-580-4.

[5]     T. Fullerton, *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*. Elsevier Inc., 2008. https://doi.org/10.1201/b13172

[6]     R. J. Pagulayan, K. Keeker, D. Wixon, R. Romero, and T. Fuller, "User-centered design in games," in *Handbook for Human-Computer Interaction in Interactive Systems* , Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 2003, pp. 883–906. https://doi.org/10.1201/9781420088885.ch13

[7]     R. Hunicke, M. Leblanc, and R. Zubek, "MDA : A Formal Approach to Game Design and Game Research," in *Workshop on Challenges in Game AI*, 2004, vol. 4, no. 1, p. 1722.

[8]     B. Winn, "The Design, Play, and Experience Framework," in *Handbook of Research on Effective Electronic Gaming in Education*, vol. II, no. April 2009, 2009, pp. 1.759-1.759. https://doi.org/10.4018/978-1-59904-808-6.ch058

[9]     V. Wanick and C. Bitelo, "O que é seu também é nosso: uma análise crítica da aplicação

do design participativo no design de jogos," in *SBC – Proceedings of SBGames 2017*, Nov. 2017, Accessed: Feb. 10, 2018. [Online]. Available: https://eprints.soton.ac.uk/415439/. https://doi.org/10.1109/sbgames43639.2017

[10]     J. Banks, *Co-creating videogames*. Bloomsbury, 2013. https://doi.org/10.5040/9781472544353

[11]     L. L. Pereira and L. Roque, "Understanding the videogame medium through perspectives of participation," in *DiGRA 2013 - Proceedings of the 2013 DiGRA International Conference: DeFragging GameStudies*, 2013.

[12]     L. L. Pereira, R. Craveirinha, and L. Roque, "A Canvas for Participation-Centered Game Design," in *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*, Oct. 2019, pp. 521–532, doi: 10.1145/3311350.3347154.

[13]     O. Sotamaa and S. Olli, "Perceptions of Player in Game Design Literature," *Situated Play. Proc. DiGRA 2007 Conf.*, pp. 456–465, 2007, [Online]. Available: http://www.digra.org/dl/db/07311.59383.pdf.

[14]     R. Khaled and A. Vasalou, "Bridging serious games and participatory design," *Int. J. Child-Computer Interact.*, vol. 2, no. 2, pp. 93–100, May 2014, doi: 10.1016/j.ijcci.2014.03.001.

[15]     R. Ismail, R. Ibrahim, and S. Yaacob, "Participatory Design Method to Unfold Educational Game Design Issues: A Systematic Review of Trends and Outcome," in *5th International Conference on Information Management, ICIM 2019*, May 2019, pp. 134–138, doi: 10.1109/INFOMAN.2019.8714678.

[16]     Newzoo, "Brazil Dominates the Fast Growing LATAM Games Market," *Brazil Dominates the Fast Growing LATAM Games Market*, 2014. http://www.newzoo.com/news/globalcollect-newzoo-brazil-dominates-fast-growing-latam-games-market/ (accessed Nov. 30, 2015).

[17]     McKinsey&Company, "Brazil 2020 – Opportunity Tree | McKinsey," 2019. Accessed: Mar. 16, 2020. [Online]. Available: https://www.mckinsey.com.br/our-insights/brazil-2020-opportunity-tree.

[18]     Newzoo, "Brazil Games Market 2018," 2018. https://newzoo.com/insights/infographics/brazil-games-market-2018/ (accessed Sep. 28, 2018).

[19]     Newzoo, "Newzoo Global Games Market Report 2018 | Light Version | Newzoo," *report*, 2018. https://newzoo.com/insights/trend-reports/newzoo-global-games-market-report-2018-light-version/ (accessed Nov. 11, 2018).

[20]     BNDES, "Mapeamento da Indústria Brasileira e Global de Jogos Digitais," 2014. Accessed: Jan. 27, 2016. [Online]. Available: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Galerias/Arquivos/conhecimento/seminario/seminario_mapeamento_industria_games042014_Relatorio_Final.pdf.

[21]     McKinsey&Company, "Brazil Digital Report – 1ª edição | Brasil | McKinsey &amp; Company," 2019. Accessed: Mar. 16, 2020. [Online]. Available: https://www.mckinsey.com/br/our-insights/blog-made-in-brazil/brazil-digital-report.

[22]     J. Gonzalez, "Gamasutra: Jose Gonzalez's Blog - Game Development in Latin America - A Research," 2017. https://www.gamasutra.com/blogs/JoseGonzalez/20170802/300668/Game_Development_in_Latin_America__A_Research.php (accessed Nov. 12, 2018).

[23]     C. Spinuzzi, "The Methodology of Participatory Design," *Tech. Commun.*, vol. 52, no. 2, pp. 163–174, 2005, doi: 10.1016/j.infsof.2008.09.005.

[24]     M. M. J. Muller and S. Kuhn, "Participatory design," *Commun. ACM*, vol. 36, no. 6, pp. 24–28, Jun. 1993, doi: 10.1145/153571.255960.

[25]     S. Bødker, "Third-wave HCI, 10 years later—participation and sharing," *ACM Interactions*, 2015. https://doi.org/10.1145/2804405

[26]     M. J. Muller and S. Kuhn, "Participatory design," *Commun. ACM*, vol. 36, no. 6, pp. 24–28, Jun. 1993, doi: 10.1145/153571.255960.

[27]     R. Khaled, V. Vanden Abeele, M. Van Mechelen, and A. Vasalou, "Participatory design for serious game design," in *Proceedings of the first ACM SIGCHI annual symposium on Computer-human interaction in play - CHI PLAY '14*, Oct. 2014, pp. 457–460, doi: 10.1145/2658537.2659018.

[28]     E. Brandt, "Designing Exploratory Design Games : A Framework for Participation in Participatory Design ?," *Proc. ninth Particip. Des. Conf. 2006*, pp. 57–66, 2006, doi: 10.1145/1147261.1147271.

[29]    F. Kensing and K. H. Madsen, "Generating visions: future workshops and metaphorical design," in *Design at work: cooperative design of computer systems*, USA: L. Erlbaum Associates Inc., 1992, pp. 155–168.

[30]    O. S. Iversen, K. Halskov, and T. W. Leong, "Rekindling values in participatory design," in *Proceedings of the 11th Biennial Participatory Design Conference on - PDC '10*, 2010, p. 91, doi: 10.1145/1900441.1900455.

[31]    C. Lambert, "Pedagogies of participation in higher education: A case for research-based learning," *Pedagog. Cult. Soc.*, vol. 17, no. 3, pp. 295–309, Oct. 2009, doi: 10.1080/14681360903194327.

[32]    K. Danielsson and C. Wiberg, "Participatory design of learning media: Designing educational computer games with and for teenagers," *Interact. Technol. Smart Educ.*, vol. 3, no. 4, pp. 275–291, Nov. 2006, doi: 10.1108/17415650680000068.

[33]    K. D. Könings, T. Seidel, and J. J. G. van Merriënboer, "Participatory design of learning environments: Integrating perspectives of students, teachers, and designers," *Instr. Sci.*, 2014, doi: 10.1007/s11251-013-9305-2.

[34]    P. Freire, *Pedagogia do Oprimido*, 18th ed. Rio de Janeiro, RJ: Paz e Terra, 1987.

[35]    W. Barendregt, T. M. Bekker, P. Börjesson, E. Eriksson, and O. Torgersson, "Legitimate participation in the classroom context - Adding learning goals to participatory design," in *Proceedings of IDC 2016 - The 15th International Conference on Interaction Design and Children*, Jun. 2016, pp. 167–174, doi: 10.1145/2930674.2930686.

[36]    P. Zimermann, W. S. Pacheco, and S. Padovani, "Design participativo de jogo de tabuleiro com crianças do ensino fundamental," in *XVII Brazilian Symposium on Computer Games and Digital Entertainment*, 2018, p. 8. https://doi.org/10.1109/sbgames46082.2018

[37]    L. C. Leite *et al.*, "Ensinando e aprendendo a fazer jogos quando os alunos são os protagonistas," in *XVI SBGames – Curitiba – PR – Brazil, November 2nd - 4th, 2017*, 2017, p. 9. https://doi.org/10.1109/sbgames43639.2017

[38]    N. B. R. R. Tomé, G. M. M. M. Junior, and F. da R. T. Filho, "A conceptual framework for the application of gamification strategies in higher education," in *XVI SBGames – Curitiba – PR – Brazil, November 2nd - 4th, 2017*, 2017, p. 7, [Online]. Available: http://www.sbgames.org/sbgames2017/papers/CulturaFull/172344.pdf. https://doi.org/10.1109/sbgames43639.2017

[39]    R. Abrantes Firme and C. de Oliveira Maia, "Gamificando o aprendizado de Ciências: desenvolvimento de uma estratégia pedagógica utilizando o contexto do jogo digital Minecraft," in *XVIII SBGames*, 2019, p. 8, [Online]. Available: https://www.sbgames.org/sbgames2019/files/papers/EducacaoFull/198427.pdf. https://doi.org/10.1109/sbgames48736.2019

[40]    A. Farbiarz, G. D. A. Xavier, J. L. Farbiarz, and C. M. Dias, "O Game Design como metodologia de gamificação na Educação Superior: projeto Commercium et Cognitionis," in *XVIII SBGames*, 2019, pp. 1034–1040. https://doi.org/10.1109/sbgames48736.2019

[41]    K. Salen and E. Zimmerman, *Rules of Play: Game Design Fundamentals*, vol. 37, no. 5. Massachusetts Institute of Technology, 2004.

[42]    J. Hamari and J. Tuunanen, "Player types: A meta-synthesis," *Trans. Digit. Games Res. Assoc.*, vol. 1, no. 2, pp. 29–53, 2014, Accessed: Aug. 06, 2014. [Online]. Available: http://todigra.org/index.php/todigra/article/view/13. https://doi.org/10.26503/todigra.v1i2.13

[43]    K. Gerling, C. Linehan, and R. Mandryk, "Involving players with special needs in Games User Research," in *Games User Research*, 2018. https://doi.org/10.1093/oso/9780198794844.003.0027

[44]    S. Deterding, "The Lens of Intrinsic Skill Atoms: A Method for Gameful Design," *Human-Computer Interact.*, vol. 30, no. 3–4, pp. 294–335, 2015, doi: 10.1080/07370024.2014.993471.

[45]    P. Mirza-Babaei, V. Zammitto, J. Niesenhaus, M. Sangin, and L. Nacke, "Games user research: Practice, Methods, and Applications," in *CHI '13 Extended Abstracts on Human Factors in Computing Systems on - CHI EA '13*, 2013, p. 3219, doi: 10.1145/2468356.2479651.

[46]    R. Bernhaupt, "User Experience Evaluation in Entertainment," in *Evaluating User Experience in Games: Concepts and Methods*, 2010, pp. 3–7. https://doi.org/10.1007/978-1-84882-963-3_1

[47]    P. Mirza-Babaei, L. E. Nacke, J. Gregory, N. Collins, and G. Fitzpatrick, "How does it play better?: exploring user testing and biometric storyboards in games user research,"

*Proc. SIGCHI Conf. Hum. Factors Comput. Syst. - CHI '13*, no. May, 2013, doi: 10.1145/2470654.2466200.

[48] L. Harmat, Ö. de Manzano, T. Theorell, L. Högman, H. Fischer, and F. Ullén, "Physiological correlates of the flow experience during computer game playing.," *Int. J. Psychophysiol.*, vol. 97, no. 1, pp. 1–7, Jul. 2015, doi: 10.1016/j.ijpsycho.2015.05.001.

[49] J. Vita, "Users as Co-creators: Player-centric Game Design User Experience Magazine," 2014. http://uxpamagazine.org/users-as-co-creators/ (accessed Dec. 16, 2018).

[50] T. Costa Kohwalter, F. M. de Azeredo Figueira, E. A. de Lima Serdeiro, J. R. da Silva Junior, L. Gresta Paulino Murta, and E. Walter Gonzalez Clua, "Understanding game sessions through provenance," *Entertain. Comput.*, vol. 27, pp. 110–127, Aug. 2018, doi: 10.1016/J.ENTCOM.2018.05.001.

[51] L. E. Nacke, "Games user research and gamification in human-computer interaction," *XRDS Crossroads, ACM Mag. Students*, vol. 24, no. 1, pp. 48–51, Sep. 2017, doi: 10.1145/3123748.

[52] V. Zammitto, "Games User Research as part of the development process in the game industry: Challenges and best practices," in *Games User Research*, 2018. https://doi.org/10.1093/oso/9780198794844.003.0002

[53] C. Ampatzidou and K. Gugerell, "Participatory game prototyping – balancing domain content and playability in a serious game design for the energy transition," *CoDesign*, pp. 1–16, Aug. 2018, doi: 10.1080/15710882.2018.1504084.

[54] G. P. Meneses, "Saberes em jogo: a criação do videogame Huni Kuin," *Rev. Antropol.*, pp. 83–109, 2017. https://doi.org/10.11606/issn.2525-3123.gis.2017.129176

[55] M. C. Medlock, "The Rapid Iterative Test and Evaluation Method (RITE)," in *Games User Research*, 2018. https://doi.org/10.1093/oso/9780198794844.003.0013

[56] P. Mirza-Babaei, N. Moosajee, and B. Drenikow, "Playtesting for indie studios," in *Proceedings of the 20th International Academic Mindtrek Conference on - AcademicMindtrek '16*, 2016, pp. 366–374, doi: 10.1145/2994310.2994364.

[57] D. Tisserand, "It is all about process," in *Games User Research*, 2018. https://doi.org/10.1093/oso/9780198794844.003.0003

[58] E. Adams, *Fundamentals of Game Design*. New Riders, 2010.

[59] J. Nielsen, "Games User Research: What's Different?," *Nielsen Norman Group*, 2016. https://www.nngroup.com/articles/game-user-research/ (accessed Apr. 21, 2016).

[60] V. Zammitto, P. Mirza-Babaei, I. Livingston, M. Kobayashi, and L. E. Nacke, "Player Experience: Mixed Methods and Reporting Results," *CHI '14 Ext. Abstr. Hum. Factors Comput. Syst.*, pp. 147–150, 2014, doi: 10.1145/2559206.2559239.

[61] G. McAllister and S. Long, "A framework for player research," in *Games User Research*, 2018. https://doi.org/10.1093/oso/9780198794844.003.0008

[62] L. Nacke, P. Mirza-Babaei, C. Moser, A. Abney, A. Drachen, and Z. Zehnyu, "Lightweight Games User Research for Indies and Non-Profit Organizations," *CHI Proc.*, pp. 3597–3603, 2016, doi: 10.1145/2851581.2856504.

[63] M. Flanagan and H. Nissanbaum, "Values at play in digital games," *MIT Press*, p. 224, 2014. https://doi.org/10.7551/mitpress/9016.001.0001

[64] S. H. Schwartz, "A theory of cultural value orientations: Explication and applications," *Comp. Sociol.*, vol. 5, no. 2–3, pp. 137–182, 2006. https://doi.org/10.1163/156913306778667357

[65] We Are Social, "We Are Social - Digital Report 2018," *We Are Social*, 2018. https://digitalreport.wearesocial.com/ (accessed Dec. 17, 2018).