ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

Consistency of Cross-Platform Game Experiences and user Satisfaction

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Abstract:- Cross-platform support is considered an important aspect of the development of multi-platform video games. This research aims to determine the effect of the consistency of multi-platform game experiences on users' perceived experiences in terms of player satisfaction. Using conjoint analysis, we collect gamers' multi-criteria evaluation ratings to proceed with this research. Our results show that game experience consistency has a greater impact on players' purchasing intentions compared to the price of a game. We propose that the dramatic impact of consistency on player satisfaction demonstrates the importance of game experience quality more generally. Our research contributes to the literature about video games and psychology and offers insights that can aid game developers in making better decisions concerning multi-platform video game development and enable developers to provide better game experiences to their target gamers.

Keywords:- *Cross-Platform Gaming, Gaming Industry Insights, Game Experience Consistency, Platform Compatibility, Expectancy-Disconfirmation Model.*

I. INTRODUCTION

As entertainment becomes digital, the performance of content creators in delivering their product becomes increasingly linked to technological foundations. This paper focuses on the special case of one particular content type, the consumer market for interactive games. We argue that games are unique due to the experiences they produce along the path traversing two distinct worlds. On the one hand, games are software applications that execute on platforms with producers, creators, marketers, and hardware manufacturers. Games occupy particular places in supply chains and value chains, with relationships between game developers and platform providers playing key roles in the sale and distribution of these experiences. On the other hand, the content type created by combining narratives, mechanics, aesthetics, and plotlines is unique. Games deliver player experiences that often combine visual, sound, and emotional immersion, teaching culture through graphics, sound, and music, and leave players telling stories about experiences they had in their virtual gaming lives. These unique types of experiences can bind us together socially and through shared values, emotions, and communication. Our belief is that this combination of technology and experience enables interactive games to unlock profound user experiences.

While the qualitative value of games might be unique, several macroeconomic indicators of performance demonstrate the growing importance of the industry. Humorously, no longer are gamers portrayed as teenage males working out of their parents' basement. Now the average age of a gamer is over thirty-four, and women over eighteen fill forty percent of those ranks, playing on devices ranging beyond computers and game consoles to phones, tablets, and phablets. In 2017, the industry transcended movies and sports as entertainment revenue from internet games alone surpassed those sporting industries. Nowadays, it is common to see actors from traditional media, popular brands, and endorsements crossing into the gaming space to reach a wider audience and demographic. We witness a more mature phase as a combination of technological feasibility and commoditized markets has driven an explosion of game content, competition, and developers. Yet, amid this proliferation of game content, debates rage over whether game experiences are now too homogeneous across platforms offered as gaming technology has consolidated and converged in favor of standardized hardware.

Table 1: Here is a Proposed Table Summarizing the Macroeconomic Indicators of Gaming based on General Trends

Indicator	Details
Industry Growth Rate	Gaming industry surpassed movies and sports combined in revenue as of 2017, continuing significant growth.
Average Gamer Demographics	Average gamer age: 34 years; 40% of gamers are women over 18 years old.
Revenue Statistics	Internet gaming alone generates higher revenue than traditional sports industries.
Platform Diversity	Gamers use a variety of platforms, including PCs, consoles, tablets, and smartphones.
Cross-Media Integration	Increasing collaboration with actors, brands, and endorsements from traditional media into gaming.

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A. Background and Rationale

Consoles and PC have been the two main platforms for video gaming since the earliest days of the industry. Consoles, with dedicated hardware configurations, simplified setup and ease of use, have been very effective. In fact, game console penetration has long been higher than PC gaming, and console games have generally demonstrated strong rental markets. The low cost of game programming has meant that there are hundreds or thousands of games on every platform; as a result, game rental has provided opportunities for players to try many games to find those most pleasing to them, and rental has increased the popularity of gaming. The variety of games available has continued to sustain the popularity and profitability of game consoles. PC games, on the other hand, usually have considerably higher production values than console games. As a result, they usually receive more attention from the media. They also tend to have longer shelf lives and higher user satisfaction scores, but sell in lower volume.

B. Research Objectives

Over the years, as game hardware managed to improve each and every day, game software underwent a transformation process to the extent of becoming refined. At this stage, games, which continue to be a part of every age, are also strengthened by the hybrid paradigm and access options. By this time, being able to get a complete play and access in different environments has become a main requirement for video games. Here, in this study, for cross-platform mobile games, the aims are to set out the users' levels of experience depending on the platform, player feedback in terms of causing loss, control dimensions, and the consequences of these dimensions on satisfaction, platform loyalty, and specific criteria, and to establish the diverse effects of factors involved in this ecosystem.

The objectives of our study can be summarized as follows: Determination of the platform participants use and are most pleased with, thus establishing the equitableness of the consistency of cross-platform games. Control Dimension: What control dimensions like graphics, gameplay controls, timing, and spillover contribute toward user loss. To determine the relationship between platform and experience and what effects experience has on satisfaction. To present the role of game control elements in causing loss and controlling some of the dissatisfaction. To explore the impact of dissatisfaction and control on platform loyalty, and what role exactly control dissatisfaction and general dissatisfaction play in these two.

C. Structure of the Article

The structure of the article is as follows. In the following, we will explain the motivations for considering cross-platform games from the perspectives of game vendors and users. Following the motivations, we outline the dynamics of the game vendor’s considerations during conversions from PC to console platforms and vice versa, and discuss the factors that moderate the consistency of cross-platform game experiences and, in turn, user satisfaction. Thereafter, we discuss how cross-platform games moderate the impact of network externalities and provide another rationale for why game vendors put effort into converting single-platform games to viable cross-platform ones. Before we summarize, we discuss three challenges game vendors may face when applying advanced AI techniques for developing cross-platform games.

We are motivated by the observation that many game vendors are willing to convert single-platform games to viable cross-platform ones. Furthermore, if or once cross-platform games win significant market share, game vendors may put less effort into creating games on other platforms separately. Then, as end-users and developers, we might be interested in investigating factors that moderate the consistency of cross-platform game experiences and, in turn, user satisfaction, and the effects of consistent game experiences on consumers and firms in the context of cross-platform game markets. To provide some insights, this article addresses strategic interactions between game consumers’ platform choices and utilities from game qualities in a two-sided market.

II. THEORETICAL FRAMEWORK

Despite the consumer intertwining of diverse media platforms, no consensus has emerged regarding the significance of video game user experience and how well-maintained cross-platform uniformity among game versions can contribute to gamers' user satisfaction. From the angle of the user experience of gamers, we built and tested a theoretical framework of the influence mechanism of high-quality cross-platform game experience on user satisfaction. The results provide valuable insights for developers to create a unified experience within the constraints posed by cross-platform display hardware and system software. The results also offer different implications for researchers and the gaming industry, as meeting the increasing need for cross-platform experience unity brings considerable challenges and market opportunities to platform managers in the video gaming industry.

This research explores the influence mechanism of cross-platform game experience consistency on user satisfaction, from the perspective of user behavior in the non-functional attributes and the manifestation of user experience, by building a Cross-Platform Game Experience Consistency-User Satisfaction Model and verifying the model. This research applies expectancy disconfirmation, disconfirmation, and emotional congruence as theoretical bases to study the effect of cross-platform game experience consistency on user satisfaction. This concept refers to users' cognitive disconfirmation and users' affective emotional congruence, which also generates user satisfaction. Our study contributes to academic literature and managerial practices by suggesting theoretical bases to explain the influence mechanism of cross-platform game experience consistency on user satisfaction.

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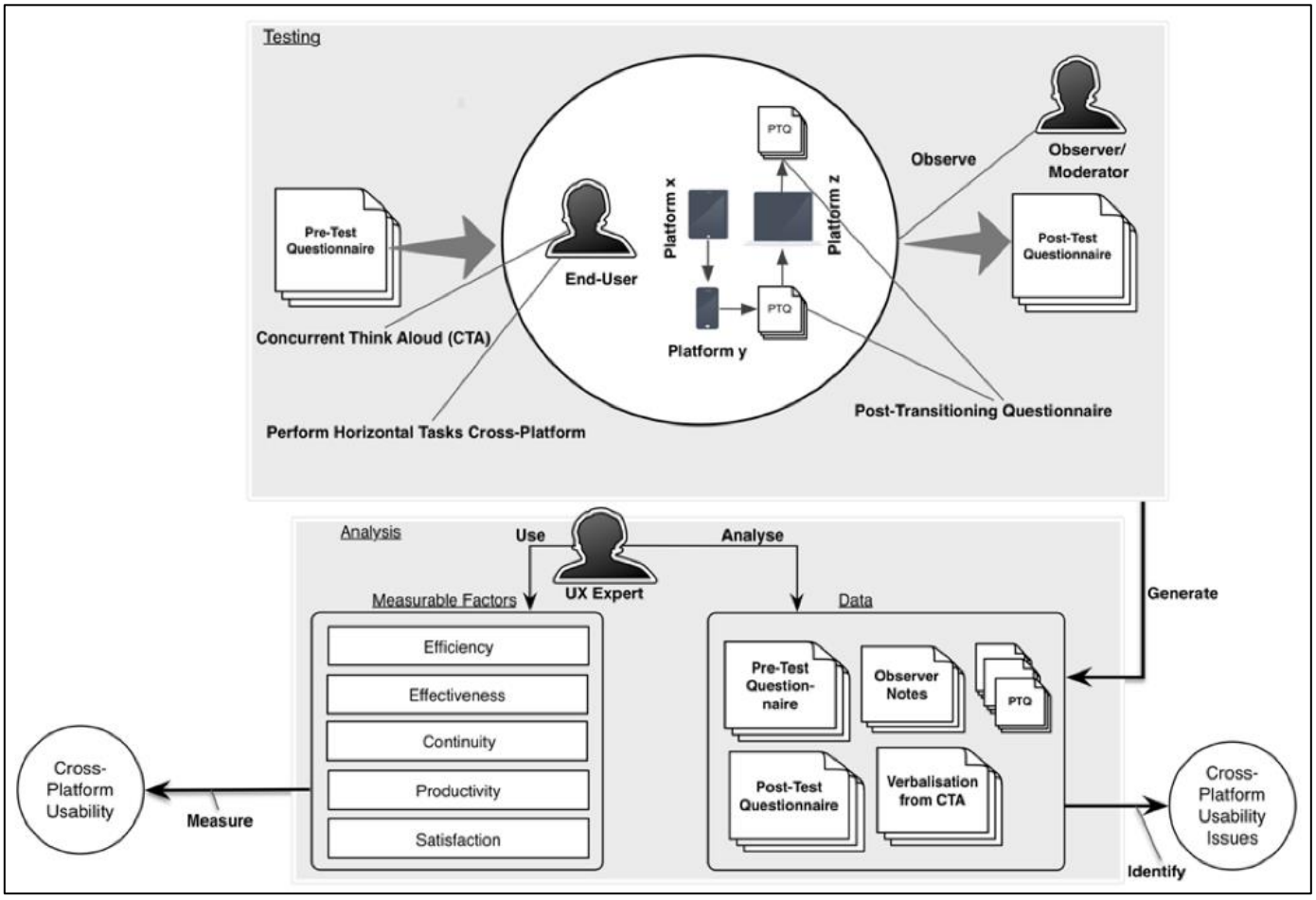

Fig 1: Cross-Platform Usability Model Evaluation

A. Definition of Cross-Platform Gaming

There is no clear and sophisticated definition of cross-platform game experience yet, whereas the cross-platform game is well explained. So far, to define the cross-platform game experience, we adopt both "cross-platform" from a computer science perspective and the characteristics of adventurous video games. As for the cross-platform concept, it indicates the capability of a system to run application programs of different vendors' user interface technology in a heterogeneous environment. For example, smartphones using different operating systems and software platforms can run the same game applications in the current environment just by translating from one platform to another. However, the operating systems of devices can significantly influence the user experience of gameplay. Moreover, the perspective of cross-platform refers to the deployments of software of information systems across a number of platforms such as computer and mobile, or different IP communication channels for streaming, broadcast, download or peer-to-peer connections.

The majority of cross-platform video games designed with the capability to be played on multiple gaming platforms make them "experientially multi-situated." In other words, they allow users to participate in the same gaming content and gaming system across different gaming platforms. With specific characteristics of cross-platform video games, we define cross-platform game experience as the gameplay could occur across different gaming platforms in different technological and contextual situations, allowing the players to have the freedom to use as well as to experience the same protean gaming content and hardware system. The cross-platform game experience has been inspired and accepted since the advancement of computer, software, and network technologies.

B. Importance of Consistency in Game Experiences

Consistency in game experiences refers to players' experience patterns remaining stable when their gaming content or platforms change. For dedicated gaming platforms, such as host computers and TV video game consoles, dedicated game content is the majority of gaming content used, with the game environment fixed during the gaming process. Consistency in game experiences is not difficult to achieve. In recent years, the concept of cross-platform gaming has gained popularity. With the combination of specialized desktop game experiences and flexible mobile game experiences, users make more and more reasonable demands for different gaming content and platforms. These dedicated gaming contents have become the minority for using a simple game shell to transplant games to various dedicated gaming platforms. Therefore, how to ensure that diversified gaming content ensures consistent user experiences for different platform games is a key point to consider. Researchers believe that consistency in game experiences would thus significantly affect the acceptability of cross-platform gaming.

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For some games with specific themes, such as MMORPGs or MOBAs, game operators launch new games or add game content to new platforms for different target customer groups. There have been rich cross-platform game customer communities. Allowing two gamers, who may play the game on different platforms, to play against or work with each other is an important method for game operators to enhance the competitive benefits of the gaming content provided. Therefore, ensuring consistency in the game experience has been seen as crucial.

C. User Satisfaction in Gaming

In recent years, the consistency of game experiences has been clearer with the development of multi-platform games. Gamers have become accustomed to experiencing games on multiple platforms. From a user experience perspective, the consistency of a game is important and plays a deciding role in their satisfaction with the game. Especially in cloud gaming, the same game content and the same frame rate can be provided by different cloud gaming platforms with varying network latency. However, the satisfaction levels of users differ for game experiences played on different platforms. Users would thus face significant challenges in predicting their satisfaction levels when playing games on different platforms, especially when they have never played the games before.

Game development companies need to choose the game platforms that will maximize the satisfaction levels of users. Will real demographic characteristic differences in terms of consistency exist in different gameplay experiences for the same game across different hardware provision methods?

III. LITERATURE REVIEW

This section undertakes a comprehensive review of literature relating to the consistency of cross-platform game experiences and user satisfaction.

A. Evolution of Cross-Platform Gaming

Cross-platform games can be summarized in three generations: browser-based games, console-web connection games, and independent multi-platform games. The period from 1999 to 2008 is the first generation of cross-platform games, which are browser games. This was also a time when online games became increasingly popular. Browser games are not restricted by time, location, or other issues. Players can play the game using applications without having to download or install programs. At that time, browser gaming technology stimulated the game industry to reduce copyright content and develop a large number of free games.

In the second generation, browsers became internet game consoles, which had limited functions for gameplay and exchange. Players could use money spent in the online game store to buy physical games and check game information or participate in game trading through the website. In this era, players could clearly understand the behavior data of their friends or enemies in games and real life. This transparency also became a bridge connecting the virtual community with the real economy, and the performance of game space nourished each other.

It also made the cross-platform financial model rich and diverse, and many game contents became the main aspect of implementation. With gaming systems starting to experiment in the cross-period, game hardware was separated from the platform. Thus, during the second-generation cross-platform game convergence period, some third parties launched a shell browser that could be embedded in the game to facilitate the acquisition and use of internet-related service functions across various game platforms. At that time, cross-platform gaming was already a tacit understanding between players and the development team, rather than a value selling point. Independent multi-platform games represent the third generation of cross-platform games, and these games can run on different operating systems, such as Windows, Mac, and Linux. At the beginning of online gaming, the most significant value in the development of cross-platform games was the ability to abandon artificially set boundaries. After that, game developers built a financial model suitable for the time. However, these boundaries have never really disappeared and are often more rigid than before. The definition of cross-platform games provides a theoretical basis for the theme of this study and will later be applied in the game sales channel to examine the degree of game channel configuration and the differences in evolution.

B. Studies on Consistency in Game Experiences

The effect of cross-platform game development and operation is very diverse, as players' choices of devices to play and compete may vary. Studies found potential game design best practices in this perspective, including the similarity of player experiences on different platforms. However, notable differences in the game experience among different groups were also reported. Given the advancements in technologies and their associated efforts in transitioning the most popular games onto multiple platforms, we are interested in the consistency of player game experiences and their association with satisfaction. This study explores the impacts of device-related consistency on user satisfaction, as well as the moderate relationships between consistency-related variables and several centrality dimensions.

A consistent game experience across devices has been proposed as a general rule of thumb for cross-platform game development. Prior work established so-called cross-platform game design best practices to offer mobile players an experience that aligns with console players' expectations of traditional favorites. These best practices include ensuring the game is the same on all platforms, allowing players to face the same challenges, and providing the same functional capabilities. Moreover, the suggested similarity in this context, such as features and mechanisms, may extend into storylines and controls for consistency of interaction between players. Consistency at the event level may influence players' connection with the game through universal experiences and shared storytelling among multi-device groups. We argue that game developers who encourage cross-platform activities, such as using a single gaming account, friends list, entry into

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

the gaming environment, and leaderboards, can maintain similarity and thus create consistent game experiences.

C. User Satisfaction Metrics in Gaming

User satisfaction metrics in gaming form a new area of research. The metrics have been categorized into an internal and an external category. For the internal category, real-time in-game feedback from game clients would be the most recent available source for developers to understand how, when, and why players respond with enjoyment. It has been proposed to explore three core game-playing enjoyment factors: skill, flow, and playfulness, to develop an automatic enjoyment evaluation method to provide real-time in-game enjoyment feedback to help the real-time anti-cheat mechanism in casual games distinguish between normal users and cheaters. "We can integrate the approach that effectively captures the emotional context of player-experienced emotions derived from amusement while the player plays the casual game and offer the progress through three representative metrics: amusement problem, affective gamer satisfaction, and amusing behavior." Furthermore, other researchers proposed taking advantage of user data unexpectedly generated from the daily use of console games to improve their experience. Their prototype platform, which depends on local crowd contributions, will provide at least 20 game enjoyment mechanisms rooted in player preferences and affect metrics. The service will be available during the players' gameplay.

The external category of user satisfaction metrics proposed in gaming research has been mainly modeled on traditional consumer market research using questionnaires as a service that provides different product distribution channels to achieve different gaming research levels. Some service creators hope that retail product sellers take advantage of the service to attract game players, and in return, the service creators can get visitor conversion revenues. For example, it has been promised to visit visitors when evaluating consoles before purchasing the latest game; they bargain at the retail store for a discount because retail store customers are also eligible for cashback rewards by visiting business partners. On the outdoor platform, after the visitor monetizes through the casino game API, the visitor conversion revenue has increased from 40% to 50%. In another example, an exclusive analysis of gaming integrity was performed. They analyzed the game for a month and provided feedback reports and ideas about players' first-date expectations and claimed that they knew gamers' personal policy.

IV. METHODOLOGY

To fully analyze the user satisfaction with the consistency of cross-platform game experiences, we designed a user study based on the following steps: 1) a survey to collect rich, detailed information about the players' game experiences, especially the detailed comparison of the cross-platform game experiences; 2) a quantitative survey for the psychological experience indicators; 3) an interview to collect the attitudes, opinions, skills, or knowledge from the players; 4) a tutorial with the linked play experience, which aimed to collect samples of cross-link experience types; 5) a statistical and qualitative data analysis that aims to explore the relationships, differences, trends, and/or interactions between the different cross-platform game experiences and the user satisfaction with them, and draw apparent conclusions from this designed user study. In the user studies, 56 students from different schools were recruited.

This study is designed based on the user study technique, which aims to explore real-world problems and extract deep meaning by conducting a user study with a dedicated approach. The dialogue between the participants and game designers is emphasized to fully understand the users' experiences, especially cross-platform meaningful experiences. The rich, detailed answers and empirical data are collected from the participants with unbiased structured and unobtrusive tests. To analyze the collected answers and data, the statistics and qualitative data analysis were attempted, which combine structured and unobtrusive applicable data analysis methods. Finally, the apparent conclusions are drawn from the designed user study. The linked play is implemented as a cross-platform design case, which was designed to evaluate the extended experiences with new game design opportunities provided by more comprehensive and complicated cross-platform games, but the results and their analysis can also be extended to other user experiences like educational experiences.

A. Research Design and Approach

With the advent of digitalization, almost every industry has been affected with various consequences, and the gaming industry is no exception. The computer gaming industry has undergone considerable expansion. Many game developers are now creating digital games on various platforms, including PC, television, smartphones, and tablets. This highlights the importance of seamless quality in the gaming experience—providing game players with compelling and engaging experiences that unite gameplay across platforms. Cross-platform gaming enables players on different platforms to play together without experiencing platform dependencies. Players on different platforms can now potentially enjoy the same gaming experience by playing together cross-platform.

Game development is a multifaceted process, and cross-platform design is increasingly noteworthy as different platforms currently used for playing games require a consistent game design to avoid impacting the gaming experience on different devices, thereby reducing the gamer experience in terms of engagement. One of the most challenging aspects of developing games for all platforms is creating a positive and unified experience across all targeted platforms. The development of games now has to consider diverse platforms, and developers' objective is to allow all gamers an opportunity to experience the game meaningfully. However, differences between various platforms may limit accessibility and decrease the gaming experience. For instance, developers may build enhanced graphics and capabilities into games for certain platforms, and the games may not display or operate correctly on all devices.

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B. Data Collection Methods

The proposed study will utilize a quasi-experimental research design. During the development process, quantitative data will be collected through in-game telemetry, gameplay observation logs, questionnaires, interviews, and focus groups. The primary objective is to reveal the characteristics of the cross-platform entertainment gaming experience aesthetic. The current research proposal concerns the aesthetic experiences of entertainment games delivered on different platforms. This study focuses on the cognitive-affective experiences from a user-centered perspective. Specifically, data is collected concerning the extent to which the cross-platform gaming experience is consistent. Further, by comparing the extent of consistency with the overall gaming experience, potential differences in terms of these cognitive-affective constructs are qualitatively explored. Finally, with regard to the use of game platforms, a key feature is the domain in which the platform will be implemented.

User experience in actual gaming scenarios may be affected significantly by the platforms through which game content is delivered. This is of particular concern when games are developed for learning purposes or serious purposes, yet it must also be considered when addressing the reasons for why consumers purchase, play, and use games within various genres. Furthermore, a platform's inherent characteristics, such as display type, cognitive complexity, and fine detection, may have effects on the player's entertainment experience. Additionally, the user's learning motivations and intention to engage in gaming are influenced by opportunities to consume. This first type of limitation addressed the fact that while multi-platform product offerings could successfully reduce the risk game developers face with trying to apply the appeal of a game across target market segments and revenue potential, no research has yet explored gaming experience consistency across platforms or within game content categories. The proposed study, thus, seeks to offer recommendations and empirical evidence to fill this void.

C. Data Analysis Techniques

To accomplish the research objectives and have a better understanding of these, several methods of data analysis were adopted. This section provides a discussion on the data analysis techniques that would be used.

Descriptive Analysis Descriptive statistics is a methodology of data analysis that helps to describe, summarize, and present the data in a meaningful and understandable manner. Generally, descriptive statistics provide the basic measurements regarding the specific characteristics of the research sample. Descriptive statistics, which consist of tables, figures, and frequency distributions, are employed before employing inferential statistics. Specifically, this descriptive statistic provides useful information about the basic socio-demographic data of the research sample, which are related to their gaming experience. The involvement of descriptive statistics in this research is not undiscerning but adapted to the specific requirements of the reduced objectives.

V. FINDINGS AND DISCUSSION

The cross-platform environment has not been able to provide complete interoperability that would create a consistent experience. Technical inconsistencies when functioning in the cross-platform gaming network, specifically in relation to the preservation of the product's quality, have an impact. Just one aspect of the perceived lack of consistent quality is that most of the respondents would use specific platforms for the titles available on them, and not just based on convenience. Consistency itself is manifested in the need, by most respondents, to use the same platform for each particular game to maintain the same look, the same performance standard in terms of graphics, and the performance of the game. The discrepancy between the expectations of the gaming community and the current capabilities provided by game manufacturers could be associated with the tough competition and rapidly changing game developer economy. These trends require the developers to focus their attention on the creation of high-quality games and strive to meet the expectations of particular users.

Technical quality inconsistencies are associated with those external conditions that the producer cannot directly control. However, this inconsistency singlehandedly creates negative experiences for the user. At the individual level, it creates user frustration and reduces satisfaction with both the gaming experience and the platform. A reduced user satisfaction level, in turn, can determine customer purchase decisions and stronger loyalty to the specific brand. At the macro level, reduction in satisfaction might be passed on in bad word-of-mouth, which reduces the willingness to buy from recommendations. Moreover, not peaking potential of all available platforms to support the user experience might result in reduced sales, and the gaming industry, being very dynamic, might not survive well such that a commitment of the gaming community to platforms will weaken and alternatives will emerge. For this particular study, the quality inconsistencies were captured while using objective data; however, in the future, it would be beneficial if, in determining the concept, to supplement this research with subjective data to better understand the perceived quality inconsistencies, and thus try to outline systematic strategies to alleviate the effects of such inconsistency. The problem has both management and policy implications, and the study also enriched the scientific quest to understand the consumer in terms of collective gaming in the specific, and in terms of user satisfaction in general.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

Table 2: Comparison Table of Platform Capabilities and User Satisfaction

Platform	Graphics Quality	Control Precision	Portability	User Satisfaction
Mobile	Low	Touch-based, Limited	High	Moderate
Console	High	Controller, Moderate	Low	High
PC	Very High	Keyboard & Mouse, High	Moderate	Very High

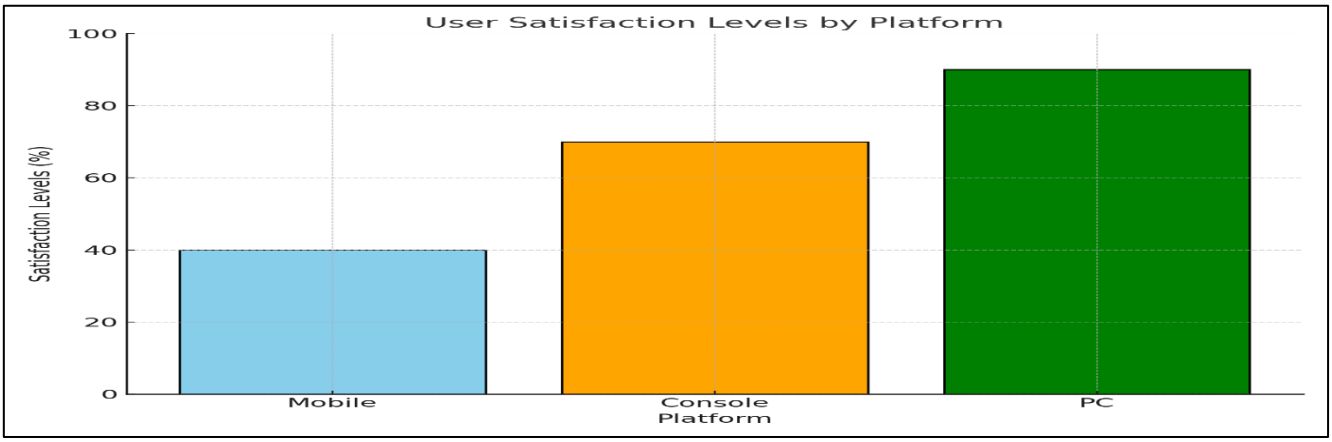
A. Consistency of Game Experiences Across Platforms

Cross-platform consistency is about ensuring that all current and future players of a cross-platform game, regardless of the device they use, can share the same core experience while still benefiting from what each device platform brings. In other words, the consistency should be as if the game world is shared among all players while still powered by devices that have different capabilities. This notion is best exemplified by discussing two devices with completely different form factors: a console device and a smartphone. While console gaming is associated with gaming controllers and high-quality graphics, two key factors that shape the gaming experience, a smartphone usually performs touch-screen gaming and can render graphics whose quality is not as good as those shown on televisions. The two devices can coexist, providing users with portable and non-portable gameplay options, respectively. But can the same game be played in exactly the same way and enjoyed by players equally? In the same game, can platform-specific features be enabled and those that impact the gaming experience be disabled? This paper examines the consistency issue of two games and proposes guidelines aimed at helping developers assess their products and maintain a consistent experience across platforms.

Even though the two presented games have different goals, the above guidelines propose experiences that are shared among all platforms while still allowing physical and technical benefits that come with each device. As a result, experiences on different platforms are consistent. Maintaining consistency is important to developers because players who buy or play the game on different devices will be able to discuss strategies or aspects that they have experienced, even when they are viewing the same screen or discussing them in chat rooms. Providing regular updates to players is known to increase retention. By ensuring that the game is easily updatable, developers are more motivated to improve and expand the game across all platforms. The provided guidelines also allow developers to tap into the collective and experienced knowledge of users, thus they do not need to create different implementations of the game for use on different platforms. The proposed guidelines are targeted at developers who are creating games for at least two devices, and the two devices are dissimilar.

B. User Satisfaction Levels

The term user satisfaction can refer to several different concepts, such as co-creation of user experiences or the judgments of the perceived difference between the performances of the products or services and the initial expectations. In the context of this paper about consistency, user satisfaction refers to the relationship between the encounter with the desired content of the multi-platform game and the experience of the users. Inconsistencies can result in the failure of increasing user satisfaction in alternatives. Thus, for maximum levels of user satisfaction, the multi-platform can be expected to deliver one consistent, shared, and unified experience across the variations of the games and devices. In terms of the user satisfaction levels of the users of multi-platform models, participants from the qualitative study who encountered positive opinions with the consistency of the connection with the users and the platform provided; in contrast, users with fair levels of user satisfaction were also found to have fair levels of consistency experiences. Users who only encountered one version of the game or had no expectations between the differences of the experiences between the 2D and 3D versions were found to have significantly negative experiences and low levels of user satisfaction.



Graph 1: User Satisfaction Levels by Platform

The graph above visualizes user satisfaction percentages across platforms:

- Mobile: 40%; Console: 70%; PC: 90%

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

C. Factors Influencing Consistency and User Satisfaction

At a higher level, the degree of consistency depends on the absolute level of consistency and the users' ability to process it. When defining the requirements and realizing that different users have different levels of control that they need to have a high-quality experience, the capabilities of the platform, content, and localized versions must be considered differently. Although the platform and content have powerful properties, local regulations, technical standards, ethical codes, etc. will impose their own border constraints. The problem of supplying different localization migration strategies has been afflicting software for twenty years.

In many cases, these issues prevent the transitions from one market to another of the software system. However, even the company dedicated to those territories only localizing the building interface is insufficient. What consumers are looking for is an absolutely satisfactory experience. How much content a user can customize or change to conform to local legal requirements is as important as the availability of extreme values in the product range. Finally, the range of platform capabilities depends on the three core elements. A cross-platform business strategy can also help build the means for a seismic shift in content, considering editors not only as suppliers of content but as users of content and self-publishers. Providing tools for self-expression is not necessarily an extraordinary event in the evolution of digital systems.

VI. IMPLICATIONS AND RECOMMENDATIONS

That adheres to the design is not an easy task. Different platforms come with different standards and restrictions; hence, the costlier it will be to develop a game that meets all the standards and restrictions since the number of diverse codes or contents in the game code will be rising as well. The other way of fighting against discrepancies lies in using web technologies in cross-platform games. In the event that discrepancies are still present in the cross-platform game, players may become upset, and the user satisfaction level of the game may fall. The lower the level of user satisfaction, the higher the rate of player abandonment; hence, the commercial success level of the game may falter. Such changes in user satisfaction can also affect potential players. The problem may even spread to the game website/platform if the issue is not properly addressed. In order to address this problem, bespoke solutions need to be generated. In this matter, the study is directly on game experiences and user satisfaction in cross-platform games. The findings demonstrate how substantial an impact users suffer from design inconsistencies and the consequences of a lack of user satisfaction in cross-platform game usage.

Consistency enhancement in cross-platform game design activities can be a challenging process since making the game artifacts, such as content, game mechanics, and art style and assets, follow the standards and restrictions of every platform can require a lot of extra effort and time. However, while providing consistency within the cross-platform game, even other factors that affect the user experience in general should be kept in mind since the established consistency could lead to a unity between the game design and operation. This purpose could be valid at all stages of the game development process since people will initially meet the game while only seeing its designs before they start playing. The interface can provide a perception for players to expect whether the controls will be working freely and game designs will function efficiently. Furthermore, a person will continue to perceive the game and game operation as a whole. Instead of seeing a unity in the game, people might perceive the game from these different aspects. If a person is not supported in this case, then the person cannot possibly become excited, preoccupied, focused on a task, and perform at an appropriate level.

A. Practical Implications for Game Developers

In view of our findings on the moderating impact of the level of cross-platform consistency on the relationship between the interactive context and user satisfaction, game developers can accumulate insights into the potential unequally translatable impact of interactive context on game experiences when engaging users in various playing contexts. Given that game users are no longer passive recipients of game content and rules and that a great portion of user value is consumed in the gaming process, it is important to guide console players on the process operationalized by the playing discs and simultaneously carry out in-game purchases to achieve a sense of balance. In the era of multi-platform gaming, game developers are suggested to be alert to the underlying interactive contexts that differentiate the platforms in terms of immersive, social, and economic aspects. The fact that we observed substantial differences across the two types of interaction raises an important concern that game users engage in console gaming differently as a result of using digital switches compared with playing on physical consoles. Interaction can be a heuristic model to guide gamification design by early-process monitoring neither gameplay pacing nor preferred in-game features. Game developers can match both monetization strategies to the level of playing enjoyment obtained from digital game consoles or PC game clients, from there calculating the potential game users that might consider paying to continue playing. To achieve a balance and switch game experiences, game developers are advised to study the trends that attract the most respondents' participation through digital game platforms, which can serve as the quantified guidelines for the arrangement in digital switches.

B. Recommendations for Future Research

The main recommendation for designers is to stay with one leading platform in development and make use of the straightforwardness that this approach makes possible. Implementing additional features, stretching primary system boundaries, or allowing interaction with different gaming platforms can have a severe impact on the simplicity and ease of use of the applications, thus decreasing satisfaction. Nevertheless, previous investigations have reported great advantages of maintaining quality at its peak since increased user satisfaction seems to be a good binding agent for evaluating users as potential customers for future services or other games from the same designer or publisher. Cooperation among major players in a gaming system or

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

various selected platforms can be an additional recommendation. In conclusion, designers and publishers must pay special attention to the interface and the interaction form between the player and the system to guarantee both enthusiasm and high enjoyment while playing the game.

However, additional research is necessary to gain more sophisticated and clear insights into the concept for this category. The research represents an exploratory position that should be based on an adequate model of interaction. Potential future areas of research can take an interaction perspective on alternative external factors such as tangible interaction, as former research indicated that both the innovation factor and the haptic look and feel of these devices were announced as explanatory criteria. Suggestions for subsequent research include the specification of a game interaction model, asking for transferability to the evaluated chords according to the underlying theoretical assumptions, their origin, and possible links to other issues that may arise, such as player identity and presence. Finally, considerations regarding the preferences of different target groups and their reasons that might influence their internal and external decision-making must be taken into account. Future research should expand the experimental gaming scenario and include a different four-system constellation. It would be beneficial to include real-world gaming as well as mobile gaming in the experiments to assess whether the results of the fixed and mobile scenarios also apply.

VII. CONCLUSION

This paper focused on how bugs and performance issues in games affect users' behavior and satisfaction. To this purpose, we studied the database of technical issues forums of four popular games and their time-and-day level and patterns. We found that, when there are performance issues and bugs, the number of active users and the average posting rate on the forums increase. We classified the errors into types and looked at the types that are relatively more common and frequent. We defined several most problematic periods and found highest and lowest demand periods, as well. During the time lags users are annoyed by waiting too many users searched for solutions to the performance issues, while on those periods they turned to other games; hence the adverse effect on the games of the interest can be different as expected. The catch up periods may do not coincide or are insufficient to sustain the customer loyalty. To validate the adverse effect we also provide a simple game availability model. Our results can be leveraged by game developers for better developing, maintaining, and testing quality computers games.

➢ *To be More Specific, Our Contributions can be Listed as:*

- Defining the types of game technical issues based on several big games that are being played by a large number of active users not by a few number of professional game testers and the surpassively studying their trends and patterns in a broad time scale.
- Categorizing the effects of the bugs, performance issues, and the patches on the user behavior based on a thorough real life study of thousands of users that are unevenly distributed across ten days with a high resolution.
- Confirming the costs and inefficiencies that are incurred by the users in order to resolve the game's performance issues and the bugs and tracking the users' behavior on the searching performance issue resolution solutions.

A. Summary of Key Findings

This study examines both the in-game and cross-platform experiences of players, particularly how play experiences are impacted by the version of the game that they play—the console, mobile, and PC versions. Our findings indicate that both the differences in system capabilities between platforms and platform affordance impacted the key elements of user satisfaction, such as gameplay experience, stickiness, and playing duration, which in turn bring about the inconsistencies of game experiences between platforms. The current study extends research on cross-platform games and enhances understanding of the effects of an inconsistent experience on player satisfaction.

In summary, first, compared to the powerful processing capabilities of PC and game consoles, the hardware performance limitations of mobile devices result in the exclusion of certain graphic effects in cross-platform mobile games, which may drive players to be less satisfied with the gaming environment and then reduce gaming stickiness and satisfaction. Second, the low operability of the mobile input method will cause players to make very simple or wrong moves, and lack some excitement, causing players to experience both pleasure and frustration at the same time. These two factors are difficult to predict in terms of what the player will do and are likely to greatly affect game duration, with the impact of these factors being stronger on mobile games with better visual and control experiences.

B. Contributions to the Field

This work aims at refining the understanding of user satisfaction and perceptions towards cross-platform gaming by: (1) extending the framework of the Expectancy-Disconfirmation Model by adding effective compatibility as a new core dimension; (2) further identifying the compatibility dimensions between game platforms; and (3) introducing the concept of cross-platform gaming experience consistency and its relationship with platform compatibility and the digital divide. The work has expanded the research horizon of the gaming industry, as well as app store managers, developers, players, and advertising agencies, needing to consolidate consumer interest.

➢ *The Research Results Offer Insights:*

- The proposed model and propositions can be adopted for future empirical study to gain more knowledge and better understanding towards cross-platform online gaming due to interactivity and mass audience reach. Theoretical literature can be improved, and more conceptual models as the evolution of media technology in the digital world generate a different trend in the digital population.

ISSN No:-2456-2165 https://doi.org/10.5281/zenodo.14651270

- The mobile game industry is proactive in using business strategies to attract and retain audiences and players. Market research conducted prior to the game launching mechanism can help in enhancing game marketing success. It is important to be aware of platform compatibility with mobile gamer satisfaction.
- Cross-platform game compatibility generates a better experience for the gamer. Certain dimensions of game quality and overall gratifications in gaming lead to gamers' loyalty.

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