Development of the Player Satisfaction Scale - A Factor Analytic Study

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Abstract. To develop a scale of player satisfaction in simulation and games, an instrument of 30 statements was first developed. The initial pool of 658 responses (undergraduate students and others) was purified by rejecting 61 duplicate and incorrect responses and two inappropriate statements. The data from the remaining 597 responses and 28 statements were processed for factor analysis. Five factors each of eigenvalue more than 1 were produced at high reliability of Cronbach α of .93. The factors were named excitement, challenge, learning experience, team victory and self-discovery to represent the statements that comprised the factors. The study found no impact of gender and category on player satisfaction. This paper discusses the nature of the factors of player satisfaction and their potential utility in further research and applications.

Keywords: Challenge · Excitement · Learning experience · Player satisfaction · Self-discovery · Team victory

1 Introduction

The success of some kinds of games depends on the satisfaction of the players. The satisfaction affects their emotional attachment to the game. It drives their repeated use of the product and encourages them to recommend it to others. Player satisfaction emerges from expectations of utility, value and quality of the product features and the game experience. Therefore, satisfaction is an important consideration in game design, development, use and sales. For video game players, satisfaction is 'the degree to which the player feels gratified with the experience while playing a video game' [1].

Playing games is attractive because it offers diverse experiences [2]. Some games offer a learning experience while others offer problems to solve. Some games offer an artificial scenario that could be engaging and far from reality, yet captivating its players. Because of the inherent entertainment in some games, the experience is a diversion for players. Generally, the player experience is comprised of their thoughts, feelings and interactions with other players which motivate and shape their gameplay.

The games and simulations have common characteristics of design and facilitation and similar objectives such as entertainment and learning. This study applies to both of them. Henceforth, the terms 'games' and 'simulations' will be used interchangeably in this paper.

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1.1 Player Satisfaction is an Experience

The satisfaction of 140 students in an enterprise business management simulation game was influenced by their participation and grades from their relative overall performance (net profit) in the game [3]. In an online course, the students' satisfaction is due to their self-motivation, learning style and actions, the course structure and their interactions and their teachers' competence and behaviour [4]. These reasons may also be true for a serious game where the objective of play is only to learn.

Player satisfaction derives from the perceived benefits such as entertainment, pleasure, challenge, interest, ease of use such as conveniences of consistency, flexibility, navigation, documentation and authenticity from play [5]. The players' experience is affected by the suspense, narrative and competitiveness in the game [6]. Their self-efficacy in action, performance, convenience in play, control over game features and actions, and their fantasy-based relationship with the game characters enhance or reduce their satisfaction with the game. Their ease of use of the game features also drives their satisfaction. The learning satisfaction in a marketing simulation game can be a proxy for their learning effectiveness and outcome in the game [7].

Player satisfaction may be derived from clashing with opponents, overcoming difficult challenges, learning and practising new skills, achieving personal and team goals and winning competitions and battles [8]. The nature of games varies in terms of their artificial environment, the kind of problems posed to the players, their skills and actions, the nature of their social interactions with their team members and competitors, and the pace at which the challenges and stages maintain the players' interest in the games.

Player satisfaction is related to game complexity, expectations of success and players' performance in the games. It is an outcome of resolving problems or completing tasks and is reflected in the players' rising self-esteem. Players seek success through their gaming actions and choose challenges that are appropriate for them to address with their abilities and actions to win the game [9]. Both their expectations and actions are based on their evaluations and therefore, their satisfaction is an experience of fun, enjoyment and feelings of accomplishment.

Interactivity in play is one of the most powerful factors in player satisfaction, irrespective of any other form of motivation [10]. When the players' need for excitement and stimulation is high, their enjoyment is high, but only when their interactivity is high. When their need for interest and engagement is high, their enjoyment is high irrespective of the level of interactivity. Similarly, rising levels of interactivity address and satisfy their needs for competence (the feeling of capability) and autonomy (the freedom to behave independently) and thus, help them enjoy their game experience.

Player satisfaction develops from the feelings of mastery (ability to overcome challenges) and control (freedom to choose and act). Collecting points, deploying resources, defeating competitors and reaching tougher stages of the games are some tasks that arouse players' actions leading to their fun and enjoyment in games. Their actions in the game generate their self-efficacy experience which predicts and shapes their enjoyment [11].

1.2 Satisfaction in Online, Video and Other Electronic Games

The satisfaction of online game players is determined by the reliability, responsibility, assurance and empathy perceptions of the service quality of the game [12]. Touchscreen players are satisfied with their feelings of pleasure, achievement, involvement, game design elements of story and interactions and game process and delivery [13]. Their experience could be measured by their satisfaction, ease of task completion (movement or other actions within the game) and ease of controls, such as keyboard and other tools.

Video gamers are satisfied due to usability, playability, narratives, enjoyment, creative freedom, audio and visual aesthetics, personal gratification and social connectivity of the games [14]. While earlier research had found immersion, fun, aesthetics, motivation, engagement, presence, flow and enjoyment in games to be factors and facets of game satisfaction, some terms like immersion and engagement had multiple definitions and different meanings. Consumer videogame engagement was conceptualised as a state of interactions between the consumer and the product that produced cognitive, affective and behavioural types of consumer engagement [15]. Game engagement was found to be a composite of three constructs with two factors each, viz., cognitive engagement (absorption and conscious attention), affective engagement (dedication and enthusiasm) and behavioural engagement (interaction and social connection).

Satisfaction is derived from expectations of utility and value and quality of the product features and is a sign of the users' intention to buy and use the product again. Pokémon players' satisfaction was affected by their feelings of flow, such as challenge, control, curiosity and concentration and their expected service quality in terms of the immediacy of information and responsiveness of the entertainment services [16]. A study of 244,360 reviews from 6,170 video games in nine genres such as adventure, racing and strategy showed that satisfied gamers played the games repeatedly and recommended them to others [17].

A study of 353 video gamers using the game user experience satisfaction scale (GUESS) [15] found that their desire to play the game could be seen in their curiosity, eagerness to win, desire to experience a fantasy role or story in the game, solve a problem, use intellectual abilities and connect with others. Players with a need to compete, interact and imagine and like fancy worlds would be more satisfied than others. Those who experience high satisfaction may play the game more often. Some frameworks of game experience have components such as challenge, sensation, curiosity, absorption, concentration, motivation, arousal, fantasy, discovery and interaction [18].

From the review of literature, player satisfaction may be defined as a range of experiences that may include ease of use, freedoms and controls, participation, performance, competitiveness, interactions and learning. For online and related game players, the satisfaction may be affected by their engagement, narrative, discovery, fantasy, sensation, need to compete and win, immersion and game features and aesthetics. Thus, player satisfaction is a product of several forces such as the nature of the game, players' expectations, perceptions and behaviour and the learning, competition or other objectives of the game.

1.3 The Objectives of the Study

Much of the foregoing review of literature showed that no research attempted to develop a meaning of player satisfaction in games except in the domain of electronic games. Player satisfaction appears to be a multi-dimensional construct with many sources, explanations and perceptions. A deeper understanding of player satisfaction may guide the design and development of more satisfying games. Therefore, the objectives of the study are:

1. To develop a scale of player satisfaction in games
2. To identify the factors of player satisfaction
3. To study the effects of player gender and category on player satisfaction.

2 Method

2.1 The Instrument

From the review of literature, several feelings representing player satisfaction as experiences at the end of a game were identified and simplified. After a preliminary scrutiny, the feelings were converted into statements and were tested for ambiguity, simplicity, repetition and grammar. The new list of statements was then reviewed by other faculty for the statements' logical links to player satisfaction. After receiving the observations of players of some games, a few statements were combined, while some others of similar themes were restructured and relocated within the instrument. This pruned list had 30 statements which were finally reviewed by the authors in comparison to the objectives of the study. The statements were scored from 1 to 5 with 1 for 'least agreement' and 5 for 'highest agreement'; a 0 (zero) option was added for 'not applicable'.

To this list, cells to enter the respondent's name, gender, age and other demographics and names of games played by the respondent were added. Respondents were also invited to discuss their experiences with the authors. This instrument was then transcribed into the Google Forms page. It was again scrutinized by the authors till no further error was found.

2.2 The Respondents

The instrument for data collection was emailed to more than 1,550 students (undergoing graduation and post-graduation in engineering and management) and others who were not students. Students and others were treated as two separate categories for the study. Responses were received from 658 survey recipients (42.45%). After a visual examination of the data, 61 duplicate and incorrect records were rejected and 597 records were processed. The sample had a mean age of 20.57 years with a standard deviation (SD) of 5.03 years. The age of 549 students was in the range of 17–26 years while age of 48 others was in the range of 21–59 years (Fig. 1).

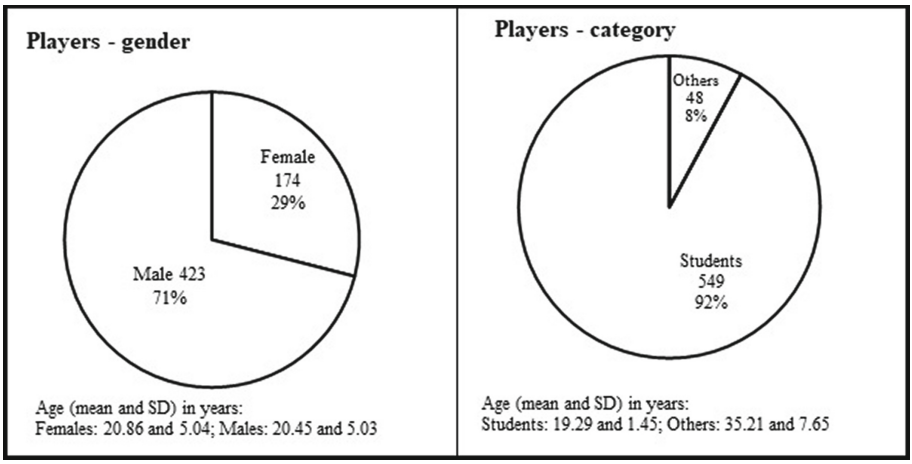

Fig. 1. Players: Age, gender and category distribution

2.3 The Procedure

The instrument was communicated to the prospective respondents in May and June 2021 along with an appeal for their cooperation. After a fortnight, the survey was closed and the data were processed using SPSS 21.0. To understand the players' responses to the instrument, the first author interviewed approximately 5 percent of the sample after the consents of the respondents were received. The respondents were asked to name their favourite games, to explain why they played games and to describe what they learnt from playing games.

3 Results

A reading of the completed forms showed that chess, ludo and sudoku were the most common indoor games, while rummy was the popular card game. Cricket was the leading outdoor game; Volleyball, football, badminton and basketball were also liked but less popular outdoor games. PUBG was their favourite mobile game. Athletics was also mentioned as a popular game by many respondents. Thus, the respondents had played a wide variety of games.

The statements #15 ('I felt sad when it ended') and #16 ('When I played alone, my confidence increased') were dropped because of their insignificant correlations with the total. The factor analysis processed the remaining 28 statements in the instrument and extracted five factors each of eigenvalue more than 1 that explained the variance of 53.53 percent. The KMO measure of sampling adequacy of .95 and Cronbach α of .93 of the results confirmed the reliability of the instrument. Bartlett's test of sphericity was highly significant ($\chi 2\ (378) = 6496.24$, $p < .000$). The factors were named excitement, challenge, learning experience, team victory and self-discovery after considering the relative weights of the statements comprising each factor (Table 1).

Table 1. Player satisfaction: Factors and their respective statements and loadings

	Loadings				
	F1	F2	F3	F4	F5
Factor 1 (F1): Excitement					
23 I liked the way the game was organised	.65				
24 I will cherish the outcome of the game for a long time	.62				
25 I liked the game structure	.56				
21 It was an exciting moment to conquer the competition	.55				
5 It was exciting to recall the game events	.53				
18 I was relaxed due to the presence of my team members	.52				
26 My memory goes back to the post-game experience	.49				
19 I was excited even after the game had ended	.48				
Factor 2 (F2): Challenge					
17 I was happy that I will remember the game experience for a long time		.28			
20 The game prepared me to face bigger problems in the real world		.65			
8 I understood many things that I did not know before		.63			
14 I am now ready to face new problems		.62			
7 I discovered that I could overcome difficult problems		.58			
22 I am glad that I know more after the end of the game		.51			
Factor 3 (F3): Learning experience					
1 I felt elated			.69		
2 I learnt how to confront problems			.56		
3 As I played more games, my satisfaction increased			.53		
6 The game experience was thrilling			.49		
4 In team games, we talked a lot			.46		
27 It is worth playing such games			.41		
Factor 4 (F4): Team victory					
12 I wanted to win, and I did				.73	
10 I am glad I won				.73	
11 I learnt from other members in the team				.57	
13 Everyone's communication had something valuable for me				.50	

(*continued*)

Table 1. (*continued*)

	Loadings				
	F1	F2	F3	F4	F5
9 I am happy that I helped my fellow team members in the game				.48	
Factor 5 (F5): Self-discovery					
29 Every time I finished playing a game, I wanted to play it again					.71
30 Playing such games gave me recognition					.66
28 I discovered myself every time I played the game					.59
Eigenvalues	9.98	1.54	1.28	1.17	1.02
Percent of variance explained	14.80	10.36	10.14	9.34	8.89

The factors showed highly significant and positive correlations with each other (Table 2). The results suggest that player satisfaction is a multi-dimensional construct composed of factors closely associated with each other.

Table 2. Player satisfaction factors: Descriptives and correlations

	Mean	SD	F1	F2	F3	F4
F1 Excitement	27.68	7.38	1			
F2 Challenge	20.91	5.65	.70	1		
F3 Learning experience	20.35	5.54	.70	.66	1	
F4 Team victory	18.41	4.74	.64	.62	.63	1
F5 Self-discovery	10.27	3.33	.62	.58	.51	.48

All correlations are significant at the 0.01 level (2-tailed)

The sample groups were based on gender (female and male) and category (students and others); z tests were conducted to determine the differences within the groups. Player satisfaction did not significantly differ within the gender and the player category for the construct of player satisfaction and its factors.

3.1 Interview Results

Only 21 students, not the others, volunteered for the interview. Here are two responses (edited for brevity):

Student 1. *Plays only online games (3–4 h a day). Learning experience: playing within a team (PUBG), coordination, strategy, leadership, role, guiding others, patience, and how to deal with failure.*

Student 2. *Plays only online games (4–5 h a day). Likes simulations and plays for pleasure and competition. Online games are better because time moves faster and learning is faster. One can learn from a chemistry simulation within hours as against a lab exercise that may take a week or more. Learning experience: strategy, repetition, failure, learning, making decisions, solving problems through trial and error, never give up, and learn and act under pressure. We need more S&G, and games must show reality more often.*

Twelve more respondents filled the instrument with their feedback, although they did not offer to be interviewed. Three observations (edited for brevity) are shown below:

Student 3. *Every game brings a chance to enhance skills and do well. Through watching scrims and all I come to learn that we can learn through seeing others the way they practice and exercise their skills and perform.*

Student 4. *When I play games it relieves tension, and there is a different kind of excitement. Especially, the Single-player computer games are really good. They have this cinematic experience, making use of all sorts of modern technology, and they are more immersive.*

Student 5. *After corona came in March 2020 and lockdown happened. Since then, I am here in my village and I am playing cricket for two hours daily for the last one and a half years. We play even when it is raining and I can proudly say that after every day's play, I feel absolutely energetic. Those two hours of play give me the strength to face the world (right now virtually) for the next 24 h, and it's not that we only play cricket, we talk a lot, we make fun of each other a lot and we enjoy every moment of the time that we play. The satisfaction which it gives to me, I cannot say it in words. Now, even after playing for this much time, every day I feel the same energy to go there and play. Even when I go out to the town to do some of the housework that my family gives me, I try my best to finish the tasks and come home before 16:30 so that I can play. And this also gives me the courage to overcome the negativity going around in this tough time. And lastly, I feel so much better mentally and physically.*

Out of the 33 interview and feedback respondents, 25 said that they played for the competition, excitement and relaxation without specifying any learning as a goal or an achievement.

4 Discussion

The study created, reviewed and administered an instrument of player satisfaction for over 1,550 potential respondents. From 597 valid responses and 28 valid statements, it achieved the first study objective by developing a scale of player satisfaction in games of adequate statistical reliability.

4.1 Factors of Player Satisfaction

The second objective was achieved when five factors were extracted from the respondent data and named as excitement, challenge, learning experience, team victory and self-discovery. For a better understanding of the results, these factors and their relevance to the study objectives are discussed below.

Excitement. Excitement could be measured to represent the changes in the expectation of victory during the game. Higher scoring rates, clashes between stronger teams, swings during the game and proximity to an expected win enhance the excitement in games such as soccer [19]. It may be seen as the probability of winning and could be codified and mathematically expressed as a formula for use in games such as tennis and golf [20]. The simulation is an active learning mechanism that engages students by evoking intrinsic interest, enjoyment, confidence, understanding, self-efficacy, enthusiasm and excitement for their course [21].

Excitement is an emotion that is characterised by feelings of elation, exhilaration and enthusiasm. Like any emotion, it influences decision making and communication and is an active and powerful ingredient in gamification [22]. Within groups, it is a product of interactions such as in games that may further enhance engagement and cohesion. Both hope and fear generate excitement in the form of uncertainty, pleasure, anxiety, suspense and nervousness during the game [23]. The results may produce other emotions such as annoyance, dissatisfaction, elation, relief, anguish and disappointment as different forms of excitement at the end of the game.

Challenge. A game is a set of problems that provokes players into action. Players may be more inclined to challenge and solve problems due to their experience in difficult situations, their conviction to solve problems, resilience, self-esteem, self-efficacy and determination to act. [9, 24]. A game evokes and retains the players' interest when it offers challenge, fantasy, control and curiosity. Game features include difficulty levels, points, badges and goals to challenge the players [25].

Successful problem solvers confront, learn from and enjoy challenges. They are extremely curious about new and difficult environments, ready to investigate problems from all angles, prepared to seek ideas and advice from others and eager to experiment for better results [26]. Problems can be solved effectively by using a broader lens for perception and understanding. One view of this lens may see problems as networks of people connected by trust, relationships and interactions. Another could be the evolution of groups of people, things and others connected by problems, decisions and behaviours. A systems view may see an information system of objects and resources connected by their features, flows, costs and applications. These views shape mindsets to choose one or more of these views to solve problems [27].

Learning Experience. Significant improvements in learning outcomes can be achieved even from small improvements like aesthetic features (such as graphics and music in a video game) in game design [28]. Quizzes and other gamification elements provide feedback that enhances engagement, learning outcome, motivation and subjective satisfaction [29]. Games that use different kinds of assignments and gamification markers such as badges and scorecards increase player motivation. Such actions would influence player performance to produce better learning and satisfaction.

The players are more engaged when they solve problems in the game because their actions enhance their learning and retention [30]. Learning is the product of interactions and experiences in a business simulation game where the players understand business goals and how to compete and collaborate and become aware of business and selling skills [7, 31]. This learning is possible due to the design of the game, the game documents,

the facilitation during and after the game ends and the problems solved by the players during the game.

Team Victory. Group conditions such as size, heterogeneity, status, empowerment and climate and group interactions such as discussions and leadership affect the satisfaction of team members [32]. The players' task satisfaction would be affected by the team's levels of task satisfaction and vice versa.

Heterogeneous teams with members of diverse backgrounds and opinions perform better in a cohesive environment of psychological safety for their members [33]. In cohesive teams, their members are focused on and interact with each other towards the goal, share information and opinions with other members of the team without fear or embarrassment and trust, assist and depend on each other to resolve their problems [34]. Such teams are more likely to win competitions and therefore, have high levels of team satisfaction [35]. Satisfaction is an outcome when members share knowledge with others in the team and focus on the goal; both are facets of cohesiveness [36]. Therefore, satisfaction is a personal and team result of accomplishing team goals which translate to victories in competitive games.

Self-discovery. Self-examination leads to self-discovery which is the players' determination that dictates and shapes intentions, decisions and behaviour and builds their self-mastery. Thus, their satisfaction arises because they recognize their own and others' strengths and weaknesses and manage them to seek mastery of their environments. Such understanding enables the players to make deliberate decisions and solve problems [37].

Players discover themselves most when they solve tough challenges using their superior skills. The discovery encourages them to learn more, use their capabilities again and attend to more problems to enhance their self-esteem. In this state of flow, the players would feel more active, alert, concentrated, happy, satisfied, creative and motivated [38]. Players discover what they can do when confronted with problems in social interactive environments. They learn to think flexibly by integrating their understanding with other domains under varied conditions. They develop learning and reasoning skills and the maturity for assessing their actions and results. In team games, they construct meaning and learn to communicate, negotiate and share ideas and assist one another [39].

5 Effects of Player Gender and Category on Player Satisfaction

Gender and Category. The absence of the effects of gender and category suggested that both genders and both categories of respondents had similar levels of satisfaction. Thus, no gender or category had more excitement and challenges, better learning experience and team victory, and more self-discovery than the other gender and category. Therefore, game features would not engage one gender or category more than the other.

The interviews and written observations of some students described and confirmed the statistical findings that they played games mostly for excitement and social engagement.

5.1 Limitations

The instrument was administered during the covid19-related lockdown of 2021. Students who normally play outdoor games like cricket and football would not have played them for (perhaps) the previous two months or more. The reduced duration of their playing experiences may have diluted their responses to the instrument.

The study covered a variety of games where the fun, engagement, enjoyment and excitement experiences were generated from high levels of participation and interactivity. None of the respondents based their survey answers on any serious game. Therefore, the study did not cover serious games whose focus is on the learning of facts and events such as in historical simulations [40] and where the nature and factors of the player satisfaction may be vastly different from the findings of the study.

5.2 Conclusion

The authors developed a scale of player satisfaction based on many games. The scale was built from a survey of 658 respondents of indoor, outdoor, board, electronic and other games. The study extracted, named and discussed the factors of player satisfaction as *excitement, challenge, learning experience, team victory* and *self-discovery* and found that the gender and player category of the respondents did not affect player satisfaction.

5.3 Implications of the Study

The findings of this study may be valid for youth aged 18–21 years because the sample size (n = 549) of students was large and fairly homogeneous (mean = 19.29 years, SD = 1.45 years). The sample of others (n = 48) was relatively small and more heterogeneous (mean = 35.21 years, SD = 7.65 years) than the student sample; therefore, extending the findings to older others may not be suitable.

Researchers may study the nature of satisfaction and its antecedents throughout a game because the player's satisfaction would change during play. The findings may be useful and interesting to game developers so that they can add the appropriate features to generate satisfaction at desired stages in the game. An index of satisfaction may help to measure and understand it better than before as in the case of excitement [19].

Researchers must use measures, such as the number of times or hours that players played the most satisfying games as an objective and reliable assessment [20]. The study used players' self-reports as measures to assess their perspectives about their satisfaction. While it was convenient to capture their playing experience as perceptions, their subjective responses may not have been fully factual. Therefore, the frequency of play is a better pointer to satisfaction than self-reports [41].

Researchers must develop scales of player satisfaction for specific games like chess and football. Players would face different kinds and levels of engagements, emotions and satisfaction as experiences even if the games belong to the same genre [41]. Games within the same genre differ vastly in terms of competitive strategy, game modes, design and features.

Game designers and developers must embed the five factors as necessary elements into their games so that players play often and recommend the games to others. The

objective of gamification to entice and keep customers engaged with the game can be served by using features like scoring, rewards and frequent communications. Satisfied customers would then be a sign of business capability to serve its customers and perform and survive in the future [42, 43].

A serious game is a teaching tool that promotes learning and behavioural change, unlike other games where the objective is to challenge and win against competitors. Serious game developers should include elements of challenge, recognition, problems to solve and social interactions in the games to enhance the players' excitement and their learning experience [44]. Serious games must capture and engage the players' attention with elements like fantasy, challenge and adventure to create an enjoyable learning experience [45].

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