Game Interface Design: Measuring the Player's Gameplay Experience

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Abstract. The objective of this study is to investigate the effects of user's gameplay experience on the generated game interface design. This paper focuses only on the findings from a conducted questionnaire involving 94 users who utilized the game interface design of "A Garuda". The seven factors observed from the gaming experience are immersion, flow, challenge, tension, competence, positive and negative affect adapted from the Game Experience Questionnaire (GEQ). The results showed that the game interface design produced has showed a lot of positive factor where the positive affect factor gave a higher mean value compared to the other factor of the gaming experience. The results from the t-test showed the effect of positive factors and the negative factors of the user's game experience, where there is a significant impact towards both aforementioned factors. However, there is also a high impact on the negative factor resulting from the effect of user's interaction on the related game interface design. This shows that the related interface design still needs to be improved in the future. The outcome of this study gives significance to game designers that they should take into account of the user's affective effect towards any game interface designs that they produced.

Keywords: Game experiences · GEQ · Game interface design

1 Introduction

Famous researcher in the field of affective computing, Picard [1] defined affective computing as "computing related to, 'arises from emotion' or 'deliberately influencing emotions'. Affective computing is a field in which its disciplines include computer science, psychology, and cognitive science [2]. Picard explained that the affective computing system must have several capacities: 1. recognition, 2. expressing, or 3. having emotions [3]. The aim of this is to focus on creating a computing system that has the ability to significantly detect, recognize and understand after a positive intervention from the state without intervention [4].

The first step in designing a good computer game is to understand how to design user emotions that can be produced from the game Lazzaro in Bateman [5]. Numerous

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studies on the design and development of computer game applications have been carried out. However, studies related to basic computer game design that particularly involve the user affective elements are less likely to be received. This is because it requires detailed research on the aspects of social, emotional and other relevance to human life. When designers want to use the appropriate method or technique to design computer games that are associated with human social needs, they have special constraints to make it work. They lack the appropriate methods and techniques for developing complex user-centered designs other than conducting tests and assessments [6, 7].

2 Affective and Game Design

In the case of affective studies, Pagulayan et al. [8] and IJsselsteijn et al. [9] has discussed some of the differences between entertainment and productivity-oriented applications in detail.

- First, in productivity-oriented applications, constraints are eliminated as much as possible, but obstacles in entertainment games are created deliberately in order to challenge the player.
- Second, in games, the process of playing moves on its own, the rewards received are intrinsic in nature, and do not rely on yeild-based rewards that are always applied in productivity-oriented applications.
- Third, productivity-oriented applications strive for constant consistency; this is different to entertainment application like games that drives more towards creating various gameplay experiences.
- Fourth, there are various input devices to interact with game (such as simulated weapons, computer vision input like Sony Eye Toy or acceleration and sensation positioning like Nintendo Wii) than in productivity application that usually only use the keyboard and mouse.
- Fifith, the use of sound and graphics in productivity applications serves to communicate the function, while in games it works to create a fascinating environment as well as to support the narrative of the game and users to trigger immersive senses.

As a game designer, we cannot design the game interface in a direct manner. We can only design the rules that cause the experience to occur. Game designers are capable of producing experience but only indirectly [10, 11]. This is due to the reason that emotions are directly related to a person's goals, it is always involved in the player's experience, regardless of whether the designer is aware of it or not [5].

A design can be made to support different game activities but it is more difficult to trigger accurate reactions or restrict specific game patterns. In its inherent nature, the design does not have a logical outcome, therefore, no sequence of operations will guarantee the end result [11, 12].

Gilleade et al. [13], Ermi and Mäyrä [14] in De Castell and Jenson [15] and IJsselsteijn et al. [16] agree to the statement that explained that there are differences between frustration to the game and in the game, where the frustration towards the game essentially involves difficulty with the user interface, for example unresponsive to input devices, unimpressive and weak interactions with tools that are used.

Frustration to the game clearly breaks the player flow, and it should be improved by applying user-centered design principles to the game interface design.

Most of the studies in the field of gaming experience, in which it can be observed as a subjective relationship between the players and the game itself, are carried out in a controlled environment [17, 18]. Despite an increase in the field of game research, the actual experience of playing digital games is still poorly represented in literature review of games. Existing researches in gameplay experience are mostly centered on one dimension of gaming experience, such as flow or immersive. As such, the writing of current literature reviews of gameplay experiences are split up [19].

Therefore, we see the need to develop a "self-report" measurement for gameplay experiences, covering the wide spectrum for experiences caused by digital games [16]. Even so, Poels et al. [19] viewed that it is impossible to develop any instrument without a comprehensive conceptual for gameplay experiences that can act as a framework to formulate the mentioned "self-report".

Aside from looking at the emotional aspect of users in evaluating the effect of he generated computer game interface design, the need to observe from user's affective angle, especially from the gameplay experience aspect can also be used as an indicator for the competence of interface design produced.

From the aspect of gameplay experience shown by the users, this study uses seven factors: immersive, flow, competencies, tension, challenge, positive affective and negative affective. Based on the questionnaires adapted from the game experience questionnaire (GEQ), the results of user affective towards the design of the computer game interface produced have been able to make a significant impact in this study. Because, according to Poels et al. [20], most researchers lack the appropriate methods to measure specific entertainment experiences in determining the accurate emotional level, the approach to analyzing user game experiences can also help researches to reinforce the findings obtained from studies related to the user's emotional effect on a design that is produced.

Another method that can be used to detect emotional presence is through the changes in voice and facial expressions [21]. For example, the views expressed in the study of Gilleade et al. [13] mentioned, if the user is playing RPG games, and the player's frustration increases, the researcher should

- identify the probable causes that cause intrinsic frustration towards the game design,
- evaluate the current status of the player in the game,
- then pick the cause that most possibly is the cause if frustration and,
- adjust the game to correct the fault (for example, if the frustration starts to rise and the game finds that the user is still trying to find the suitable antidote, it will drive the player with an indication to the cause of the frustration.

Brown and Cairns [22], Al Mahmud et al. [23] and Johnson et al. [24] said one of the dimensions of user experience, which is immersive, can be defined as the level of player engagement in the game. A player responded as follows in their qualitative interviews; "The game allow me to connect deeper with myself and I think I went deeper into the game".

Jennett et al. [25], Nacke [26], Cox et al. [27] and Kappen et al. [28] describes flow as an optimum process of experience, which is the situation in which individual involved engaged in an activity that feels nothing else is more interesting than the said activity.

In the year 1990, Csikszentmihaly has presented all eight components of flow, which are a clear goal; high level of concentration; loss of self-awareness (feeling calm); feel distorted by time; direct and immediate feedback; balance between skill levels and challenges; feel of satisfying personal intrinsic control [25, 26, 29, 30].

To measure the level of user gameplay experience, IJsselsteijn et al. [16] has developed and performed a validation to a questionnaire that was named Game Experience Survey (GEQ). This questionnaire was used to identify the differences between the seven dimensions that differ on the level of user gameplay experience, namely sensory and imaginative immersive, Tension, Competencies, Flow, Negative Affective, Positive Affective, and Challenges [16, 19, 31–33].

Based on studies conducted by previous researchers on use of technology and its effect on user emotions, it would be appropriate if the study was conducted on a computer game interface design and observation on the emotional aspects of the user is done while looking at the design impact on the field of human computer interaction, such as usability, effectiveness, satisfaction and efficiency.

At the same time, the weaknesses in the field of computer game design can be supported with the involvement of the affective computing field through this study can give a positive impact to the world of computer games.

3 Research Design

The entire study in this project uses the User Centered Game Design (UCGD) model pioneered by Rankin et al. [34] as the methodology of the study. The original model for UCGD was founded by Fullerton et al. [35] which was then improved by Rankin and his colleagues. In the fourth phase of the playtesting phase, testing was performed to determine the effectiveness of the design of the game interface produced.

3.1 Methods

A study was conducted on 94 users who have utilized the designated game interface. The game, named "A Garuda", is a RPG genre game where the main character carried a responsibility to save his kidnapped child.

The criteria of RPG game that were implemented into the game design such as dialogue, combat, mini map and etc., with the purpose for allowing user to be able to interact with the whole respective game design.

Figure 1 displays a screen capture and the user's face while interacting with the game interface design. Apart from the study to identify game experience factors, this study also examines the effect of user's emotions on game interface design. However, the focus of this paper is simply to illustrate the findings of the game experience aspect only.

For the purpose of obtaining data about the gameplay experience for users using the prototype design of the game interface produced, a set of questionnaire called Game Experience Questionanaire (GEQ) was used in this study. This questionnaire was

Fig. 1. Screen capture from video recorded while user play the games

adapted from Al Mahmud et al. [23], Nacke [26], Brockmyer et al. [36], IJsselsteijn et al. [37] and Nacke [30] in their study. This questionnaire contains seven factors related to immersive, flow, competencies, tension, challenge, positive affective and negative affective.

The Likert measurement scale has been used in this questionnaire and it is divided into 5 sections which are 1 to 5. The part or scale 1 represents the "none at all" and the 5 scale represents the "very likely" statement of each item in the aforementioned questionnaire.

3.2 Gathering Data

To analyze the gameplay experience of a user that uses the computer game interface design produced, the quantitative data obtained through the gameplay experience questionnaire has been analyzed descriptively. This is done by looking for the mean and standard deviation values according to the seven specified factors. Data that has been analyzed is then presented in the data table.

Based on the data analysis obtained, the discussion then focuses to the factors that have the highest mean and lowest mean value. In addition, the items of factors are analyzed and seen in two angles of factors, namely positive and negative factors. Next, the conclusion about each factor that are tested will be summarized.

4 Result and Discussion

4.1 Result

From the questionnaire for the demographic section, 94 respondents were involved, in which 28 respondents were men and the remaining were 66 women. Of these numbers of respondents, 10 respondents were aged between 15 and 17 years old, 67 were aged between 18 and 23, 11 were between 24 and 27 years and the remaining 6 were between 28 and 35 years old. The findings also found that 27 respondents played games on a daily basis. 16 people play once a week, while a total of 43 people play occasional and 8 respondents rarely play.

The results of data analysis related to the level of user gameplay experience are obtained through user game experience questionnaire. Tables 1 and 2 show the mean value and the standard deviation for the findings obtained from the related questionnaire.

Table 1. Mean value for positive factor

Factor	Mean	SD
Immersive	3.28	0.16
Flow	3.16	0.46
Competencies	3.29	0.21
Positive affective	3.40	0.21

Table 2. Mean value for negative factor

Factor	Mean	SD
Challenge	2.28	0.41
Tension	2.45	0.14
Negative affective	2.33	01.7

In this user's gameplay experience questionnaire, there are two different factors which is a factor that looks similar to a positive-form factorare Immersive, Flow, Competencies, Challenge and Positive Affective, meanwhile there are two factors that are seen as negative factors which are Tension and Negative Affective.

Based on Table 1, it is notable that the highest mean value is for positive affective factor with the value of 3.40 while the lowest mean value is 2.33 which is the mean value of the negative affective factor. Other positive factors also show a high mean value compared to the negative factors.

The mean value of the Immersive factor is 3.28, the mean value of the Flow factor is 3.16, the mean value of the Competencies factor is 3.29 while the mean value of the Challenge factor is 3.28. All these factors have a mean value of more than 3.00 which means the factors being above the moderate level (in the designated Likert scale) for their opinion on the user's gameplay experience rather thanthe design of the computer games being played.

For negative factors, apart from negative affective factors, the mean value obtained is 2.45 which is for tensile factor, that indicate a small value (in the designated likert scale) for their views on user gameplay experience rather than the computer game design being played. The t-Test was conducted on all the analyzed factors, the results showed that there was a significant difference between the two factors that were seen, such as the positive factor and negative factor. Table 2 shows the data analysis that has been obtained.

Table 3. t-Test analysis

Factors	Mean	P
Positive	3.27	0.000
Negative	2.34	

Based on Table 3, it can be seen that the overall mean of the positive factor is 3.27 while the mean value of the overall negative factor is 2.34. From Table 3, there were significant differences between positive factor (M = 3.27, SD = 0.098) and negative factor (M = 2.34, SD = 0.087) given that: t (92) = 0.801, P = 0.00. The results show that the significant value obtained (P = 0.000) is less than the prescribed value of significance (P < 0.05). This shows that the computer game interface design created poses more positive effects on user's gameplay experience.

4.2 Discussion

To analyze the data for the findings from the player experience questionnaire. It can be seen from two factors which are the positive and negative factors. Positive factors consist of five factors, namely immersive, flow, competencies, challenge and positive affective, while negative factors are tension and negative affective factors.

Based on Table 1, it is found that the positive characteristic value has a mean value greater than 3.00 while the negative factor has a value less than 3.00. For positive factors, the value obtained is 3.28 for immersive factors, 3.16 for flow factor, 3.29 for competencies factor, 3.28 for challenge factor and 3.40 for positive affective factor. For the negative factor, the mean value obtained is 2.45 for tension factor and 2.33 for negative affective factor. The findings of this study are consistent with what IJsselsteijn et al. [16] and Nacke et al. [38] who looked at all these factors in their study. They found that the impact of positive factors has a high mean value of which the generated game design has a positive impact on user gameplay experience. In a study conducted by Nacke et al. [38], comparisons were made with a study made by Shilling et al. [39]. He finds that the results of his studies are contrary to the study conducted by Shilling et al. [39] who found that the mean value of a positive factor was not necessarily high as was obtained by Nacke et al. [38]. However, the study by Nacke et al. [38] is in line with the findings of previous studies such as Ravaja et al. [40], Lindley et al. [41], IJsselsteijn et al. [16] and Livingston et al. [42].

In addition, a study conducted by Poels et al. [19] and Poels et al. [20] on children as well as the enjoyment of the user on the computer game interface design found that

there was significant high mean value with positive factors such as immersive, flow, competencies and positive affective in their research findings. The mean value obtained for the positive factor exceeded the mean value of 4.00, which indicated a sign of agreement on the relationship between the game used and the tendency for positive user gameplay experience. This was then reinforced by the study conducted by Nacke et al. [38] and IJsselsteijn et al. [37]. They have discovered that there was a significant relationship between the user gameplay experience and the positive factors found in the questionnaire through their study.

Based on the discussion that has been made, it can be said that the user's gameplay experience that is categorized as a positive factor has a greater effect on the design of the interface produced.

5 Conclusion

Relevancy between interface design and game experience gives the designers a bigger impression to think of something meaningful. Based on the findings, players are very concerned about the immersive and the flow of which gives the player a sense of mood to better feel while playing the game.

Apart from research related to game experience, research is also suggested to look at the effects of game design on user emotions. This is also very important from the point of play satisfaction to the user.

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