

Investigating UX in Brazilian Digital Game Development: Practices, Challenges and Lifecycle

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Abstract The development of digital games requires the creation of immersive experiences that align with players' expectations, making UX practices essential to ensuring the quality of the user experience. However, the integration of UX in the industry still faces significant challenges, such as validation with end users, collecting representative feedback, and the shortage of specialized professionals. This exploratory study aims to investigate how UX practices and tools are applied in the development of digital games in Brazil. Conducted through the Survey Research method, the study analyzed the perceptions of professionals (N=128) and the barriers faced by Brazilian studios. The analysis employed a mixed-methods approach, combining quantitative and qualitative methods. The results highlighted that, although UX is widely recognized as strategic, its implementation is still constrained by technical and strategic challenges, particularly in small studios. Furthermore, the research suggests that advancements in training, accessible tools, and validation processes are essential to overcoming these barriers. The study contributes to the understanding of UX practices in the industry and proposes directions for future research.

Keywords: Game UX, Digital Games, User Experience, UX Techniques, Game Development

1 Introduction

User Experience (UX) has become a priority in the development of digital products, including games, applications, and websites [Hassenzahl and Tractinsky, 2006; Mahlke, 2006]. This approach aims to provide users with seamless, enjoyable, and intuitive interactions with interfaces, meeting their needs, expectations, and emotions. In an increasingly competitive market, companies have recognized UX as a strategic differentiator capable of enhancing customer satisfaction, fostering engagement, and promoting loyalty [Bernhaupt, 2010; Guerino *et al.*, 2024]. Thus, UX has evolved from being merely a complementary element to becoming essential in the planning and execution of digital projects [Sánchez *et al.*, 2012].

In the context of digital games, UX plays a crucial role, directly influencing players' satisfaction, engagement, and immersion [Bernhaupt, 2010, 2015]. Creating experiences that deeply and meaningfully engage players requires a detailed understanding of the practices and tools used to design and optimize these interactions [Nacke *et al.*, 2019]. The application of UX techniques in game development aims not only to improve usability but also to create an environment that fosters engaging and emotionally captivating experiences [Huber and Rückel, 2023].

However, Brazilian studios face significant challenges in this scenario. According to the latest survey by the Brazilian Association of Digital Game Developers (ABRAGAMES) [Fortim, 2022], the main obstacles include a shortage of financial resources, difficulties in attracting and retaining qual-

ified talent, limitations related to competitiveness in both national and international markets, as well as administrative and regulatory barriers that directly impact development and operational processes [Querette, 2013].

Despite the recognition of the importance of UX in digital game development, it is observed that many development companies face difficulties in establishing themselves, especially in the Brazilian market [Querette, 2013; Fortim, 2022]. Thus, studios face these challenges in order to remain competitive in the landscape [Querette, 2013; Fortim, 2022]. Furthermore, there is a gap in the literature regarding the application of UX practices in Brazil, including how developers overcome these obstacles and adapt UX techniques to their specific contexts. The lack of clarity and investment in the application of UX not only compromises the quality of interactions offered to users but also the ability of companies to stand out in a highly competitive market [Da Silva *et al.*, 2024]. This gap highlights the need for studies that explore in depth the strategies and adaptations used by Brazilian studios to incorporate UX into their processes, as well as the impacts of these practices on the success and sustainability of their projects.

In this context, this study aims to investigate how UX practices and tools are applied in the development of digital games in Brazil, analyzing their implementation strategies, the challenges faced, and their impact on the product lifecycle, focusing on the creation of engaging experiences and integration into MVPs (Minimum Viable Products). The method used was adapted from Kitchenham and Pfleeger [2008] and Petersen [2020], which outlines the definition of the objective,

planning, data collection, data analysis and discussion, and reporting and dissemination. The study involved 128 participants, whose responses were analyzed both qualitatively and quantitatively. The study also explores the methodologies used by developers, identifies the most commonly employed tools for implementing effective UX strategies, and analyzes the stages of the game development lifecycle. Additionally, the challenges faced in this process are examined, including technical, creative, and financial barriers that may impact the application and success of UX practices.

This study contributes to the understanding of UX practices and tools in digital game development, highlighting their application in creating experiences and their integration into MVPs. The key findings include the identification of the methodologies and tools most commonly used by developers, the analysis of the stages of the game development lifecycle, and a detailed evaluation of the challenges faced in this process. These contributions provide a foundation for improving the application of UX in the industry, offering valuable insights for both academia and the industry.

The structure of this paper is as follows: In Section 2, related works are presented, providing the theoretical background and context of the study. In Section 3, the methodology and the stages of the work are outlined. Section 4 presents the results obtained and their corresponding discussions, along with Section 5, which addresses threats to the validity of the study. Lastly, Section 6 presents the conclusions of the study and suggests directions for future research.

2 Related Work

The study by Bernhaupt [2010], presents methods and concepts focused on evaluating UX in digital games, highlighting the unique characteristics of this context. The research emphasizes the importance of understanding the interaction between players and interfaces to improve satisfaction and engagement. Among the aspects analyzed are playtesting methods, player satisfaction metrics, immersion analysis, and the evaluation of emotions evoked during gameplay. Additionally, the work highlights the importance of integrating both quantitative and qualitative approaches, using techniques such as interviews, observations, and psychophysiological measures to capture players' perceptions and reactions in detail.

Complementing this discussion, another study by the same author [Bernhaupt, 2015] provides a compilation of methodologies focused on UX evaluation in digital games, investigating specific challenges and proposing best practices. Among the methodologies highlighted are playtesting, behavioral analysis, and the use of automated metrics, which capture players' objective reactions. The study emphasizes the importance of elements such as visual and auditory feedback, accessibility, and the adaptation of UX for different genders and audience profiles. The uniqueness of digital games is emphasized, particularly in the balance between challenges and rewards, which is crucial for maintaining engagement. Corroborating the methodologies mentioned, Wanick and Bitelo [2020] conducted a survey with 29 designers and digital game developers in Brazil regarding the use of participatory design techniques during the design process of studios. The results

showed that playtesting is the most commonly used technique to improve the player experience.

In the educational games area, Nagalingam *et al.* [2020] investigate how factors such as usability, immersion, motivation, and feedback can be designed to align the player experience with educational objectives, promoting greater engagement and effectiveness in learning. This corroborates the studies by Nagalingam and Ibrahim [2015]; Laine and Lindberg [2020]; Toh and Kirschner [2020]; Lunak [2022], which state that educational games have captivated students by blending fun with learning.

Additionally, Hyrynsalmi *et al.* [2018] introduces the concept of Minimum Viable Game (MVG), adapting the concept of minimum viable products (MVPs) to the context of digital games. The MVG focuses on developing a minimal functional scope that ensures a satisfactory experience for users. The authors emphasize that the MVG is also a strategic tool for quick decisions during development, allowing for the prioritization of elements most relevant to players and optimizing resources.

In an academic context, the study by Da Silva *et al.* [2026b] conducted a systematic literature review with the aim of understanding how UX practices are applied in digital game development. The authors analyze the incorporation of UX throughout the entire digital game development lifecycle, mapping the benefits, challenges, and limitations faced by studios. Furthermore, the study proposes a research agenda intended to guide future investigations based on the gaps identified in the literature.

Another relevant study is presented by Fontes and Milanez [2023], who organize research on UX in digital games, synthesizing methods, metrics, and approaches. The work highlights widely adopted practices, such as playtesting and surveys, and emphasizes the growing importance of accessibility and inclusion as fundamental elements for designing experiences that are engaging and accessible to diverse audiences.

In a national context, the study by Xavier *et al.* [2023] collected 200 responses from different stakeholders in both industry and academia. The authors identified twelve aspects (such as networking, financial sustainability, and market opportunities) and their interrelationships, which describe the Brazilian game industry and independent studios. The results of this study were also comparatively analyzed alongside the data presented by Fortim [2022].

Finally, Da Silva *et al.* [2024] explores innovative approaches and practices adopted by Brazilian studios to integrate UX into their processes. The research, involving 41 studios, led to the creation of a visual framework that synthesizes UX techniques, benefits, challenges, testing tools, and evaluated dimensions. This framework provides a practical and theoretical foundation that contributes to the evolution of UX usage in digital game development.

In an international context, Rajanen and Tapani [2018] investigated the practices and methods of North American game companies regarding usability and compared the results with those obtained from European companies. Furthermore, Karlsson *et al.* [2023] addresses the processes and challenges related to level design, in which they state that most of their observations are comparable to previous findings on game development in general.

These studies highlight the growing concern with UX in game development, presenting methodologies aimed at optimizing interaction and capturing player perceptions. Whether in entertainment or educational games, these practices provide a solid foundation for the development of successful MVGs.

In contrast to previous studies, this work provides a deeper analysis of the application of UX practices and tools in Brazilian studios, focusing on the perspectives of professionals. The research includes an extensive survey that explores how UX practices are integrated into the game development lifecycle, from initial conception to launch. This approach uncovers strategies tailored to the national context, offering significant contributions to both academia and industry.

3 Research Method

This research adopts the Survey Research approach, as presented by Petersen [2020], and the Kitchenham and Pfleeger [2008] approach, both of which provide structured guidelines for collecting and analyzing opinions in specific contexts. These methodologies, widely recognized in Software Engineering, allows for the exploration of perceptions, attitudes, and practices of professionals on complex topics. In the context of this study, the approach was applied to investigate how UX practices and tools are used in digital game development, focusing on the strategies employed, challenges faced, impact on the product life cycle, integration into MVPs and the most adopted tools.

Figure 1 illustrates the research method adopted, detailing the stages of planning, data collection, and analysis.

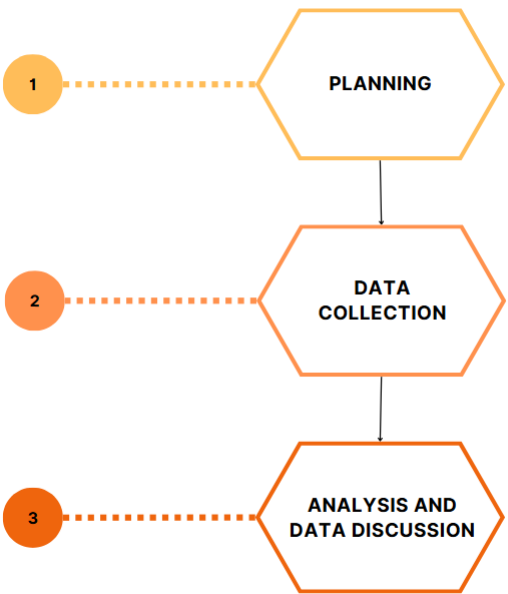


Figure 1. Research Method.

3.1 Planning

The target audience of the research consists of professionals from digital game studios in Brazil. To this end, a database [Da Silva et al., 2024] was updated, which initially contained information from 524 studios. This database was expanded to include 100 new studios, totaling 624 companies. Contact with the participants was made via email, requesting their collaboration and encouraging the dissemination of the survey among their colleagues. The outreach was also extended through groups on *Discord* linked to national associations.

The questionnaire, created using the *Google Forms*, contained 28 questions structured into four sections: i) Demographic Data; ii) Product Information; iii) UX and Product Lifecycle; and iv) Final Considerations. The questions combined open-ended, closed-ended, multiple-choice formats, and Likert Scale questions, and can be seen in Table 1.

To ensure the quality of the instrument, a pilot was conducted with three professionals from the UX and game development. The profile of these professionals is characterized by experience in UX and programming in digital game development studios in Brazil, with market experience ranging from one to five years. The questionnaire was available for two days for validation by the professionals. The participants in the pilot evaluated the questionnaire and provided writing recommendations to improve the readability of the questions. After adjustments suggested by the evaluators, the questionnaire was validated and considered ready for application.

3.2 Data Collection

Data collection took place over three months, from May to August 2024. The questionnaire was made available online, and participants were informed about the estimated time to complete it, which was approximately 10 minutes. Before starting the questionnaire, a Free and Informed Consent Term (FICT) was presented, approved by the Research Ethics Committee of the State University of Maringá, under number 83936724.4.0000.0104.

The FICT ensured the confidentiality of the data, clarified the objectives of the study, and described the conditions of participation. Participation in the study was contingent upon explicit agreement with the terms presented, through an electronic signature at the beginning of the questionnaire. Both the questionnaire and the FICT are available to read at: <https://doi.org/10.5281/zenodo.18576697> [Da Silva et al., 2026a]. At the end of the data collection period, 128 professionals agreed to participate and completed the questionnaire, providing relevant data for analysis.

3.3 Analysis and Data Discussion

The data were analyzed using a combined approach. Initially, the quantitative results were organized and tabulated in Microsoft Excel, highlighting the correlations among the questionnaire items, ensuring clarity and systematization. Then, a qualitative analysis was conducted to identify patterns, relationships, and relevant insights in the collected responses.

This combination of analyses enabled a deeper understanding of UX practices in game development. The results and

Table 1. Questionnaire.

Section	Number	Question
Demographic Data	1	What is your educational background?
	2	What is your gender?
	3	What is your position/function within the company?
	4	What is the type of your employment contract?
	5	What is your work arrangement?
	6	How long have you been with the company?
	7	How many employees does the company have?
	8	In which state is the company located?
	9	Is the company a part of any business association?
Product Information	10	What type of game does the company develop?
	11	For which platforms are the games developed?
	12	How does the company distribute these games?
	13	Which game engines do you use for game development?
UX and Product Lifecycle	14	Does the company you work for have the conditions for internationalization?
	15	Which continents consume your games the most?
	16	Which of the following stages are part of the game development process in your company?
	17	In which stages are UX techniques applied?
	18	What is the level of difficulty for each of the company's challenges?
	19	What is your experience with UX?
	20	To what extent does your company value the importance of UX in digital games?
	21	To what extent does your company employ specialized UX professionals?
	22	To what extent does your company offer UX training to the teams?
	23	What UX techniques does the company use in the development process?
	24	What tools does the company use to apply UX?
	25	In addition to techniques and tools, what practices does the company adopt to ensure a satisfying gaming experience for the user?
	26	What are the main challenges and difficulties your company faces when applying UX?
	27	To what extent do you believe that a good user experience can positively impact sales and the perception of the game in the market?
Final Considerations	28	Please feel free to add any comments about UX that you believe are relevant to this study.

discussions are detailed in the following section, linking the findings to the research questions.

4 Results and Discussion

This section presents and discusses the results obtained from the survey with 128 professionals, with the objective of investigating how UX practices and tools are applied in digital game development, as well as the strategies adopted and challenges faced by Brazilian studios.

To address this objective, the results are organized into four complementary topics. First, **Demographic data** characterizes the profile of the respondents and the context in which UX practices are applied. Next, **developed products** provides an overview of the types of games and platforms involved, contextualizing the application of UX within different production scenarios. The topic **UX and Product Lifecycle** analyzes how UX practices and tools are integrated across the stages of the game development process, highlighting strategies adopted by studios. Finally, **challenges** discusses

the main technical, organizational, and strategic barriers reported by professionals when applying UX in digital game development.

The analyses presented in this section not only interpret the collected data but also contextualize the findings, offering reflections on their impact on digital game development. The discussions aim to relate the results to the research questions and the existing literature, contributing to a deeper understanding of the role of UX in this context.

4.1 Demographic Data

The demographic data of the 128 participants were analyzed to understand the profile of the professionals involved in digital game development, which helps contextualize the findings of this research. As this was an anonymous questionnaire, respondents were not asked to identify the company for which they worked. However, by cross-referencing variables such as state, number of employees, and participation in associations, it is estimated that approximately 120 distinct studios participated in this study.

Regarding **academic background**, it was found that the majority of respondents, 54.7% (N=70), have a bachelor's degree. Another 21.1% (N=27) have a specialization, while 12.5% (N=16) completed only high school. Respondents with advanced degrees include 8.6% (N=11) with a Master's degree and 3.1% (N=4) with a PhD.

Regarding **gender**, the majority identify as male (71.9%, N=92), followed by females (21.9%, N=28). Additionally, 3.1% (N=4) identified as non-binary, and another 3.1% (N=4) chose not to answer the question.

The Figure 2 presents the **roles and positions** held by the participants. The majority work as game designers (N=56), developers (N=46) or CEOs (N=44). Other roles include director (N=29), UX designer (N=27) and UI designer (N=25), highlighting the diversity of roles within the game development ecosystem. It is important to note that each respondent could provide more than one answer.

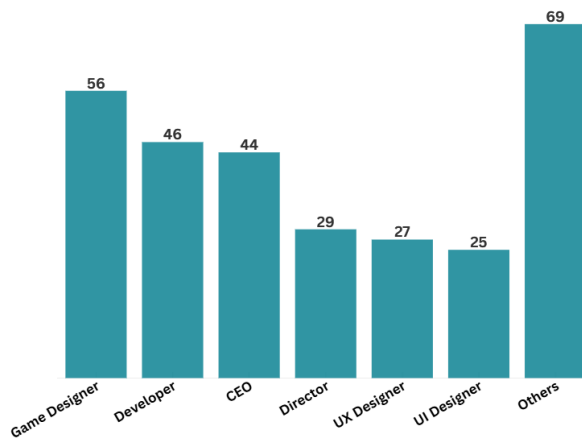


Figure 2. Roles and Positions.

Regarding **work mode**, 72.7% of the participants (N=93) work remotely, while 15.6% (N=20) work on-site, and 11.7% (N=15) use a hybrid model.

Regarding the **length of employment with the companies**, Figure 3 shows that 28.9% of the respondents (N=37) have more than 5 years of experience, followed by 27.3% (N=35) with 1 to 2 years, 22.7% (N=29) with up to 1 year, and 21.1% (N=27) with 3 to 5 years.



Figure 3. Participant's length of association with the company.

Regarding the **number of employees in the studios**, 46.1% (N=59) of the participants work in small companies with up to 5 employees. Studios with more than 50 employees represent 17.2% (N=22). Teams with 6 to 10 employees account for 14.8% (N=19), while companies with 11 to 20 and 21 to 50 employees each represent 10.9% (N=14).

The **geographical distribution** of the respondents is presented in Figure 4. The states with the highest concentrations of participants are São Paulo (35.9%, N=46), Rio Grande do

Sul (14.1%, N=18), Rio de Janeiro (11.7%, N=15), Minas Gerais (8.6%, N=11), Paraná and Santa Catarina (both with 6.3%, N=8). All Brazilian regions are represented, with an emphasis on the South and Southeast regions, which account for the majority of the studios. The results of this study highlight the findings of Fortim [2022], which state in their latest census that 78% of game developers in Brazil are concentrated in these two regions.

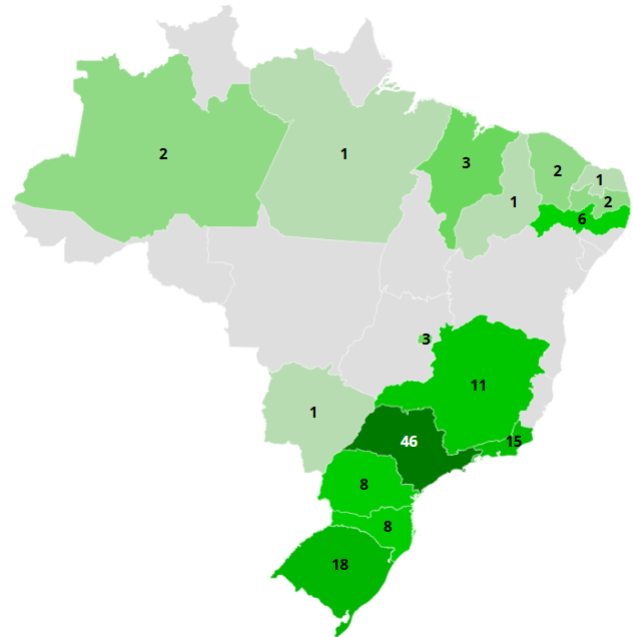


Figure 4. Geographical distribution of respondents.

4.2 Developed Products

The products developed by the studios represented by the respondents encompass a variety of types and platforms, reflecting the diversity and complexity of the digital games market in Brazil.

Most companies focus their **production** on entertainment games (N=115), demonstrating the predominance of this segment in the industry. Next, educational games are highlighted, mentioned by 39 respondents, followed by advergames with 22 responses. Additionally, the survey data revealed the production of other types of games and applications, such as corporate training games, serious games, simulators, health-related games, general apps, adult content games, instant games, gamification apps, and personal projects, highlighting the breadth of the market served. These data corroborate the research of Boyle *et al.* [2012]; Law and Sun [2012]; Moizer *et al.* [2019]; Nagalingam *et al.* [2020], which confirms the growth of the gaming market in recent years.

Regarding the **development platforms**, participants were allowed to select multiple options, providing a comprehensive view of the trends. A significant preference was observed for games developed for computers (N=107) and mobile devices (N=80). Next, browser games stand out (N=52), consoles (N=42), and augmented reality (N=18), indicating a diversification in game delivery and consumption strategies.

The **distribution strategies** also reflect the multiplicity of approaches adopted by studios. Distribution through digital

download stores was mentioned by 76 respondents, followed by mobile app stores, with 55 responses. Publishers and on-line game portals were each mentioned by 35 respondents, while 29 participants indicated the use of their own websites as a distribution channel. These data highlight the use of digital platforms as the main means of reaching the consumer audience, especially for independent studios, which have fewer financial resources and promote their games individually, as stated by Martin and Deuze [2009].

Regarding the **consumer market**, the games developed by the participants' companies predominantly serve the South American audience (N=88), representing 35.9% of the responses. North America (N=72) follows with (N=72) follows with 29.4%, then Europe (N=42), with 17.1%, and Asia (N=28) with 11.4%. The other continents have a smaller share: Central America (N=7, 2.8%), Africa (N=4, 1.7%), and Oceania (N=4, 1.7%). It is worth noting that many developers distribute their games in more than one continent, demonstrating the globalization potential of the Brazilian digital games market.

These results highlight the diversity of products and strategies employed by Brazilian studios, as well as their ability to cater to both local and international markets. This variety reflects the dynamism of the digital games industry in Brazil and points to opportunities for expansion and innovation.

4.3 UX and Product Lifecycle

The research results show that integrating UX practices into the game development lifecycle is essential for creating experiences that not only meet players' expectations but also maximize engagement and satisfaction. This approach enables a more accurate identification of the target audience's needs, resulting in products that are more aligned with user demands.

In this context, an analysis was conducted on how companies have incorporated UX into different stages of the development cycle, with an emphasis on aspects such as adopted practices, the roles and responsibilities of the team members involved, the techniques and tools used, and the overall perception of the importance of user experience throughout the process. These stages are integrated into the game development process presented by Chandler [2012].

4.3.1 Practices and Stages in Game Development

The analysis of responses related to the **game development process** reveals a comprehensive overview of the practices adopted by developers. The design stage was the most frequently mentioned, cited by 120 respondents (93.8%), establishing itself as a central and indispensable component in the game production cycle. Despite this, Maeda Palm [2022] states that although there are studies reporting the evaluation of user interfaces in game production, there are still few studies addressing the design of these interfaces. Other stages also stood out, such as prototyping (N=112, 87.5%), testing (N=111, 86.7%), and implementation (N=110, 85.9%), highlighting the priority given to the creation of preliminary versions, technical development, and the validation of functionalities before the final release.

The **Game Design Document (GDD)** also plays a significant role, being mentioned by 108 respondents (84.4%). This data shows that most companies use this documentation as an essential tool to align the project's vision and detail its planning. This is confirmed in the study by McAllister and White [2015] and reinforced by Aleem *et al.* [2016], who state that after the game concept has been discussed, a development team should spend about one to two months creating the GDD. Additionally, feedback collection was mentioned by 89 respondents (69.5%), reflecting the concern to incorporate user perceptions, both during the testing phase and after the product's release.

Other stages, such as **storyboarding**, mentioned by 77 respondents (60.2%), highlight the importance of creating narratives and contexts that enrich the player's experience. However, earlier stages such as **ideation**, **benchmark**, and **reference research**, were cited less frequently, appearing in only one response. This may suggest that these practices are less formalized or are integrated into other activities within the development process.

Finally, some responses, such as "I don't know" and "N/A," indicate that although the game development process includes widely recognized stages, there are still variations in the level of formalization and understanding of this workflow in some companies. These results reinforce the need to standardize and integrate practices that can contribute to a more structured development process, especially in the context of UX.

4.3.2 Application of UX Techniques

The analysis of data regarding the stages in which UX techniques are applied in game development reveals a varied distribution, with greater attention given to specific phases of the process. The **design** stage stood out as the main moment for applying these techniques, mentioned by 95 respondents (74.2%). This result reflects the importance of incorporating user experience into the visual and conceptual design of the game, highlighting its role in the success of the product.

The **prototyping** stage was the second most mentioned, with 80 responses (62.5%), indicating that many developers recognize this phase as a valuable opportunity to test and improve usability and player experience. The studies by Hyrynsalmi *et al.* [2018] and Da Silva *et al.* [2024] state that prototyping is essential for the development of a Minimum Viable Game (MVG). Next, the stages of **Game Design Document** and **implementation** were each mentioned by 66 respondents (51.6%). These numbers suggest a significant effort to integrate UX practices both in documentation, which aligns the project's vision, and in the technical execution of the game.

The **feedback collection** and **testing** stages were also identified as strategic moments for the application of UX techniques, with 61 responses (47.7%) and 60 responses (46.9%), respectively. These results highlight the importance of evaluating user experience at critical stages, allowing adjustments based on internal tests and player perceptions.

On the other hand, stages such as **storyboarding**, mentioned by only 12 respondents (9.4%), were less frequently associated with the application of UX practices. This may indicate that, for many companies, these practices are still

not seen as essential in the creation of narratives or textual content. Responses such as “Not applicable” (N=5, 3.9%) and “I don’t know” (N=8, 6.3%) reveal that some companies have limited familiarity with or do not fully integrate UX practices into their workflow, highlighting gaps in knowledge or formalization.

The data highlight a predominance of UX techniques being used in the design and prototyping stages, emphasizing the importance of considering the player’s experience from the early phases of development. This initial approach, combined with application at critical moments of testing and validation, reinforces the importance of ensuring an optimized experience throughout the entire game creation process. However, the results also point to opportunities for expanding the use of UX techniques in less explored stages, such as storyboarding, promoting a more comprehensive and consistent integration into the development cycle. Thus, this study proposes a deeper and more structured integration of UX practices into the game development lifecycle.

4.3.3 Roles and Responsibilities

The analysis of the respondents’ roles and responsibilities, as well as their relationship with the application of UX practices in digital game development, was organized into three main aspects. First, it addresses the direct influence of different roles on the implementation of UX, highlighting the relevance of both strategic and operational functions. Next, it discusses the relationship between professionals’ tenure and the maturity in adopting UX practices. Finally, it explores the respondents’ level of experience with UX, including barriers faced and the impact of these practices on the success of the games. This division provides a structured and detailed view of how UX is perceived and integrated by the companies participating in the study.

- **Relationship Between Roles and UX Practices:** The analysis of the data reveals that most respondents hold roles or positions directly related to design and user experience, such as game designers, UX/UI designers, and game producers. This predominance explains the high presence of UX practices in the design and prototyping stages, suggesting that professionals responsible for the visual and functional creation of games play a central role in applying these techniques. These roles have a significant impact on the player’s experience, particularly in areas such as interface and gameplay, where the quality of interaction is prioritized. This is corroborated by the work of Law *et al.* [2014], which states that there is a tendency for UX practices to be applied by professionals responsible for design.

Although less frequent, roles such as CEO and director also appear among the respondents, indicating a strategic concern with the formalization of UX practices. These professionals play an important role in incorporating UX into documents such as the GDD, which aligns the project’s vision among teams and promotes greater cohesion throughout the development cycle. This effort demonstrates that companies are striving to structure UX practices, integrating them in a formal and planned manner.

- **Importance of Experience and Tenure:** The data indicate a positive relationship between professionals’ tenure and the consistency in applying UX practices. Most participants with more than five years of tenure reported greater familiarity and application of these practices, suggesting that low turnover promotes organizational maturity and the more strategic adoption of UX. More experienced professionals tend to understand the relevance of UX in the early and fundamental stages of the process, such as design and prototyping, which lay the foundation for the game’s quality.

On the other hand, the presence of respondents with less than two years of tenure suggests an expansion in UX awareness within the sector. Companies have been promoting these practices from the beginning of their employees’ professional journeys, reflecting an effort to incorporate UX as a standard competency.

- **Levels of Experience with UX:** The analysis of the levels of familiarity with UX revealed significant variations among the participants. As shown in Figure 5, 64% of the respondents (N=82) reported practical application of UX in their projects, demonstrating that these practices play a relevant role in game development. Another 17.2% (N=22) indicated theoretical knowledge but without the opportunity to directly apply the techniques, while a small portion (1.6%, N=2) was completely unfamiliar with the concept.

These data suggest that UX is becoming a widely recognized and relevant competency in the industry. The combination of practical experience and theoretical interest reflects a positive trend toward the broader adoption of these practices [Ramirez-Mora *et al.*, 2020].

- Have worked with UX in the industry
- Current position is focused on performing UX-related tasks
- Familiar with UX and have applied some techniques
- Have heard about UX but never worked with it
- Do not know what UX or UX techniques are

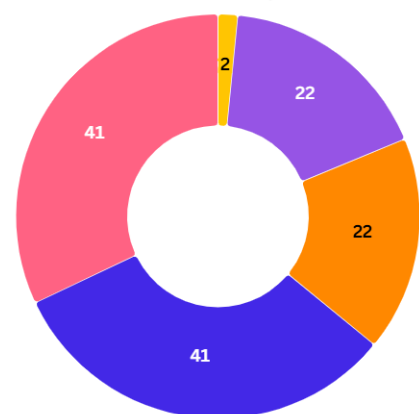


Figure 5. Levels of UX experience of the respondents.

- **Impacts of UX and Implementation Barriers:** The Figure 6 provides insights into the challenges faced by companies in adopting UX practices and their perceived impact. Despite the recognition of UX by a large number of companies, significant barriers still exist. Almost half of the respondents reported that their companies do not consistently employ UX specialists, and more than half indicated the absence of structured training in this area.

These data reflect a gap between the recognition of UX and its practical implementation.

Despite these limitations, 71.1% of the participants (N=91) believe that UX has a direct impact on the success of games, particularly in sales and market perception. This recognition reinforces the need for investments in training and the hiring of specialists to maximize the potential of UX practices.

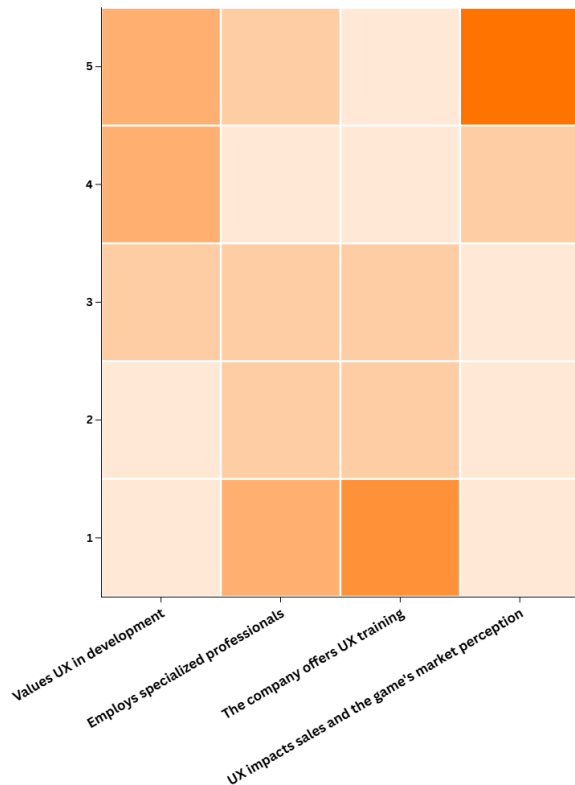


Figure 6. Difficulty in adopting UX measures and its perceived impact.

In summary, the results highlight the importance of UX practices in game development and the direct relationship between roles, tenure, and professionals' experience in applying these practices. While awareness of UX's relevance is on the rise, challenges such as the lack of specialized professionals and structured training limit its full adoption.

The growing interest in UX, as evidenced by the data, reflects significant potential for its consolidation as a standard competency in the game industry. To achieve this goal, it is essential to invest in training, hire specialists, and integrate UX practices throughout all stages of the development cycle, promoting user-centered games that are more competitive in the market.

4.3.4 Valuation of UX

The valuation of user experience is a strategic element in the development of digital games, widely recognized as a key differentiator for product success in the competitive market [Bernhaupt, 2010; Law and Sun, 2012; Desurvire and Wiberg, 2015]. This section is organized into four main parts: initially, we discuss the degree of recognition and appreciation of UX by the participating companies, followed by an analysis of

the differences related to the size of the studios and their resources. Next, we address the challenges in implementing UX practices, including the lack of specialized professionals and structured training. Finally, we explore the perceived impact of UX on commercial success and game reception in the market. This structure aims to provide a detailed and segmented view of the current state of UX valuation in the digital games sector.

- **Recognition of the Importance of UX:** The analysis of the degree of UX valuation in digital game development revealed a predominantly optimistic scenario. As illustrated in Figure 6, a significant majority of respondents (71.1%, N=91) assign high importance to UX in their processes, selecting valuation levels 4 and 5. This reflects a growing awareness of the strategic relevance of UX for the success of games. In contrast, only 7.0% (N=9) of participants assigned low value (levels 1 and 2), indicating that a very limited number of companies still do not recognize the crucial role of UX.

These data reinforce that, although a small portion of companies still do not prioritize UX, the overall trend points to a growing awareness of its importance as a critical factor for the success of digital products in the highly competitive games market.

- **Relationship Between Studio Size and UX Valuation:** The analysis revealed interesting differences in the valuation of UX based on the size of the studios.

- **Small Studios (up to 5 employees):** Despite limitations in human and financial resources, these studios demonstrate a strong appreciation for UX. This attitude reflects an effort to offer high-quality user experiences, even with operational constraints, highlighting the strategic importance of UX as a competitive differentiator. Despite the interest in applying UX, these companies require practical, developer-focused tools to ensure game usability, as they lack the resources to hire usability specialists to handle usability [Mylly et al., 2019].
- **Medium Studios (between 6 and 50 employees):** These studios occupy an intermediate position, with the potential to apply UX practices but facing challenges in dedicating resources exclusively to this area. Still, the awareness of UX's importance remains high, reflecting efforts to integrate these practices within their capabilities.
- **Large Studios (more than 50 employees):** With more robust resources, these studios have a greater ability to invest in specialized professionals and advanced UX methods. The valuation of UX in this group is aligned with the adoption of structured practices and consistent investments, allowing for a more in-depth approach to game development.

Studios that showed low valuation of UX may face specific barriers, such as a lack of knowledge, resources, or understanding of its strategic impact. These cases highlight the need for training and awareness to expand the adoption of UX in the industry.

- **Challenges in Implementing UX:** Despite the recognition of UX's importance, the analysis revealed signifi-

cant barriers to its implementation.

- **Lack of Specialized Professionals:** Nearly half of the respondents indicated that their companies either do not have UX specialists or hire these professionals only on an occasional basis. This absence may limit the potential to consistently improve the user experience.
- **Lack of Training:** More than half of the participants reported that their companies do not offer formal UX training. Only a minority reported receiving significant training, reflecting a lack of investment in team development. This scenario perpetuates a cycle where the absence of training hinders the consolidation of UX as a strategic practice.

The relationship between the lack of training and the scarcity of specialized professionals highlights a structural challenge. Without training, companies struggle to recognize the importance of hiring specialists, keeping UX implementation at an initial or exploratory stage. According to Karabinus and Atherton [2018], this is evident because there is a lack of transparency in the processes and professional practices of game development, making it difficult to understand how game development actually takes place.

- **Impact of UX on Game Success:** The data demonstrate a direct impact of UX on game sales and market perception. As highlighted in Figure 6, 71.1% (N=91) of respondents considered this impact highly significant, while 25.8% (N=33) assessed it as moderately significant. Only 3.1% (N=4) rated the impact as intermediate. These results reinforce that UX is widely perceived as a competitive differentiator, capable of directly influencing the acceptance of products by players and their commercial performance.

The data evidence that the value of UX in the digital games sector is growing, with most companies recognizing its strategic importance. However, challenges such as the lack of specialized professionals and the absence of structured training still limit the full implementation of these practices.

The perceived positive impact of UX on game success highlights the need for continued investments in training and hiring specialists, especially in smaller and medium-sized studios. These efforts are essential to consolidate UX as a standard practice, promoting more user-centered experiences and ensuring greater competitiveness in the digital games market.

4.3.5 UX Techniques and Tools in Game Development

UX techniques and tools play a crucial role in digital game development, enabling the creation of user-centered experiences that are optimized to meet audience expectations. In this subsection, we analyze the data collected about the UX practices adopted by the participating companies, dividing the discussion into two main aspects. First, we explore the UX techniques used, identifying the most common approaches and the challenges related to their implementation. Then, we examine the tools employed by the developers, highlighting

the most popular resources and the gaps identified in the use of specialized solutions. This structure provides a detailed understanding of UX strategies in the industry and points out opportunities for future advancements.

- **UX Techniques Used:** The analysis of the responses regarding the UX techniques used by game developers reveals a wide variety of approaches and methodologies. Most companies reported the use of multiple techniques throughout their development processes, highlighting an effort to incorporate UX practices at various stages. Table 2 presents the details of the techniques mentioned by the respondents.

Table 2. UX Techniques Used by Developers.

UX Techniques	N
GDD	96
Playtesting	72
User Flow Map	69
Prototype	66
Storyboard	58
Wireframe	50
Benchmarking	50
Personas	42
Interviews	41
Competitive analysis	38
Information architecture	27
Cognitive ergonomics	23
Survey	22
Not informed	10
Does not adopt any technique	7
Google Analytics	1
Outsourced	1

The Game Design Document is the most commonly used technique, mentioned by 75% of respondents. This data reflects the importance of the GDD as a central guide for the team, consolidating information about the design and structure of the game.

Other widely adopted practices include playtesting (56.3%) [Rajanan and Tapani, 2018], which emphasizes the focus on validating the user experience, and the user flow map (53.9%), which helps visualize the player's journey. High-fidelity prototyping (51.6%) is also notable, indicating efforts to create detailed and functional representations of the product.

Techniques such as personas (32.8%) and interviews (32%) demonstrate initiatives to better understand the target audience, while the adoption of information architecture (21.1%) and cognitive ergonomics (18%) remains low. This points to areas that could be further explored to enhance the usability and effectiveness of games.

Despite the advances, 5.5% of participants reported that their companies do not use UX techniques, and 7.8% were unsure about their use, highlighting the need for greater awareness and training in the area.

- **Relationship between Experience and UX Techniques:** When correlating professionals' experience in UX with the techniques used, it is observed that most have practical experience, applying these techniques di-

rectly in the industry. The GDD, with its structuring role, and playtesting, essential for validating the user experience, stand out as pillars in the practice of UX in game development.

There is also a group of professionals with theoretical knowledge but no practical application, which suggests a growing interest in incorporating UX practices. This data reflects the potential for expansion for companies that are still exploring or beginning to adopt these techniques.

On the other hand, a small portion stated that they do not use or are unaware of UX techniques, reinforcing the need for training and guidance to increase the adoption of these practices and promote more user-centered development.

- **UX Tools Used:** In addition to the techniques, the tools used by companies reflect the variety of needs and preferences of developers. Table 3 presents the tools mentioned by the respondents.

Table 3. UX Tools Used by Studios.

UX Tools	N
Figma	96
Miro	72
Google Analytics	69
Wireframing	16
FireBase	16
Does not use any tools	14
Not informed	8
Invision	3
Xd	1
Canva	1
Steam Analytics	1
Trello	1
Own tools	1
Lucid Chart	1
Adobe Suite	1
Outsourced	1

Figma is the most used tool, mentioned by 43.9% of respondents, due to its collaborative design capabilities, which facilitate the creation of interfaces and prototypes in an integrated manner. Miro (38.6%) and Google Analytics (20%) are also widely used, highlighting the importance of visualization and data analysis tools.

Tools such as Wireframing and Firebase appear less frequently (9.1% each), while 8.0% of companies stated that they do not use any UX tools. This data reflects possible barriers, such as a lack of resources or knowledge about the application of structured tools.

The results demonstrate that the adoption of UX techniques and tools is a growing practice among game developers, with a focus on the GDD, playtesting, and Figma as the most used. However, gaps such as the low adoption of techniques such as cognitive ergonomics and information architecture, as well as the absence of tools in some companies, highlight opportunities for improvement.

Training and awareness remain key elements to expand the application of UX in the industry, allowing companies

of all sizes to integrate these practices more efficiently and strategically. This can lead to more user-centered experiences, increasing the competitiveness of games in the market. Thus, this study contributes to early-stage studios by providing guidance on which tools to use for game development, offering a snapshot of the Brazilian ecosystem.

4.4 Challenges

The challenges faced by the digital game development industry were analyzed based on the participants' responses regarding different difficulties encountered. The analysis highlights the main barriers faced and their relation to specific practices, such as the application of UX and game validation with users. The results are presented in two main aspects: general industry challenges and challenges related to the application of UX.

- **General Challenges in the Industry:** To assess the general challenges faced by studios, participants indicated the level of difficulty of various issues. Figure 7 presents a heat map that summarizes the responses, highlighting the main perceptions of the participants.

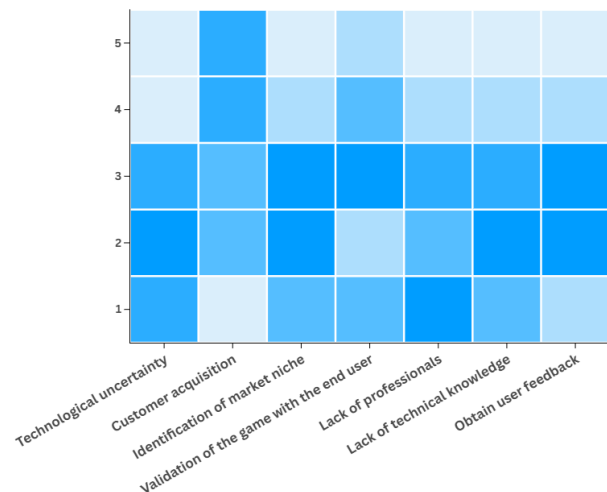


Figure 7. Level of difficulty of the challenges faced by the respondents.

- **Customer acquisition** was identified as the biggest challenge, with 58.6% (N=75) of respondents assigning a high level of difficulty (4 or 5). This highlights the complexity studios face in attracting and retaining a solid customer base, a critical aspect for the commercial success of games.
- **Technological uncertainty** was perceived as a less significant challenge, with 64.1% (N=82) of responses rating it as low difficulty (1 or 2). This suggests that, overall, companies have a satisfactory grasp of the technologies used in their processes.
- **Market niche identification and obtaining user feedback** were considered moderately difficult challenges, with 60.9% (N=78) of responses concentrated between 2 and 3. This indicates that, while not critical barriers, these issues require attention, especially in a dynamic and competitive market. To mitigate these challenges, Ataíde and Lima [2023] suggests conducting interviews,

surveys, focus groups, and other ways to gather information from end users.

- **Lack of professionals in the area and lack of technical knowledge** showed low to moderate levels of difficulty, with more than half of the participants (53.9% and 56.3%, respectively) assigning ratings of 1 or 2. These data suggest that, in general, companies are able to handle technical requirements and the availability of qualified labor well. This shortage of professionals is also noted in the de Oliveira Amélio [2018].

When correlating the participants' length of tenure with the challenges, it is observed that professionals with more than five years of experience or between one and two years at the company perceive technological and technical challenges as less impactful, indicating a consolidated level of knowledge. However, customer acquisition remains a critical challenge, regardless of experience, reflecting a strategic barrier in the industry.

- **Challenges Related to the Application of UX:** Participants also highlighted specific challenges related to the application of UX in their development processes. Among the key points mentioned are:
 1. **Game validation with end users :** Identified as one of the biggest difficulties (N=50; 39.1%), validation depends on direct access to players and effective methods for gathering representative feedback. This challenge is especially critical in games targeted at specific niches, such as health or educational games.
 2. **User feedback collection:** Although many companies implement UX practices, the difficulty in obtaining relevant information from players still represents a significant barrier (N=50; 39.1%). This limitation can directly impact the ability to adjust and improve the user experience. To mitigate this issue, the study by Da Silva *et al.* [2024] presents various actions that studios have taken to extract information from users.
 3. **Understanding the target audience:** Indicated as one of the most relevant challenges (N=34; 26.6%), the need to deepen the understanding of players' preferences and needs reinforces the importance of advanced research practices and market segmentation.
 4. **Lack of UX-specialized professionals:** This challenge reflects a structural barrier for many companies, which face difficulties in forming or hiring teams dedicated to the area (N=42; 32.8%). The lack of specialists limits the application and advancement of UX practices, impacting the final product's quality.
 5. **Practical application of UX techniques:** Some companies reported specific difficulties in implementing UX methods and tools (N=27; 21.1%), indicating that, although they have basic knowledge of the subject, the operationalization of these practices remains a significant challenge.

Despite these difficulties, some companies reported not facing significant challenges (N=12; 9.4%) or were unable to identify specific barriers (N=45; 35.1%). This may reflect variations in organizational maturity levels or the integration of UX practices across companies.

- **Relationship between Game Types and UX Challenges:** The challenges related to the application of UX also vary depending on the type of game being developed.
 - **Entertainment games** stand out as the most represented segment (N=115; 89.8%), indicating that effective UX practices are essential for creating engaging and immersive experiences. However, validation with end users and obtaining feedback remain the primary obstacles.
 - **Niche games** (such as educational games or advergames) present additional challenges, as they require a deep understanding of the specific needs of the target audience and a careful adaptation of UX practices to meet educational or advertising goals (N=31; 24.2%).
 - **Scarcity of specialized professionals and low level of UX knowledge** are recurring barriers in these segments, limiting companies' ability to adapt their practices to meet the specific demands of each type of game.

The analysis reveals that while technological and operational challenges are perceived as less critical by experienced teams, strategic issues, such as customer acquisition and game validation with end users, remain significant barriers. The need to better understand the target audience and collect relevant feedback reinforces the importance of advanced UX practices in the sector, in line with the study by Zamri and Tan [2022].

The results of this work differ from those presented by Giri and Stolterman [2022]. In that study, the authors conducted interviews with industry professionals, highlighting concerns related to studio operations, game development processes, player research, and academic advancements in game design.

Although there is a wealth of international research on UX in games [Brown, 2008; Takatalo *et al.*, 2011; Engl and Nacke, 2013; Alexiou and Schippers, 2018; Yu *et al.*, 2018; Keebler *et al.*, 2020; Packer *et al.*, 2021; Pichlmair and Johansen, 2021], this study provides a specific perspective from Brazil, highlighting unique barriers and challenges faced by Brazilian studios, such as a lack of funding [Fortim, 2022], administrative and regulatory barriers [de Oliveira Amélio, 2018], and a shortage of specialized professionals.

The lack of specialized professionals and the challenges in the practical application of UX remain significant obstacles, especially for companies developing games targeted at specific niches. To overcome these barriers, it is essential to invest in team training, implement effective validation methods, and expand access to representative players.

4.5 Comparison With Previous Work

In order to further deepen the results of this study, the findings of other works investigating the digital game industry in Brazil

were analyzed. To this end, the main studies examined were those by Xavier *et al.* [2023] (R1) and Da Silva *et al.* [2026b] (R2).

First, in study R1, twelve aspects related to the Brazilian game industry were identified, namely: Target audience; Financial sustainability; Market opportunity; Networking; Production cost; Professional qualification; Project execution; Public policies; Sector growth; Team formation; Technological resources; and Working conditions. Each of these aspects is discussed below.

1. **Target Audience:** In study R1, this aspect is related to consumer attraction strategies and marketing practices. This finding is corroborated by the results of the present study, which identify customer acquisition as the main challenge faced by Brazilian studios. Furthermore, this work deepens the discussion by demonstrating that the difficulty is not limited to marketing actions, but is also associated with a limited understanding of user needs, resulting from the insufficient use of UX techniques, such as personas and surveys.
2. **Financial Sustainability:** In R1, this aspect is defined as the balance between costs and revenues, as well as the sustainability of studios. This perspective is corroborated by the results of our study, which indicate financial constraints as a determining factor for low UX maturity. It is observed that small studios often lack the resources to hire specialized professionals dedicated to this role, which consequently has a negative impact on the overall quality of the games developed.
3. **Market Opportunity:** R1 addresses business conditions and internationalization processes. In line with this, the results of the present study indicate that the games developed primarily target the North American and European markets. With regard to market opportunities, this work adds the nuance of “niche games,” which require even more specific UX approaches and represent a distinct opportunity compared to other game segments.
4. **Networking:** While R1 emphasizes the relationships among different stakeholders with a focus on business opportunities, the present study highlights the use of networks primarily for learning and recruitment purposes, given that the survey was disseminated through association groups on the Discord platform. However, the results suggest that knowledge exchange related to UX practices still occurs predominantly in an informal manner.
5. **Production Cost:** R1 interprets this aspect as the measurement of resources. In the present study, this issue is examined through the studios’ day-to-day practices, as production costs impose limitations on the use of tools, highlighting the predominance of free solutions. These costs are partially mitigated through the adoption of low-cost techniques, such as paper prototyping, as well as the use of free tools.
6. **Professional Qualification:** This aspect shows equivalence in both studies. In R1, the lack of formal knowledge is identified as a relevant challenge. Complementarily, the results of the present study indicate that nearly

half of the companies do not have specialized UX professionals nor offer training programs in this area. Although there is observable interest in the topic, this interest has not yet been translated into practice, due to the scarcity of experienced professionals available in the market.

7. **Project Execution:** In R1, this aspect is described in a generic manner, encompassing production processes and quality. In contrast, the present study deepens this theme by revealing that a significant proportion of studios carry out design activities and use the GDD in their development processes.
8. **Public Policies:** Study R1 emphasizes the role of government and bureaucracy. In the present study, this aspect was not explored in depth, being mentioned only in a contextual manner when referring to regulatory and administrative barriers. Thus, the analysis focused predominantly on internal studio practices rather than on external factors.
9. **Sector Growth:** The authors of R1 analyze the sector’s infrastructure and representativeness. The results of the present study corroborate the expansion of the digital game development field, while also highlighting the predominance of small-sized companies.
10. **Team Formation:** R1 highlights the multidisciplinary perspective in game development. In contrast, the present study reveals the accumulation of roles in small studios, where developers themselves are often responsible for applying UX concepts due to the absence of dedicated teams. Furthermore, the results indicate a high turnover of professionals, with a significant proportion having worked in the field for less than one year.
11. **Technological Resources:** In R1, the authors identify this aspect as being related to access to equipment and technologies. In the present study, this dimension is explored through the identification of the predominant tools in the development process, mapping those effectively used by studios and highlighting that tools aimed at data collection and validation are the least frequently mentioned.
12. **Working Conditions:** R1 addresses the work environment and individual factors. In contrast, the results of the present study indicate remote work as the predominant standard in the industry, and also establish a direct correlation whereby the longer a professional remains at a company, the higher the maturity of the adopted UX practices.

This work differs from R1 in that, while the authors adopt a broad and structural perspective of the Brazilian ecosystem, our study focuses on investigating the challenges encountered when applying UX practices throughout the game development process, thereby complementing the findings of R1.

On the other hand, R2 study maps the state of the art of UX use in digital games from an academic perspective, revealing a significant divergence in methodological priorities compared to studio practices. While current research demonstrates that the industry focuses heavily on continuous documentation, the academic research analyzed in R2 prioritizes techniques geared towards rigorous scientific validation. The academic focus falls primarily on playtesting and surveys that use stan-

standardized instruments to evaluate the user, paying less attention to documenting the design process itself.

These differences extend both to the stage of the lifecycle in which the techniques are applied and to the main obstacles faced. The industry reports that UX is proactively incorporated early in the game development stages. In contrast, the literature reviewed by R2 shows that academia focuses on the application of UX in the final stages of development, using the techniques predominantly to validate a product that is already nearly complete. Furthermore, the central challenges identified also differ: while the greatest practical difficulty for Brazilian studios is customer acquisition, the biggest bottleneck reported in academic research is validation with players, specifically the operational difficulty of recruiting the appropriate target audience to conduct the tests.

Finally, the comparison highlights a disconnect from the use of agile methodologies, specifically the concept of MVP. Although current research confirms that game industry professionals are already actively applying MVP concepts as a practical artifact in development, the R2 study points out that this term is rarely explicitly mentioned in academic publications. This absence suggests that academia still lacks the theoretical maturity to formally investigate and document how the MVP acts as a strategic UX tool in the digital game lifecycle.

5 Threats to Validity

The threats to the validity of this study were analyzed and classified according to the definitions proposed by Coughlan *et al.* [2009]. Below, we present the main threats identified and the strategies adopted to mitigate them:

Internal Validity: A threat to internal validity is related to the self-selection of participants, as the sample consisted of professionals who voluntarily chose to respond to the questionnaire. This factor may have introduced a response bias, with greater participation from individuals who are more engaged or familiar with the topic. To mitigate this risk, the questionnaire was widely distributed through various channels, including game developer communities, social media, and industry events, with the aim of reaching a more diverse and representative sample. Another potential threat was the interpretation of the questionnaire's questions, which could vary among participants depending on their levels of knowledge or professional context. To minimize this risk, a pilot of the questionnaire was conducted with a group of professionals with experience. This process allowed for adjustments to ensure the clarity and appropriateness of the questions before the final application.

External Validity: The generalization of the results constitutes a threat to external validity, as the study focused on Brazilian studios. This may limit the applicability of the conclusions to other international contexts, where cultural, economic, and organizational factors may differ significantly. Also within the Brazilian context, there is a limitation related to the concentration of respondents, who are predominantly from only two regions of the country. To address this issue, the results were presented with an emphasis on the Brazilian context, highlighting the need to replicate the study in

other countries to validate and expand the generalization of the findings. Another threat was the predominance of small companies among the respondents, which could skew the conclusions regarding the practices adopted by large studios or multinational corporations. To mitigate this bias, the analyses were segmented according to company size, allowing for more detailed interpretations aligned with the specific characteristics of each group.

Limitations: The limitations identified in this work involve possible variations in the interpretation of concepts by participants, influenced by their experiences and backgrounds. To mitigate this risk, the questionnaire included clear and objective definitions for the key concepts. Furthermore, the researchers provided a contact channel for clarifications during the completion process, ensuring greater consistency in the responses. Another potential threat was the limitation of the response categories, which might not encompass the full range of practices or challenges mentioned by the participants. To mitigate this limitation, open-ended response options were included, allowing respondents to share additional information or aspects not covered by the predefined categories, enriching the quality of the collected data. Finally, regarding data analysis, it is important to highlight that the results obtained in research surveys identify associations between variables, but it is not possible to establish causal relationships. To mitigate this problem, we used a pilot strategy, which allowed, through experts, the careful definition of the questionnaire items.

6 Conclusions

This exploratory study investigated the application of UX practices in the development of digital games, analyzing the challenges faced by companies of different sizes and niches, as well as the perceptions of professionals. The results confirm that UX is widely recognized as an essential element for the success of digital games, but its implementation still faces significant barriers that vary according to organizational context and available resources.

Among the main challenges identified are: validation with end users, collecting representative information about players, and the scarcity of professionals specialized in UX. Small studios face difficulties related to limited resources and tools, while large studios, although having greater infrastructure, encounter strategic challenges, such as customer acquisition and retention. Additionally, studios focused on niche games, such as educational and health games, require highly personalized UX approaches, increasing the complexity of development.

The findings of this study highlight the need for investments in team training, hiring UX specialists, and strengthening processes that promote the active participation of end users. These actions are crucial to consolidating UX as a common and strategic practice in the digital games industry.

6.1 Implications for Research and Practice

The results of this study have relevant implications for both researchers and professionals in the digital game development industry. For **researchers**, the findings reinforce the

need for more in-depth empirical investigations into the integration of UX in the different stages of game development. Although the results indicate a concentration of UX practices in the design and prototyping phases, a limited application of these practices is observed in the initial stages. This study highlights opportunities for exploring the impacts of incorporating UX on MVP quality, reducing rework, and aligning the product with player expectations. Furthermore, the identified mismatch between the value placed on UX and the low availability of formal training and specialized professionals provides support for proposing UX maturity models adapted to the reality of game studios, especially in emerging contexts such as Brazil.

The results also provide an empirical basis for the development and validation of UX-oriented frameworks, methods, and artifacts, such as the evolution of GDD to include systematic elements of user experience. The widespread adoption of GDD observed in this study indicates its potential as an integration point between technical and creative decisions using UX.

On the other hand, in the **professional sphere**, the findings provide practical guidance for studios of different sizes. The evidence that UX practices are most frequently applied in design, prototyping, and playtesting suggests that these stages should be prioritized as strategic points of intervention, especially in resource-limited scenarios. For small studios, the results indicate that adopting low-cost techniques, such as prototyping, user testing, and flow mapping, can generate significant gains in experience quality, even in the absence of dedicated specialists.

The widely shared perception that UX positively impacts sales and market perception of the game provides empirical support for managerial decisions related to UX investment. Managers and team leaders can use this data to justify allocating resources to training, hiring specialized professionals, or adopting appropriate tools, reinforcing the strategic role of UX as a competitive differentiator. Therefore, the practical implications of this study contribute to more informed decision-making aligned with market demands, promoting the development of more user-centered digital games with greater potential for commercial success.

6.2 Directions for Future Work

Based on the results of this study, several future directions are proposed:

1. **Longitudinal Study:** Perform temporal analyses to monitor the evolution of UX practices adoption, investigating how market changes, technologies, and organizational maturity affect their implementation.
2. **Specific Tools:** Develop and validate tools aimed at user validation and feedback collection, especially adapted for small studios with limited resources.
3. **Training and Education:** Propose specialized training programs for professionals, integrating UX practices with the specific realities of different types of games and studios.
4. **Impact Study:** Investigate the direct impact of UX practices on business performance, player retention, and market perception, providing quantitative evidence that reinforces their strategic relevance.
5. **International Study:** Expand the research to international contexts, comparing how cultural, economic, and technological factors influence the adoption and challenges related to UX.
6. **Niche Exploration:** Focus on niche games, such as those aimed at health, education, or corporate training, analyzing how UX practices can be adjusted to meet the specific needs of these markets.

This study contributes to the understanding of UX practices in the digital gaming industry, highlighting challenges and opportunities for their implementation. The recommendations presented aim to support companies and professionals in adopting more effective and strategic practices, promoting the development of user-centered gaming experiences. By addressing the identified barriers and exploring new directions, this work hopes to inspire future advancements that strengthen UX as an essential and integrated competency in the gaming industry.

Declarations

Authors' Contributions

Felippe Fernandes da Silva: Conceptualization, Methodology, Investigation, Analysis, Writing - Original Draft. Mariana Santos de Jesus Alexandre: Analysis, Visualization. Guilherme Guerino: Supervision, Writing - Review Editing. Gislaine Camila Leal: Supervision, Project administration, Writing - Review Editing. Renato Balancieri: Supervision, Project administration, Writing - Review Editing.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

The authors confirm that the data supporting the findings of this study are available within the article.

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