Exploring Facets of Playability: the Differences between PC and Tablet Gaming

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***Abstract*–With the advent of mobile devices, game consoles and computers as gaming platforms, the gaming industry is growing at exponential rates. Players are now accessing the latest video game entertainment in more than one digital medium thus expanding a player's game time and making video games the number one leisure choice. If one of the goals of the player is to derive a quality of experience that highlights enjoyment, it is important to understand the relationship between player experience and pleasurable game play, not just in terms of game play, but also, with respect to the gaming platform. This study aims to examine the difference in player experience when playing a video game on a tablet versus a personal computer. By triangulating physiological data of emotional responses using galvanic skin response, heart rate, and subjective-feelings data of facets of player experience, this paper aims to determine whether player experience is affected by two different kinds of gaming input controls, a computer keyboard with mouse, and a tablet touchscreen. Data will be analyzed and reported in future work. This paper provides an overview of the literature survey and methodology.**

Keywords – *Tablet gaming; player experience; gaming platforms; physiological evaluation.*

I. INTRODUCTION

Game designers are constantly challenged to build more sophisticated interactive gaming environments to keep up with players' increasing demand. An interactive player experience provides the user with a hedonic pursuit of stress relief, cognitive challenges and enjoyment [1]. This interactivity allows the players to experience the narrative at their own pace and as such contributes to immersive features in the gaming environment. The gaming platform affects interactivity as the controller connects the player with the gameplay [2]. Facets of Playability are used to measure and evaluate the interaction experiences between the game and the player [21]. Player experience is a consequence of the interaction experiences. Flow state is an important factor for a player to attain optimal player experience. Player experience can be positive or negative, that correlates with the user's perceived enjoyment of the gaming experience. Lazarro's four Fun Keys are examples of how experience has become a new area of economic development in game development [3]. According to Ermi et al. [4], game play experience can be defined, as a mix of "player's sensations, thoughts, feelings, actions and meaning-making in a game play setting." This sets a ground for player experience by providing entertainment, escape, competition and challenge. As each aspect directly relates to the user, the type of game that a user chooses to interact with is an important factor in the area of player experience [5]. Marchland et al. [6] state that although consoles are considered the preferred gaming platform, mobile gaming is having a larger impact on the overall market putting the burden on mobile game developers to perform. PC games are still popular. They advocate the need for more research in the domain of gaming platforms. Csikszentmihalyi's [20] approach of Flow has helped game researchers develop new insights of player experience, as it will provide more clarity on areas of immersion and flow. The rest of this paper is organized as follows: Section II is dedicated to the literature reviews of related works. Section III describes the aims of the experiment. Section IV addresses the methodology approach. Section V has to do with the analysis of the results. The acknowledgement and conclusions wrap up the article.

II. LITERATURE REVIEWS

According to Ritterfeld et al. [7] "play is not a random activity selected to overcome boredom, but rather a rational choice." Individuals, therefore, make choices in how they relate to video game products based on the narrative, and interactivity. Players have an opportunity to choose their unique experiences by selecting a particular game to play for maximum pleasure [8]. The game designer creates a digital environment that allows players to immerse themselves within the gaming environment, provides opportunities for agency by allowing the gamers to choose their experiences, and transforms the players by allowing the sensations of becoming different people or objects [9]. These transformational experiences specifically do not provide a holistic framework for defining player experience (PX). According to Kidd [3], people are compelled to use technology for three reasons: utility, symbolism and experience. People want a gadget that serves a purpose, looks good, and engages the user's attention. His study examined which characteristics of "technology-mediated experience" would captivate the user. By observing the behavior of children and adults at an interactive exhibit and following up with focus groups, the study concluded that compelling technological experience requires the following dimensions: social engagement, sensation/drama, and self-expression/challenge. Social engagement carried the least weight, while self-expression and challenge were the most compelling. Participants wanted an experience that tested

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their mental/physical skills, allowed for creative expression, was tactile, and allowed for escape from the ordinary. The researcher concluded that a meaningful experience is grounded within the user and not within the technology. Finally, the experience of the user was individualized, and relied on both intrinsic and extrinsic cues for optimal satisfaction. Attributes from this study coincide with findings from Sweetser et al. [10] game flow model, describing how a player's enjoyment relates to game flow. Game flow criteria associated with core elements related to a positive player experience can be used to find issues and predict the popularity of the game; however, the model also "serves as a starting point for academics and game developers to understand enjoyment in games and to conduct further research into understanding, evaluating and designing enjoyable games." By including elements of concentration, challenges, player skill, clear goals, control, feedback, social interaction and immersion, game designers can predict a game's success. In order to validate these criteria, Sweetser et al. [10] evaluated two real time strategy games that represented a poorly rated and highly rated game. The game evaluation concluded that the higher rated games met more of the Game Flow Model criteria than the poorer rated video games. Challenge, as a core element of player experience, requires the game to be both intrinsically motivating, and goal orientated for a user to feel pleasure. Abuhamdeh et al [1] performed two separate studies to validate this claim. Study 1 observed the relationship between the perceived challenge, skills and the level of enjoyment, while Study 2 examined the strength of these relationships. The first study found that there was a relationship between challenge and level of enjoyment; however, a user's perception of his/her skill did not influence the level of enjoyment. Study 2 verified that challenge was a strong indicator of enjoyment for intrinsically motivated, goal directed activities. Trept et al. [11] agree that there is a strong relationship between enjoyment, and game challenge. Their study revealed that a user's subjective experience of enjoyment relies on both experiential and psychological aspects related to the player's sense of accomplishment, self-efficacy, and the challenges associated with game play. Malke et al. [12] examined human computer interaction through the assumptions that a user's experience influences their assessment of the system and components that interact with each other in distinct ways, which make up the user's experience. The Component User Experience model has the user completing a specific task within a specific context and time. These interactions can be influenced by either instrumental or non-instrumental systems that produce an emotional response within the user that directly influences the appraisal system. The results indicate the user's overall judgment of the experience. The perceptions related to instrumental systems relate directly to system ease of use, functionality, while non-instrumental systems include perceptions associated with the visual aesthetics, the look and feel of the gaming platform, haptic and symbolic quality.

Takatalo et al. [8] further the definition of system assessment with a holistic model that includes both the experiential and psychological aspect of enjoyable gameplay. They argue that player experience involves not only game flow, but also, presence and involvement. The idea behind the Presence-Involvement-Flow Framework (PIFF2) is that "players must invest time, effort and attention into a game in order to get any relevant experience from it." Takatalo et al. [20] explain that player experience can be measured using dependent variables such as *presence, involvement, cognitive evaluation, and emotional outcomes*.

Interest in the game, and the importance of the experience both work to establish a cognitive connection, which garners the meaning and relevance of that experience for the individual. Involvement therefore measures the quality of the relationship between the game and the gamer.

This involvement can manifest through the game narrative and the emotions of the user when playing the game. Tavinor [13] explains that there is a causal connection between fiction and emotional response. Players willingly enter a world of fantasy in which they interpret appropriate actions and reactions to the perceived stimuli presented on screen. Van Aart et al. [14] take a different approach to emotional interactivity by studying the areas of boredom and curiosity. By designing game play through emotional cues, players are better able to navigate the gaming environment. User's emotions are used to make decisions, enhance cognitive skills, and maintain memory. Boredom can be defined as both a lack and an overload of stimuli. This boredom can be intensive, collative, and affective in nature. Players are drawn toward emotional, exciting experiences and draw away from experiences associated with waiting. The duration, commonness, and user expectation of the waiting experience can deter a user's overall perspective of the game play. While boredom stagnate a user's cognitive experience, curiosity pushes one to explore, take risks, and motivate. A zone of curiosity is required to maintain alertness in the game play environment. Emotions are invoked through the images shown on the screen, the sound track, and the challenges presented to the user. As such, the element of involvement does not work alone, but in tandem with a feeling of presence.

Browne et al. [15] found that touch screens fell behind in speed and performance when comparing three different multi-touch game interfaces on an iPod Touch. This multi-touch interface "offers user interface capabilities beyond physical buttons such as accelerometers and touch screens capable of recognizing the movements of multiple fingers." Mobile games required a configurable touch interface that had pre-specified criteria such as diagonal direction touch gestures for game play that related directly to the virtual properties of the game narrative. Participants chose an accelerometer console most frequently in the experiment because it allowed for best performance.

Gleeson et al. [16] found the same results when they compared the effectiveness of the touch screen over the use of a mouse and keyboard as a tool to interact with information systems. The mouse performed better in terms of movement time for small-targeted areas. Where the target is medium or large sized, the touch screen interface performed at an equivalent rate. A mouse has a minimal error rate compared to touch screen and higher interactive accuracy

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rate. Moreover, it is believed that touch screens cause physical wrist and finger fatigue [16].

III. AIMS

The aim of this study is to conduct a comparative study and examine *playability* in two game environments, using a PC and a touch screen tablet. A game interface acts as a bridge between the gaming system, and player's experience. This bridge provides a lens through which the player can assimilate the rules and pacing of the game narrative; hence, it becomes important to look at the differences between mouse and click, and touch experience.

IV. METHODOLOGY

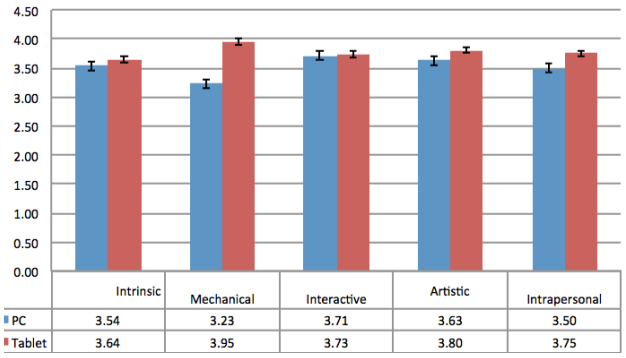
The overall goal of this study was to determine the overall effect a gaming platform has on player experience. In order to provide both a subjective and objective approach to the research, Mandryk et al. [17] suggest using "subjective reporting through questionnaires, and interviews because they are generalizable." Mandryk explains that, subjective data collection that has both quantitative and qualitative results data provide a more robust experimental design; however, the subjective data provide only partial results as they lack certain patterns [18]. Physiological data collection is therefore required to validate the player experience.

A total of 14 participants were recruited from a Midwest university in the USA to play the strategy digital game *"Plants vs. Zombies"* on a PC (Windows) and OSX tablet (iPad4 retina) respectively for the purpose of data collection. Two instruments were used during the pre-test session such as *demographic survey*, *mood questionnaire*, while in the post-test session the following instruments were used to measure the dependent variables: *Self Assessment Manikin* to measure emotional responses [23], *Facets of Playability* to evaluate components of player experience [21] and *Game Enjoyment Questionnaire* (FUGA) to measure game enjoyment [22]. In addition to subjective-feelings questionnaires, we collected objective data to evaluate emotional reactions of valence using pulse rates while arousal was captured using electrodermal activity (EDA). The independent variables were *screen size*, *mode of interaction*, *screen resolution*, and *products*. First we ran a pilot study to verify the following items: instructions were clear and comprehensible; tools and game stimuli for capturing relevant data were in working conditions; selected questions of the validated questionnaires that were relevant to the research questions of this study. The sample frame chosen were between 18-35 years old. This accounts for 32% of digital game players in the USA [19]. The sampling and recruitment were conducted by network and convenience methods. The design of the study was within-subjects ANOVA test whereby the same participants took part in two different experimental conditions, playing the same game in a PC and a tablet environment.

When the participants arrived in the lab, the researchers went through the research protocols before they could sign the consent form. Biopac Systems electrodes were placed on each subject's second and middle finger of the non-dominant hand to record EDA, and onto the middle finger of the other hand to record pulse. Prior to starting the game, baseline pulse and EDA were recorded for the first 5 minutes and, thereafter, both physiological data were captured during gameplay. After 10 minutes of gameplay, the participant was instructed to fill a self-report questionnaire to record his/her emotional responses (SAM) and another questionnaire to self-report their challenges and skills at a given point. The participant also filled the PIFF2, GEQ, and Facets of Playability questionnaires at the end of game play. Playability is a property that characterizes player experience in games [21]. After that, each participant took a rest for 5 minutes before switching to the other game platform. The same procedure of data collection was followed while playing the game on the other platform. The disadvantages of this design were (i) order effects and (ii) practice effects (iii) fatigue effects. Order effects refer to the actual order the treatment is administered. In fact, participants were assigned randomly to the tablet and PC game to counterbalance the order effect. Similarly, to avoid any practice and fatigue effects, participants were instructed to take a break in between each treatment.

V. ANALYSIS

A preliminary analysis of the *Facets of Playability* questionnaire was performed. Paired t-tests were conducted to compare the mean values of the five components that characterize player experience (Figure 1).



	Intrinsic	Mechanical	Interactive	Artistic	Intrapersonal
PC	3.54	3.23	3.71	3.63	3.50
Tablet	3.64	3.95	3.73	3.80	3.75

Figure 1. Player Experience results based on Facets of Playability

Figure 1 shows that the mean values for intrinsic, mechanical, interactive, artistic, and intrapersonal playability were greater when the players used a tablet device as compared to a PC. A hypothesis testing was conducted such that the null hypothesis Ho: $\mu_d = 0$ (difference of the means is equal to zero); the alternative hypothesis, Ho: $\mu_d \neq 0$ (difference of the means is not equal to zero). The results of the paired t-tests conclude that they were not statistically significant. We report the following probability-value for each component: intrinsic (p-value 0.770 > standard alpha level of 0.05); mechanical (p-value 0.168> alpha level 0.05); artistic (p-value 1.00 > alpha level 0.05); interactive (p-value

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0.393 > alpha level 0.05); intrapersonal (p-value 0.371 > alpha level 0.05). Since the p-value is greater than our standard alpha level 0.05, we fail to reject the null hypothesis. The preliminary results reveal that there is a positive trend towards an optimal player experience using a tablet but based on statistical analysis, that trend fails to reach statistical significance. This implies that observed mean differences may still be reasonably attributed to chance rather than to the type of platform used. This is because we have fairly small effect sizes and few data points. We only had data for 14 individuals. In order to be able to detect at least a medium effect size of the type of platform used and how it affected players' experiences, we should have had data from at least 34 participants according to G-power analysis. The analysis of physiological data and other self-report questionnaires are currently underway.

VI. CONCLUSION

The results of this preliminary study suggest that Tablet games provide better user experiences in the facets of intrinsic, mechanical, interactive, artistic, and intrapersonal playability. We can note that Mechanical playability was more pronounced in the Tablet environment as compared to the PC. Considering practical significance, it is clear that the mode of interaction, i.e., the touch screen, brings a different kind of user experience that is not achieved with the other game platforms. Mobile games are the new consoles offering portable experiences. Users have the flexibility to play games on their tablets from virtually any location at any time.

REFERENCES

[1] S. Abuhamdeh and M. Csikszentmihalyi, "The importance of challenge for the enjoyment of intrinsically motivated, goal-directed activities," on Personality and Social Psychology Bulletin, vol. 38, (3), 2012.

[2] M. Wysocki, Ctrl-Alt-Play Essays on Control in Video Gaming. Jefferson, NC: McFarland Publisher, 2013.

[3] A. Kidd, "Technology experiences:What makes them compelling?" Hewlett-Packard Laboratories, Bristol, UK, 2002.

[4] L. Ermi and F. Mayra, "Fundamental Components of the Gameplay Experience: Analysing Immersion." DiGRA Changing Views - Worlds in Play, 2005.

[5] R. Koster, Theory of Fun for game Design. Sebastopol, CA: Paraglyph Press, 2005.

[6] A. Marchand and T. Hennig-Thurau, "Value Creation in the Video Game Industry:

Industry Economics, Consumer Benefits, and Research Opportunities," on The Journal of Interactive Marketing, *27,* pp.141-157, 2013.

[7] U. Ritterfeld and R. Weber, "Video Games for Entertainment and Education," in P. Vorderer & J. Bryant (Eds.), Playing Video Games-Motives, Responses, and Consequences. Mahwah, NJ: Lawrence Erlbaum, Inc., pp. 399-413, 2006.

[8] J. Takatalo, J. Jyrki, J. Kaistinen, and G. Nyman, "User Experience in Digital Games," in I. Pavlidis (Ed.), Human Computer Interactions. Croatia: In Tech. [Online] http://www.intechopen.com/books/human_computer_interaction/user_experience_in_digital_games

[9] C. Fencott, M. Lockyer, J. Clay, and P. Massey, Game Invaders: the theory and understanding of video games. Hoboken, NJ: Wiley, 2012.

[10] P. Sweetser and P. Wyeth, "GameFlow: A model for evaluating player enjoyment in games," in Computers in Entertainment - Theoretical and Practical Computer Applications in Entertainment, vol. 3 (3), 2005.

[11] S Trepte, L Reinecke, "The Pleasures of success: Game-related efficacy experiences as a mediator between player performance and game enjoyment," in Cyberpsychology, Behavior, and Social Networking, vol. 11 (9), 2011.

[12] S. Mahlke, and M. Thuring, "Studying antecedents of emotional experiences in interactive contexts," on B. Begole (Ed), The SIGCHI Conference on Human Factors in Computing Systems, New York, 2007, pp. 915 - 918.

[13] G. Tavinor, "Video games, fiction, emotion," in The 2nd Australasian conference on Interactive entertainment Sydey: Creativity and Cognition Studios Press, 2005, pp. 201-207.

[14] J. van Aart, B. Salem, C. Bartneck, J. Hu, and M. Rauterber, "Designing for experience: Arousing boredom to evoke pre-defined user behaviour." The sixth Design and Emotion Conference. Hong Kong, 2008.

[15] K. Browne, and C. Anand, "An empirical evaluation of user interfaces for a mobile video game," in Entertainment Computing, pp. 1-14, 2011.

[16] M. Gleeson, N. Stanger, and E. Ferguson, "Design strategies for GUI items with touch screen based information systems," ISSN 1172-6062, 2004. [Online]. Avaliable from: http://otago.ourarchive.ac.nz/bitstream/handle/10523/994/dp2004-02.pdf?sequence=3&isAllowed=y

[17] R. L. Mandryk and S. Atkins, "A fuzzy physiological approach for continuously modeling emotion during interaction with play technologies," in International Journal of Human-Computer Studies, vol. 65 (4), April 2007, pp. 329-347.

[18] R. Mandryk, "Evaluating affective computing environments using physiological measures," in Proceedings of CHI'05 Workshop on Evaluating Affective Interfaces-Innovative Approaches, Portland, Oregon, pp. 1-4.

[19] "Game Player Data, Entertainment Software Association," [Online]. Avaliable from: Retrieved on Oct 26, 2014. http://www.theesa.com/facts/salesandgenre.asp

[20] J. Takatalo, "Psychologically-Based and Content-Oriented Experience in Entertainment Virtual Environments," (Doctoral dissertation), 2011, University of Helsinki, Finland.

[21] J. González Sánchez, F.L. Gutiérrez Vela, F. Montero Simarro, and N. Padilla-Zea, "Playability: analysing user experience in video games," Behaviour & Information Technology, vol. 31 (10), pp.1033–1054, Aug 2012.

[22] W. IJsselsteijn, K. Poels, and Y.A.W De Kort, "The Game Experience Questionnaire: Development of a self-report measure to assess player experiences of digital games," Eindhoven: TU Eindhoven. FUGA Deliverable D3.3. Technical Report, 2008.

[23] N.M. Bradley and P. Lang, "Measuring emotion: the self-assessment Manikin and the Semantic Differential," in Journal of Behavior Therapy and Experimental Psychiatry, vol. 1, pp. 49-59, 1994.

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