

Research Article

Evaluating Affective User-Centered Design of Video Games Using Qualitative Methods

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In recent years, researchers and practitioners in the human-computer interaction (HCI) community have placed a lot of focus in developing methods and processes for use in the gaming field. Affective user-centered design (AUCD) plays an important role in the game industry because it promotes emotional and mental communication, hence improving the interaction modes between users and video games. This paper looks at the development of a suitable AUCD guideline to determine if the expressed emotion, semantics, and mental concept of a tangible and intangible video gaming interface are well received by its intended users. Approaching AUCD in video games requires investigating multiple data to obtain a reliable data especially when assessing and interpreting affect and emotion. They present a challenge due to many ambiguities related to affect definition and measuring affective emotion can be very tedious due to its complexity and unpredictability. In this paper, we describe the methods and techniques used to assess affective user-centered design in video games. We also discuss our approaches within the context of existing affective gaming and user-centered design theory and data gathering procedures, including the factors affecting internal and external validity and the data analysis techniques.

1. Introduction

In recent years, game studies have shown to be worthy of research attention and have become one of the established domains of research within the field of human-computer interaction (HCI) [1]. Evidently, user experience studies have also become more prominent in HCI [2]. The user experience in video gaming tends to go beyond the actual implementation of the game itself. To appreciate and comprehend gaming, there is a need to understand what happens in the act of playing, as well as player and the experience of gameplay [3, 4]. The main intent for any game development is to develop a game with the following factors: fun to play, entertaining, providing surprises, challenging, providing aesthetically pleasing experiences, to support social connectedness, and allowing the player to identify with the game [5]. Hence, the user experience design for video games is highly important [2, 6] to the success of the games.

It is noted that the user experience is closely connected to affect and emotion [4, 7] where affect plays the main role in both entertainment and “serious” games. Player’s emotions usually act as mediator for player engagement within the game [8, 9]. “*Emotion*” is often used interchangeably with “*affect*”. However, it does not share the same definition [10]. In Norman’s [11] term, “*affect is a general term for judgmental system, whether conscious or subconscious*”. When users are experiencing queasy or uneasy feeling without knowing why, this is called affect. Whereas emotion is the conscious experience of affect [11]. Desmet [12] suggested that “*emotions are best considered as a multifaceted phenomenon which consist of the following components: behavioural reactions (e.g., approaching), expressive reactions (e.g., smiling), physiological reactions (e.g., heart pounding), and subjective feelings (e.g., feeling amused)*”.

Therefore, games should be designed to provide players with a variety of unforeseen changes (visual or auditory) to

evoke affective reactions in the players. However, there is a need to understand affect in multiple levels concurrently. The current focus of game research is to design games that provide an equal user experience to all players, irrespective of player motivation, experience, or skill. A number of HCI practitioners and researchers have placed a lot of effort to apply, refine, and invent user-centered design (UCD) techniques to improve the enjoyability of games. Several HCI researchers have pointed that affect plays a vital role in both entertainment and “serious” games, in terms of designing experience for users [5, 13–15] and also in terms of assessing the game design factors and aesthetic discipline which instills certain effect upon the user [5, 16].

2. Affective User-Centered Design

Although usability and design receives a lot of attention, emotions are increasingly seen at the heart of user experience [11, 17]. For all types of games during gameplay, the emotional factor is one of the most important components. Quoted by Hudlicka [9], “*affect plays a key role in user experience, both in entertainment and in serious games.*” Therefore, the key is focus on the user-game affective communication, where the user affectiveness will help create believable interaction between players and the gaming interface [9, 18].

This is where both “affective design” and “user-centered design” are needed to improve the user-game experience by addressing the human needs and game design, leading to the term “affective user-centered design” (AUCD) being coined by Ng and Khong [19]. AUCD can be defined as the “*attempt to explore the emotional relationship and the affective properties of both interface and design while addressing the user’s needs and desire at the same time*” [19].

3. Affective Evaluation

The ability to measure user affect has become important for the intelligent interfaces in games that aim to establish believable interactions or to alter internal behaviours. It is challenging to capture what users are feeling at a particular moment because every individual expresses and reacts differently under different situations. As a result, satisfying a player’s true needs is indeed challenging [20]. According to Wang and Yu [21], players’ response to video game is based upon the relationship between the presentation of the game content and the interpretation occurring within the mind of the player. Their characteristic and personality can influence how they think and behave in the real world and should, therefore, also influence their in-game behaviour as well [21]. Hence, it is also important to take into consideration the differences in cultures, age groups, and social and national requirements.

There is an extensive variety of options that exist for evaluating affect and emotion in video games as shown in Figure 1. While much progress has been made in the assessment methods, tools, and techniques to evaluate affect and emotion, several researchers [9, 22–24] pointed out that to gain a more reliable assessment, coexisting use of multiple

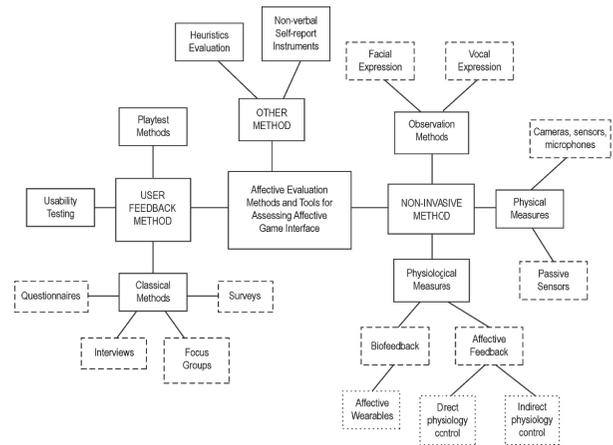


FIGURE 1: Affective evaluation methods and instruments for assessing affective game interface.

methods is required to provide a more holistic result and to obtain more reliable data regarding emotion and affect. Thus, Ng and Khong [19] proposed two types of methods to be employed: (i) user feedback method and (ii) noninvasive method. By merging these two methods, HCI and game researchers are able to obtain data of the player’s behaviour and emotional responses, consciously and subconsciously.

For any affective evaluation, attaining user feedback is of the highest importance. Users can provide valuable information about various aspects of a game to help make it more fun to play. Furthermore, they may generate an important information that game designers refer to when designing better features, as well as gaining a better understanding of player thoughts and preferences. The advantage of user feedback method is that it can be used to measure mixed emotions, as well as being adapted to appear as any set of emotions [12]. When collecting feedback from users from the target group, it is important to be assured that the data gathered actually represent the feelings and thoughts of the population. While this method can collect user feedback, they are far from immediate gaming experience. Hence, they may need other types of methods to support them [25].

When evaluating affective game interface, it is essential to find a noninvasive and easily carried-out method to help gain further understanding about the affective state of a person during interface evaluation with users [26]. The biggest possible advantage of noninvasive method is that it can be taken in parallel during interaction rather than interrupting the user or asking him after the task. As Phan [18] pointed out, players disliked being interrupted while playing. However, Picard [27] advised to keep in mind that some people might feel uncomfortable with “parallel communication” of affect, especially with methods involving signals that they do not usually see. Hence, this highlights a limitation of this method which is the lack of accuracy in assessing mixed emotions [12, 26], which is overcome by user feedback method.

However, according to Isbister, Höök, Sharp, and Laakolahti [28], there are more methods yet to be discovered. Moreover, there are other factors to be considered during

affective evaluation for video games. Besides the game characters, game storyline, game mechanics, and game usability, it is also important to consider aspects that may change the results during the evaluation such as the genre, music, difficulty, and environment. It is important to recognise these types of affective video game applications because different applications demand the utilization of different gaming approaches.

4. Methods

Approaching AUCD in video games requires investigating multiple data sources in-depth. For this study, multiple case studies were conducted. This allowed us to analyse within and across each setting. We examined several cases to clarify the similarities and differences between each case. Moreover, the evidence from several case studies added more assurance compared to that of a sole case study. The two research objectives that were identified to help frame the inquiry are (i) to investigate game designers' and gamers' thoughts and feelings on the video game design and (ii) to determine which game design components affected the user behaviour and emotional responses.

For the first objective, we examined the thoughts and feelings on the game design from both the game designers and avid gamers. This enabled us to determine the video game design components that instill affect on the player's emotional state which is likely to influence their gaming experience. More importantly, these factors will determine in what way AUCD can influence the interface design of a game to provide a better gaming experience. By drawing out the affective game design components from the perception of game designers and gamers, a profile of affective game interfaces can be explored, verified, and developed further through the second case study by utilizing a popular video game. This leads to the second objective.

Measuring emotion and affect proves to be challenging; hence, a verbal method and nonverbal method were employed. For the verbal method, interview was conducted to measure subjective feelings. Interviewees can provide valuable information about various game design aspects that can create an engaging video game. As for nonverbal method, observation was chosen to evaluate the participants' affective states during their interaction with the popular video game and to highlight the game design components that instill effect on their behaviour and emotional responses.

4.1. User Feedback Method: Interview. The central research question was formed to determine the video game designers' and gamers' background experiences and their involvement in gaming, which relate back to affective user-centered design. The subquestion was formed to explore their viewpoints and knowledge on the game design components that affected their gaming experience.

The purpose of this interview is to answer the first objective which was to discover game designers and players' thoughts and feelings on the game design in video games as well as their gaming experience. For this interview, a

semistructured approach was used. Semistructured approach can assist in developing a structure for content analysis to promote generalisation of the discoveries [29], while allowing more flexibility for follow-up questions for the interviewees to elaborate on their answers. The selected participants will involve a 45-minute face-to-face interview. The interviews were video recorded to aid the researcher during data analysis. We insisted that the interview dialogue to be descriptive and beneficial and to have a natural flow while gathering information on the interviewee's opinions relating to affective user-centered design in video games.

A sample of eight interviewees were conducted comprising four game designers and four avid gamers. These two groups were selected as they played an important role in AUCD. The game designer role is to guide the players through the game and to create game components that provide opportunities for players to experience emotionally. Besides, they have vast knowledge and experience on designing video games, thus knowing which game design aspect will provide a good gaming experience. Although the game designer can induce emotion through the design, it may not be experienced by the gamer. Hence, expert gamers are needed as well because their involvement may provide richer insights into the game design due to their broad experience in playing video games. They know what to expect from a good game and they can identify the errors and faults in the gameplay. It is essential to gain different viewpoints from game designers and expert gamers to ensure the results will not lead to biasness. Evidently, the most important criteria for selecting the interviewees are that they must have a strong passion towards gaming.

4.2. Noninvasive Method: Observation. Observation is used as a supportive and supplementary method to complement the information obtained through the series of interviews. Observation is used to validate and corroborate the information obtained in the interview [30] to help clarify the game design components which affect the player's emotion, reaction, and gaming experience. In this study, we observed the participants playing a preselected popular video game. The participants were also given the opportunity to provide their feedback after playing the game. The interview took place prior to the observation study. Data collected from the interviews pertaining to the perceptions of the game designers and gamers were referenced to determine if the statements made were evident during the course of the observation study. Interview content and players' observations were attentively compared to determine the similarities and differences.

The observation study was conducted through an expert review and prior to the actual observation we tested the chosen video game to set a guideline of expectations as an aid during the player's observation. Therefore, to use this method effectively, an event coding scheme (see Figure 2) was created to record the participants' activity along their emotional and behaviour responses. According to Robson [30], events can be recorded in many ways but the observer must respond whenever the event occur, using either some complex recording instrument or pencil and paper.

NAME:	REF. NO:
Minutes: 0 1 2 3 4 5 6 7 8 9 10	
Activity:	
States:	
Minutes: 10 11 12 13 14 15 16 17 18 19 20	
Activity:	
States:	
Extra Notes:	Activity: G - Game Stage M - Mini Game S - Story (Cutscenes) T - Tutorial E - Exploring Game World C - Customise Character O - Option Choosing

FIGURE 2: Event coding scheme. The event coding scheme can aid the researcher to record the participants' activity and their emotional and behaviour responses.

The observation was coded in two forms: activity and states. There are seven main activities that the participant is likely to carry out in the game: play a game stage, play minigame, watch story (cutscenes), watch tutorial, explore game world, customize character, and choose option settings. States are participants' reaction during gameplay and what prompts them to react in such way. Nevertheless, main focus of this observation in the study is to clarify the affective game design components of a popular game, not the participants' emotional states.

As Barr, Noble and Biddle [6] mentioned that to represent the updated or current state of video games, there is a need to perform in-depth studies on popular and contemporary video games. In addition, a popular video game was selected because it is a game that players enjoy playing and find it appealing. Moreover, players are drawn to popular games because they usually provide good feelings and experience. Thus, LittleBigPlanet2 (see Figure 3) was chosen as the popular video game for this study. LBP2 is listed as one of the top selling game series for PlayStation 3. The LBP series has won numerous awards for its outstanding innovative design and artistic achievement from various gaming press and entertainment community. By knowing the strength and flaw of the popular video game, the researcher was able to verify further the design components of the video game that affects the player's gaming experience and what made the game popular in the first place. In addition, according to the post literature review, puzzle type games are one of the suitable genres for affective evaluation as it requires a player's full, undivided attention to respond rapidly in the gameplay [31, 32]. Furthermore, LBP2 appeals to all types of players where anyone can play LBP2 irrespective of their skills or experience.

The post-activity questionnaire helped the researcher to determine which affective game design component potentially made the LBP2 a popular game. The questionnaire was formed based on data collected from the interview. After the participants have played LBP2, they were given a post-activity questionnaire to complete. Nine males and 7 females were



FIGURE 3: Selected game, LittleBigPlanet2 (Sony Computer Entertainment Europe, 2011).

selected for this observation study. The participants consist of amateur, intermediate, and expert players. Each of the participants was given 20 minutes to play LBP2. After 20 minutes of playing, the participants were then requested to provide their feedback on LBP2 affective design elements, as well as their experience while playing the game.

Written field notes, including chronological and personal notes, were taken during the observation study. Personal notes helped to create a record of the researcher's emotions, behaviour, and reactions during the research process. These notes provided us rich data to understand better the emotions and to formulate new strategies or derive more questions. Thus, it built a stronger validity in the study. Triangulation was engaged via interviews, direct observations, and the synthesis of the literature review. Recurring themes were used as a basis to determine when data saturation has been reached. Member checking was employed in the study as well.

5. Findings and Analysis

The literature review pointed to a number of aspects of affective user-centered design for gaming. These aspects were from the player's affective state while playing a game, including their gaming experience, game genres, type of players, and a combination of these factors. We created a list and definition of a priori codes. The data was assigned codes to identify the data source type. The interviewees were coded "P" with a number to identify the participant in order of the interview sequence. For example, the first interviewee was coded as "P1". Observations were coded "OB" with a number to identify the observations in sequence. For example, the first participant to be observed was coded as "OB1".

After transcribing the interviews, it was carefully read as a whole. Responses were then evaluated for content analysis using matrices to identify the main elements and emergent themes, as well as exploring any emergent components of affective gaming. The aim was to analyse the data and establish common themes, patterns, terms, or ideas that can inform a deeper understanding of relating issues. Once the

TABLE 1: Affective game design components that were aggregated from post literature review.

Affective Game Design Components	Frequency	Percentage
Challenging Gameplay	5/8	62.5%
Pacing difficulty for every stage or level	7/8	87.5%
Clear goals or objectives	5/8	62.5%
Increasing player's capability	8/8	100%
Special rewards	6/8	75%
Interactive game environment	6/8	75%
Interaction between AI actor and player's character	6.5/8	81.25%
Graphic quality	6/8	75%
Creativity	8/8	100%
Fantasy	4/8	50%
Storyline	8/8	100%
Characters	7/8	87.5%
Range of options to customize game settings	4/8	50%
Options to skip-non interactive content	6/8	75%
Interruption during gameplay	4.5/8	56.25%
Not lagging	8/8	100%
Organized menu design	4.5/8	56.25%
Provide tutorial and training session	5.5/8	68.75%
Unobtrusive view	6.5/8	81.25%
Provide help or hint when player is lost	7/8	87.5%
Consistency and non-complex control system	6/8	65%

similarities and differences were found in the data, they are then used to verify patterns in the data and code where cross-case analysis was conducted on affective gaming aspects and how they influence the gaming experience.

5.1. Findings: Interview. The findings of the interview found that each sample has similar and different opinions and perceptions on the design components in games. During the interview, the interviewees were also asked to provide their perception on the game design components and how each component affects player emotional responses and gaming experience. According to Sediq, Haworth, and Corridore [33], it is important to identify and isolate components of a game in order to determine how the particular components affect player's gaming experience. Table 1 shows a list of game design components which emerged from the post literature review. In this table, interviewees have expressed their thoughts and feelings on the importance of these game design components for video games and how it can affect the user's emotional responses and gaming experience. This will aid the researcher to clarify the affective user-centered design elements in video games.

In Table 1, it was found that the interviewees have different viewpoints for each game design component because they experienced each of the design components differently. Even if some design components in games were not important for some, but other users may need them because they supported the overall game design to provide a positive gaming experience. All of the interviewees agreed that increasing players' capability, creativity, story-telling, and no lagging in games are important because these components can affect

the user's gaming experience greatly. Almost the majority of the interviewees found these design components such as challenge, pacing difficulty for every level, clear goals, special rewards, interactive game environment, AI actor interaction, graphic quality, characters, option to skip noninteractive content, unobtrusive view, hints, tutorials, and consistent control system to be important as well in video games because these components do instill affect on user's gaming experience during the course of the game. However, although these game design components are essential, some interviewees mentioned it also depend on the user and the game itself. Some users may not be affected by some of these design components due to their preference or skill wise. Besides that, the video games may be designed in such way that some of these design components have no importance in it.

5.2. Findings: Observation. It seems that there are variation and similarity patterns among the participants that emerged from the data analysis during the observation study. Each participant is apparently different in terms of experience and skills. During the observation study, it was found that even experienced player could not master the gameplay instantly. Some participants had trouble playing LBP2 even though they are seasoned player because they could not master the controls in a short time. They took quite some time to remember the action buttons. In addition, for players who play a genre that they dislike or are bad at, this is likely to affect their overall gaming experience in a negative way. It seems that platform difference can affect users gaming experience as well. Few participants had a hard time familiarizing themselves with the controls of another platform. Every participant

TABLE 2: LittleBigPlanet2 user experience ratings.

Participants	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Mean	Std.dev
Rate	5	5	5	4	4	4	3	4	4	5	4	5	5	5	5	4	4.44	0.61

Reference: 1 = poor, 2 = fair, 3 = average, 4 = good, and 5 = excellent.

TABLE 3: Affective evaluation on LittleBigPlanet2.

Affective Game Design Components	Frequency	Percentage
Challenging	13/16	81.25%
Pacing difficulty in levels	15/16	93.75%
Provide Goals	15/16	93.75%
Provide Rewards	14/16	87.5%
Interactive game environment	16/16	100%
Good graphic quality	15/16	93.75%
Creativity	16/16	100%
Fantasy	16/16	100%
Good narrative	7/16	43.75%
Interesting characters	13/16	81.25%
Option to adjust game settings	15/16	93.75%
Option to skip non-interactive content	14/16	87.5%
No lagging	12/16	75%
Organized menu design	12/16	75%
Helpful tutorial	15/16	93.75%
Provide hints	13/16	81.25%
Good camera angle	14/16	87.5%
Easy to pick-up controls	12/16	75%

appeared to have different motives when playing LBP2. They were either interested in exploring the game world, wanting to know the story ending, looking for good challenges, or mainly to enjoy and experience the game. Participants who are familiar with the gameplay tend to play spontaneously and seldom falter in the gameplay, thereby completing the level quickly. For participants who are new and unfamiliar with the gameplay, they will hesitate occasionally.

Similar patterns were found in terms of the participants' emotions during certain events of the game including how they choose their level. Participants who felt insecure with their skills usually chose an easier level, whereas those who were confident with their skills chose to play a more difficult level and they tended to feel excited when there is a challenge. Furthermore, while playing through the levels, many participants took their time to enjoy other design components such as the characters, the background animation, interactive objects, cutscenes, graphics, music, and many more. The participants found the characters to be amusing and entertaining. They provide good entertainment and humour to the game. Participants were mostly calm and laid-back when exploring the game world, or during the cutscenes and cinematic scenes, or when the level offers no challenge. When the participants are deeply immersed into the gameplay, they usually have a serious expression. In addition, participants also change many expressions in a short time whenever they stumble upon a difficult obstacle. Most of the participants do become frustrated eventually if they make the same

mistakes repetitively, regardless unintentionally or not. Only few participants found making mistakes was fun when they have successfully overcome the obstacle, they will show a relief expression and delight when they have completed the level. The participants mainly showed a confused expression when they have problem recalling the controls or they were unsure what to do in the game.

After playing LBP2, the participants were requested to complete post-activity questionnaire for feedback on *LittleBigPlanet2*. Besides observing the players behaviour and emotional responses while playing LBP2, the participants feedback also provided us deeper insights into affective user-centered design in video games. The participants' feedback are listed in Tables 2 and 3, respectively.

LBP2 has both strengths and weaknesses in its gameplay even though it is a popular game. Overall, the game received mostly positive views from the participants. From Table 2, it appears that a majority of the participants (15/16) enjoyed the game ($M = 4.44$; $SD = 0.61$), except for one participant. He explained that he is not a fan of platform and puzzle genre type of games and did not enjoy playing LBP2. Nonetheless, LBP2 was rated highly by the participants with seven participants rating it as "good" and eight participants rating it as "excellent", with the one participant rating as "average". Many of the participants praised the game mainly on its aesthetics, creativity, challenges, and diverse gameplay. Although the concept of the game is simple, the visual is positively appealing and pleasant. Participants noted that

LBP2 has many quirky design elements which made the whole game bright and jovial. Besides that, the well-designed puzzles in LBP2 actually make them test their intelligence. In fact, participants actually had fun making mistakes because they enjoyed learning new techniques and tricks to get through the levels. Thus, although it was challenging to learn, in the end it was rewarding. Participants found LBP2 entertaining as they enjoyed the many interactivity features in the gameplay. Additionally, it has nonrepetitive gameplay which many participants found refreshing. Elements found to be lacking in LBP2 are the depth in the narrative, and, for some participants, the lag of AI responsiveness and confusing controls.

6. Discussion

Fifteen recommendations of affective user-centered design for video games have emerged from the data analysis: (i) user preference, (ii) user capability, (iii) pacing difficulty, (iv) providing goals, (v) providing rewards, (vi) interactive game environment, (vii) graphic quality, (viii) fantasy, (ix) good narrative, (x) interesting characters, (xi) reducing lagging, (xii) flexible options, (xiii) good game interface, (ivx) tutorials and hints, and (vx) ease of user controls. These recommendations are the main elements that affect users behaviour and emotional responses during the course of the game, which in turn affects their gaming experience. These recommendations are listed under five main groups: (i) Diversity of User, (ii) Challenging Gameplay, (iii) Impressive Visuals, (iv) Creative Gameplay, and (v) Flow in Games. After the list of recommendations was gathered, a framework was formulated (see Figure 4) as a guide to create an engaging affective user-centered design for video games.

For AUCD, it is important to understand the players' wants and needs beforehand because the players will be affected differently while playing due to their biasness. Once the player's characteristics are identified in the earlier stage, it is easier to study their preconceived notions and individual affective states and emotions without judging them because their biasness is already known. The following four groups are based on the main elements of affective user-centered design in games. These game design elements are responsible for instilling affect in player's gaming experience as well as their behaviour and emotional responses.

6.1. Diversity of Users. Several researchers [4, 21] stress that understanding player characteristics or personalities is one of the key components of game design in order to understand both the uses and effects of video game. However, Khalid [34] stated the need for affect differs greatly among people as user population becoming more diverse and it is hard to determine an ideal user. This was supported during the interview and observation study where the interviewees and participants were different individuals with distinct personalities. Players who become immersed in their interaction with the game will experience affective pleasures and hence evaluate their game experience positively, whereas those who fail to become immersed will evaluate their game experience negatively [4].

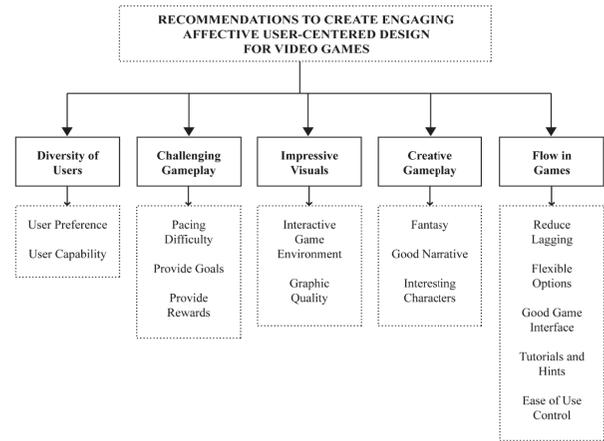


FIGURE 4: List of recommendations to create an engaging affective user-centered design for video games.

Thus, it is essential to pay attention to all types of player when dealing with affect and emotion. Fortunately, LBP2 is playable for all types of player. In the domain for diversity of user, there are two general areas: (i) user preference and (ii) user capability.

6.1.1. User Preferences. The work done by Sacranie [35] highlights the difficulty in measuring user emotion due to the users' preference in the video game. It appeared that all users have their own preference of game genres and game titles they have played. Players hardly play from a single genre as they crave for variations in the video game market. Users taste in video games is always changing. However, users do show loyalty to games that are reputable and provide good gaming experience, as mentioned by Liu, Li, and Santhanam [36].

6.1.2. User Capability. In Gilleade and Dix's [7] work, users' capability must be taken into consideration to ensure the game flows smoothly depending on their motivation, skills, and experience. In addition, Khalid [34] also mentioned that there are certain individuals who possess the need to showcase their skills in games and constantly looking to improve their skills. Based on the observation, expert players seemingly mastered the controls quickly after a few attempts. For amateur and intermediate players, it depends on how fast they can learn to memorise the controls. However, there are cases where expert players have trouble learning the controls if they are playing an unfamiliar different game platform or game genre.

6.2. Challenging Gameplay. The findings have revealed that challenge is an important element in gaming, especially towards motivation. Another reason why challenge is important is because it inspires users to improve themselves until they become masters of the game. The game loses its replay value when the user feels unmotivated to continue playing the game anymore. For challenging gameplay, there are three

general areas of interest: (i) pacing difficulty, (ii) provisions of goals during gameplay, and (iii) provisions of rewards.

6.2.1. Pacing Difficulty. The work done by Desurvire, Caplan, and Toth [37] as well as Juul and Norton [38] highlighted the importance to vary a level's difficulty gameplay to ensure user faces good challenge while developing mastery in gameplay. Thus, it is important to vary a level's difficulty to ensure the user faces a good challenge while developing mastery in the gameplay. However, they should not experience losing streaks all the time because it will discourage them and eventually quit the game as they are unable to progress further.

6.2.2. Provide Goals. Malone's [39] work emphasized strongly that games without goal are less enjoyable than games with goals. This is supported along with Pagulayan, Keeker, Wixon, Romero, and Fuller [23] work where the main aim in games is to experience everything in it but Desurvire, Caplan, and Toth [37] highlighted the importance of introducing the goals in early stage of the game and should be identified effortlessly. Besides that, secondary goals or minor objectives such as bonus levels should be presented to help the players achieve a further sense of positive affect [40]. It is essential to provide game objectives to the players especially if they are meant to explore the entire game world because players may easily get lost in the game. When a user fails to know how a challenge is to be completed and his progress in reaching the given goal is impeded, his frustration level will start to arise. Gilleade and Dix [7] call this in-game frustration.

6.2.3. Provide Rewards. Rewards such as power-up, level-up, weapons, armour, and many more should be provided to draw players more deeply into the game and to keep them inspired to return to play [23, 37, 39]. The reward should have the same value as the player's efforts in obtaining it. As the player's character grows stronger, they will need to unlock more capabilities to expand their skills in order to beat the next level. However, it is important to consider that users can eventually become bored once their character reaches the maximum point of its potential and can no longer grow further. This mainly applies for online hard-core levelling games.

6.3. Impressive Visuals. According to Gilleade, Dix, and Allanson [13], the advancement in the design and aesthetics for games has allowed gaming to produce a more honest emotional experience to the users. Therefore, games should be made as appealing as possible to draw more attention. Visual plays an essential role in capturing people's attention because it is the first thing that they see. For this aspect, there are two general areas of interests: (i) interactive game environment and (ii) graphic quality.

6.3.1. Interactive Game Environment. According to Bidarra, Schaap, and Goossens [41], human beings are strongly influenced by their environment. Current games are striving to provide a richer gaming experience; thereby improving game environment is essential. In addition, Malone [39]

emphasized that the game environment must be novel and surprising but not entirely incomprehensible. It should provide an optimal level of informational complexity just enough for the players to know what to expect while evoking their curiosity. This was supported by the interview and observation findings. Majority agreed that an interactive game environment can improve the overall gameplay because it creates suspense in the gameplay. Gilleade and Allanson [32] also added that game must be able to respond to the players' existence within the game environment. Nonetheless, Norman [11] stressed that players should devote their time and effort towards mastering the game by enjoying the presentations and exploring the whole game domain rather than spending time mastering the controls.

6.3.2. Graphic Quality. In today's contemporary world, high-quality games are likely to sell better according to Davis, Steury, and Pagulayan [25]. Not only it keeps players engage on the gameplay, but also it allows gaming to produce a more honest emotional experience to the users. This is supported by majority of the interviewees and participants. They agreed that game graphics and animations have enhanced greatly over the years and it is one of the game industry's greatest achievements. According to them, it seemed that every game platform is having a console war as the console has the most impressive graphics. In this modern gaming era, it is unacceptable to have bad graphics. People do not want to play the game that has bad graphics because it is unappealing. Moreover, as Picard [27] stated users tend to feel good when they see something that they like. Therefore, impressive game visual can attract players to play the game because it provides them mostly positive feeling.

6.4. Creative Gameplay. Malone [39] emphasized the importance of creativity, strong aesthetic, and psychological sensitivity to create more interesting, enjoyable, and satisfying games. Creativity is identified as one of the important main design aspects in affective gaming because it gives users a completely different experience for every game they play. Video games are always innovating [42]. Creativity also aids in making a game more unique than the other. It offers the players a chance to imagine more. For creative gameplay domain, three general areas emerged: (i) fantasy feature, (ii) good narration, and (iii) interesting characters.

6.4.1. Fantasy Elements. In Malone's [39] work, he stressed that fantasy is an important game feature and it assists a game's routine tasks to be more enjoyable and not repetitive. Majority of the participants disliked playing repetitive gameplay because it tends to be meaningless and boring. In the observation study, all of the participants agree that LBP2 has a strong fantasy element which made the entire gameplay enjoyable, refreshing, and unique. Some of them pointed that a game without fantasy is not really a game, because it is not possible for games to follow the exact facts. Besides that, the main reason why people play games is because they want to explore a world that cannot be found in the real world. However, it is not necessary to have a fantasy or unrealistic

environment to catch the user's interest. Malone [39] advised that the game designer needs to be careful when choosing a fantasy that appealed to their target audience.

6.4.2. Good Narrative. Pagulayan, Keeker, Wixon, Romero, and Fuller [23] stated that every game has a story and game designers should approach the storyline the same way as the conventional authors approach it. Players could not imagine a game without a story because the story is the main factor that drives the gameplay and other elements in the game. Many [6, 43, 44] support that while game narrative is not consistently connected with its nature as a game, it still conveys values to the player which may shape their gameplay and allows them to become emotionally involved with the trials of the game character. This type of fundamental understanding can help assemble the aspects of a true video game.

From the findings, it appeared that the story can bring both great moments and bad moments to the players. Narrative drives players to keep playing further into the game because they are interested to know the ending and to unlock new stories. This statement is supported by all the interviewees. They also believed that the story can affect a good game and the user's experience.

6.4.3. Interesting Game Characters. In recent video games, the game developers provide players a much deeper insight of the character background. In Bidarra, Schaap, and Goossens' [41] work, they believed that game characters' unique traits and emotional behaviours can enhance the interaction level between the players and the gameplay. There are three main reasons why players are attracted to the game character. Firstly, the character's personality or life story may be very much alike with the player. Secondly, the player may find the character fascinating. Thirdly, the players are interested in the character's growth and development during the course of the game. It appears that both interviewees and participants from the observation study share the same opinions as above. Moreover, since users are in control over their characters, they tend to feel attached to the characters and become emotionally involved. According to Horsfall and Oikonomou [43], players look for in-depth characters that they can relate to. This definitely affects the players' emotions and their gaming experience in the game.

6.5. Flow in Games. Csikszentmihalyi's [45] notion of "flow" is a state of deep concentration, enjoyment, and total absorption in an activity. Many [11, 34, 40, 46] shared similar views that any game which facilitate flow will be successful because it generates a positive effect, where players have deep involvement and enjoyability during gameplay. For this particular domain, known as flow, five areas of interest emerge: (i) reduce game lag, (ii) flexible options, (iii) good game interface design, (iv) game tutorials and hints, and (v) easy-to-use controls.

6.5.1. Reduce Lagging. According to Johnson and Wiles [9] work, a common mistake in game design is to make the user

wait. Users should not encounter any pauses or interruptions during gameplay because it might allow time for self-reflection [47]. Lagging is one of the major factors that can easily destroy the game flow and the gaming experience. It appeared that all interviewees agreed that lagging can be very inconvenient especially when the gameplay suddenly does not run as smoothly as they wanted. They will eventually become annoyed and likely to quit the game because they cannot progress further, for instance, after confirming all options and selections at the end of every game event, which was also mentioned by Johnson and Wiles [9]. One of interviewees suggested the loading should be of a more simulative kind where the players can feel that they are not pulled out halfway from the game. This is supported by Whitson, Eaket, Greenspan, Tran, and King [47] where they considered loading screen as one of worst offenders for self-awareness. In terms of multiplayer games, players will appreciate a swift loading time especially if they wished to quickly log in and out of a game.

A majority of interviewees also found that Artificial Intelligent (AI) must be able to respond well if it is designed to aid the player in the game. If the AI responded poorly and interrupted the player's game instead, then it will spoil the whole gaming experience. AI supporting characters are important because they help provide guidance and aid to the player throughout the game.

6.5.2. Flexible Options. Several authors [13, 34, 48] highlighted the importance of allowing the player to customize the game settings in order for the game to accommodate their individual needs. If all the options in the game are prefixed, it can be a dull experience for the players. From the game developer perspective, they preferred to provide more customization options to suit every player's needs because they do not know what the players want most of the time. In terms of challenging gameplay, there should be an option to choose a different level of difficulty to allow both amateur players and expert players a choice where they can enjoy the gameplay at their own level of skills [13, 34]. The interviewees who are expert gamers shared a similar view as well. Besides that, it is convenient to have difficulty settings for players who are only interested to know the game narrative and experience the gameplay.

From the findings, there should be an option to skip noninteractive content, i.e., cutscenes, especially if players are to play the game repeatedly. Several interviewees emphasized the importance of having the option to save anywhere or anytime in the game. Players do find it a hassle when they have to go only to certain places to save their games especially games that have long hours of gameplay.

6.5.3. Good Gaming Interface. It is also important to design a good usable game interface [5, 39] to create a compelling experience and provide an overall positive effect on the quality and success of a game. Good games are meant to make tasks easy but at the same time it has to make them difficult enough for players to compete. Games with poorly designed interface are difficult to use and may easily cause players to

be aggravated. A player should experience a consistent user interface but it should be unobtrusive to the player [37]. The interface can include menus, status bars, field of view, and controller buttons.

Based on the findings, players do not mind the interference if it is important or intended in the game. However, they will be frustrated if they are interrupted often especially when they are doing something important in the game that requires their full attention. Thus, the interviewees suggested that the game should have an option to close any task bars or the game automatically pauses when the notification appears for the players' convenience.

Johnson and Wiles [40] also stated that it is important to design a game menu interface with visual consistency and readability to provide convenience for the players to make their selection in the gameplay. Desurvire, Caplan, and Toth [37] asserted that menu layers should be well organized and simple. Many of the interviewees shared the similar view as well where a fluent and organized menu design is essential because it provides convenience for the players to make their selection.

Besides that, the field of view (FOV) is another important aspect in games according to Pinelle, Wong, and Stach [48]. Field of view allows the player to observe the game world to a certain extent on display at any given moment. All the games should allow more flexibility in camera angles rather than prefixed camera. Poor camera angles can ruin the whole gameplay because it is inconvenient and frustrating if the player's FOV is restricted during a critical moment.

6.5.4. Tutorial and Hints. Games required its players to develop a conceptual understanding of the rule of use due to the complexity and steep learning curves [23, 25] pointing to tutorials and help systems within the game interface. Majority of the interviewees also have a similar view that tutorials and training are crucial especially for complex games, or a new genre, new gameplay element, or something unfamiliar. From the observation study, a majority of the participants found the tutorials and training sessions were provided in LBP2. It appears that some of the participants found LBP2 tutorials very enjoyable as they had fun learning the controls and exploring them. Skills that players expect to use later or right before the new skill is needed should be taught early [37]. As the players explored further into the game, the tutorials are slowly disabled because at some point they should be quite familiar with the gameplay.

Lastly, Pinelle, Wong, and Stach [48] also stressed that players should have access to a complete documentation of the game, including how to interpret the visual representation and how to interact with the game elements. Almost all of the interviewees feel that helps or hints should be provided whenever the player is lost in the game. Although a majority of the participants saw the hints provided in LBP2, there were some who were not aware of them because they were solely concentrating to finish the level. One interviewee suggested that when a player gets stuck or stays at one place for too long, the system should eventually learn that the player is unsure of their next objective. Then, a nonplayable character (NPC) will

show up to prompt the player of what they are supposed to do. This helps to keep the players back on track in the game.

6.5.5. Easy-to-Use Controls. Johnson and Wiles [40] asserted that the lesser cognition required for remembering input commands, the better concentration and engagement the player has, thereby generating a flow while completing the task. If the control itself is complex, even experienced players may take a while to actually learn and become familiar with the controls. According to the interviewees, it depends on the players' experience as well. This has been explained earlier in the users' capability section. Experienced players tend to pick up the controls fast, whereas nonexperienced players might take a while. This was proven during the LBP2 observation study. Overall, the majority stated that LBP2 control was easy to pick up and they were not required to remember many commands. Besides that, a few participants believed that once the players were familiar with the gameplay, they can eventually guess the controls.

7. Mapping with Other Researcher's Work

All fifteen recommendations were mapped against other researcher's work for comparison, as shown in Table 4. This mapping is to ensure that this study has contributed to the field of research and provide a more holistic view on affective user-centered design (AUCD) for video games. Five research works were selected based on their similarity to this study that is to form a set of guidelines for engaging video games. The "tick" in the table (Table 4) means that the AUCD recommendation is covered by other researcher's work under one of their game design categories.

Desurvire, Caplan, and Toth [37] have presented a heuristic to evaluate playability (HEP) for games which is helpful in early game design and user studies. However, there is a lack of in-depth studies on the user preference and user capability which is important for user studies. In addition, fantasy element and reducing lagging in games were not included in their HEP guidelines. Johnson and Wiles [40] research have explored many components of flow in games that can inform affective design as well as highlighting the importance of cross-platform differences in audience and game style. Their research more or less covered majority of the recommendation except for graphic quality, game tutorials, and game narrative and characters. Malone [39] research work has presented a checklist of game design features to design better user interface for engaging games. Malone's work emphasizes the importance of creativity and strong aesthetic in the interface. Although his work was chosen as one of the main references for this study, there are some recommendations he did not cover in his research such as the game narrative, lagging in games, game tutorials, and game controls. Pinelle, Wong, and Stach [48] research work introduced a set of heuristic to identify usability issues in early game. However, their research mainly focuses on the usability principles for video games. Thus, their research did not cover most of the recommendations which are the user studies (user preference; user capability) as well as the game visuals

TABLE 4: Mapping with other researchers' work.

List of affective game components	Desurview, Caplan and Toth (2004)	Johnson and Wiles (2003)	Malone (1982)	Pinelle, Wong and Stach (2008)	Sweetser and Wyeth (2005)	Ng, Khong and Nathan
Player Preferences		✓	✓			✓
Player Skills		✓	✓		✓	✓
Pacing Difficulty	✓	✓	✓		✓	✓
Goals	✓	✓	✓	✓	✓	✓
Rewards	✓	✓	✓	✓	✓	✓
Interactive Environment	✓	✓	✓		✓	✓
Graphic Quality	✓		✓			✓
Creativity		✓	✓		✓	✓
Narrative	✓				✓	✓
Characters	✓		✓		✓	✓
Game Interface	✓	✓	✓	✓	✓	✓
Ease-of-User Controls	✓	✓			✓	✓
Tutorials and Hints	✓				✓	✓
Reduce Lagging		✓				✓
Flexible Options	✓	✓	✓	✓	✓	✓

(interactive environment and graphic quality) and game creativity (fantasy, good narrative, and interesting characters) for video games. Similar to Johnson and Wiles [40] research work, Sweetser and Wyeth [49] also focused on the flow components in video games. They presented a game flow model which aims to build understandable and enjoyable games. However, their work did not cover the user preference as well as graphic quality and reducing lag in video games.

8. Conclusion and Further Work

This paper hopes to clarify the principles and elements of affective user-centered design in gaming that can improve the interaction between the users and video game design components. The overall findings here served to assist game developers in enhancing and creating better quality games. The summary presents a comprehensible clarification of affective user-centered design for video games that will greatly aid game designers to identify the affective problems early on in the game design process.

There are several limitations of this study. Firstly, there were limited sample sizes. However, according to Miles and Huberman [50] as well as Creswell [42], it is typical for qualitative researchers to work with few individuals or cases because larger number of people or cases can become unmanageable, which might result in superficial perspectives. Validity can be strengthened by increasing the sample size with as many conditions of the research. Secondly, this research was firmly grounded in the assumption that the participants' gaming experiences and emotional responses were affected by the game design components of the video games that they have played throughout their life. However, according to Picard [51], it is crucial to always draw

assumptions on the affective and emotional state of the users regardless what they are feeling exactly. Lastly, the limitation in the observation method was that participants were observed in a short amount of time. Observer can only observe and review the participants within a time period. If the time is given longer, participants' feedback and their gaming experience may vary, and the observation on the users' affective state could be more in depth.

The research results also suggest a few implications. However, each of these implications should be considered in light of the research limitation and should be tested further. First of all, researchers should consider popular games as a legitimate site of study for researching users' affective state and gaming experience. This is because contemporary and popular video games are known as the representative of the current state of the art [6]. The results of the research suggest that the participants' affective state changes depending on the design component in the game. Popular games can be used as contexts to evaluate how users feel and how they react while playing which helps to determine whether the current gameplay design is good or bad. Next, game designers should understand that players may play and react differently from what they intended of them. There are some unquestionable explanations on how users make their decision and play a game in their own way. Therefore, it is important to understand and learn how players work through the levels and what inspires them into the course of action and react the way they did. Finally, video games in general may provide insights of individual personality and interest. By understanding deeper the relationship between affective emotions in gaming, it is possible to gain insights of the users personality and interest. When participants expressed their dislike, desire, and opinions on video games, they are partially exposing their interest as well. However, whether they apply

in real-life it is still unanswered, but hopefully gaming will one day aid in approaching this study.

We hope that other researchers and practitioners from the HCI community and game industry will continue to pursue this list of recommendations in the future using alternative game genre or game platform to further probe its efficacy and limitations. Further studies in understanding the components of game design that affects user's behavioural and emotional state are necessary as the design of user experience become increasingly important in the development of video games. In addition, we foresee more work in the future in affective user-centered design employing mixed-methodologies and multidisciplinary approaches to obtain a more reliable assessment.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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