The User Experience of Disney Infinity

Do Smart Toys Matter?

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Abstract. This study investigated what factors come into play when looking at the user experience involved with the commercial video game Disney Infinity (2.0 Edition), and sought to determine if the unique combination between sandbox and smart toy based gameplay present in gameplay offers an additional level of immersion. This study analyzed the effect of Disney Infinity (2.0 Edition) on immersion utilizing a Game Immersion Questionnaire modified to analyze play preference as well as video game experience. The study methodology analyzed 48 users while playing in "Toy Box" mode both with and without the associated smart toys, or Disney characters. Results show that while there was no significant difference in immersion for either group, nor were there any significant correlations between variables, there was a preference for playing the game with the associated smart toys in both groups. Recommendations were made for continued research building on modifications to this study as well as future research exploring the potential for smart toys in other areas.

Keywords: Pervasive games · Smart toys · Immersion · Disney infinity · Virtual worlds · Sandbox games · User experience · Usability · Human-computer interaction

1 Introduction

A user experience designer's role is to understand how to make a game appealing to users. This research addresses what factors come into play when looking at the user experience (UX) involved with the video game Disney Infinity (2.0 Edition), also referred to as Disney Infinity: Marvel Super Heroes (2.0 Edition). Disney Infinity (2.0 Edition) is more than just a virtual world playable on a video game console– it is a unique combination of vast virtual worlds, sandbox modes, and smart toys all playable across multiple platforms and linked through the Internet.

While the potential for further research utilizing smart toy based games is vast, this research focused on two specific aspects of UX in order to determine if the unique combination between sandbox and smart toy based gameplay present in Disney Infinity (2.0 Edition) offered an additional level of immersion. Additionally, this research goes on to discuss whether users prefer gameplay with the tangible objects incorporated into the Disney Infinity (2.0 Edition) experience, and offers explanations why this may be the case.

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2 Literature Review

Smart toys in video games have much to add to UX. Research on informal learning suggests smart toys can add educational benefits, which aid users in learning, assist in developing positive social skills, and promoting motivation and engagement in the classroom [6, 8]. This research suggests the value users' associate with smart toys in games like Disney Infinity (2.0 Edition) extends beyond monetary value or justification. While some users may suggest that smart toy based games are more valuable simply because there is a physical object to help justify a less tangible digital purchase, others may see the more personal value these smart toys bring to gameplay. As supported in the qualitative feedback in this research, many users already have some sort of familiarity and preference to play with the Disney characters present in Disney Infinity (2.0 Edition) gameplay, suggesting that perhaps there may be additional intangible value to these characters.

2.1 Defining User Experience

As the name suggests, UX is all about the users' experience with a device or emerging media, focusing on both qualitative and quantitative data from users. Many UX designers and researchers define UX as focusing on both a users' emotional response as well as their perceptions on more practical aspects, such as usability. While UX can be defined in many ways, sometimes very empathetically, for the sake of this research UX is defined based off an industry standard definition for the term: every aspect of the users interaction with the video game that make up the user's perceptions of the whole, in order to allow for the best possible interaction by users [11].

As shown in research on serious educational games, video games can have a major impact on a user's experience. The level of fun and excitement in video games can motivate or even distort perception, and the opportunities for social interaction in video games can inspire feelings of relatedness and belonging [2]. Furthermore, the pervasive nature of many video games, like Disney Infinity (2.0 Edition), can blur the line between the physical reality and the virtual world invoking an even different experience for its users.

In contrast to research on flow and engagement, Brown et al. conducted research in order to define immersion using grounded theory, and concluded that immersion has three stages: engagement, engrossment, and total immersion [1, 4, 12]. Similarly, Ermi et al. broke down immersion into three components: sensory, challenge-based and imaginative immersion [5]. These two definitions of immersion are very similar, with overlapping concepts in several areas as seen with the component of imaginative immersion as well as the engrossment and total immersion stages. This research focused on these overlapping aspects of immersion. Specifically imaginative immersion, in which "players empathize with the characters and/or enjoy the fantasy and virtual reality of the game" as well as the engrossment and total immersion stages, in which players' "perceptions of their physical surroundings and physical needs become lower and their emotions are directly attached to the game" as well as the players' sense of attachment towards in-game characters and empathy towards those characters' situations [2].

This research focused on play preference as it relates to use of smart toys during gameplay. Play preference was measured utilizing responses collected during a post-survey. This research focused specifically on play preferences during gameplay and allowed users to interpret the questions based on their own definition of smart toy based video game play.

3 Experiment

3.1 Objective and Goals

The objective of the research this was to determine if the unique form of gameplay involved in Disney Infinity (2.0 Edition), specifically the addition of smart toys, had an effect on UX. This research analyzed the effect of Disney Infinity (2.0 Edition) on immersion while playing in "Toy Box" mode, as well as play preference during Disney Infinity (2.0 Edition) gameplay. This research had the following research goals in mind: determine if the smart toys included with Disney Infinity (2.0 Edition) have any effect on immersion, and determine if users prefer playing Disney Infinity (2.0 Edition) with the smart toys.

3.2 Hypotheses

This research purposes the following hypotheses: (H1) immersion will be higher in the Disney character group compared to Control group, (H2) there will be no significant difference between either group for preference playing with smart toys, (H3) there will be a small or larger correlation between number of game element used and immersion– the higher the number of game elements used, the higher the immersion ($r = 0.2$ or greater), (H4) there will be a small or larger correlation between average amount of gameplay experience and immersion– the higher the gameplay experience, the higher the immersion ($r = 0.2$ or greater), and (H5) there will be a small or larger correlation between number of smart toys used and immersion– the higher the number of smart toys used, the higher the immersion ($r = 0.2$ or greater).

3.3 Methodology

The research design targeted young adults aged 18–25. A total of 53 users were recruited for this research, 5 of which were excluded from data analysis due to technical complications during testing.

The research design evaluated gameplay in Disney Infinity (2.0 Edition) "Toy Box" mode both with and without the associated smart toys. Users were divided into two groups: Disney character group, and Control group. Alternating conditions for each user randomized distribution into groups. The Disney character group was assigned gameplay using Disney Infinity (2.0 Edition) including the smart toys. The Control group was assigned gameplay using Disney Infinity (2.0 Edition), but lacking the physical presence of smart toys and was provided with a selection sheet, which depicted visual

representations of the physical smart toys. Users in the Control group could select a character for gameplay by pointing to the character on the selection sheet, or by saying so verbally. The research proctor would then place the appropriate Disney character on the Disney base.

Both groups were provided access to the same selection of smart toys, including eight Disney characters and eight Power Discs. Disney characters were selected based on four types: (1) villains, (2) heroes, (3) minorities, and (4) non-human characters of both male and female genders (where applicable). An additional Disney character, Sorcerer's Apprentice Mickey, was used during the tutorial portion of the research session and was not available for selection during the gameplay portion of the research session.

Users were allowed 30 min of uninterrupted play with the game in "Toy Box" mode, allowing users the freedom to interact with the game as they preferred utilizing sandbox style or adventure style game features.

A 5-point Likert scale and free response questions were used to measure survey responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A positive (i.e., yes) response was indicated by a Likert scale score of four or five. A negative (i.e., no) response was indicated by a Likert scale score of one or two. A neutral response was indicated by a Likert scale score of three. Survey responses were collected using Google Forms and analyzed using SPSS.

A single PS3 gaming console was used including a wireless controller, Samsung 32" High Definition (HD) TV, the commercial video game Disney Infinity (2.0 Edition) as well as the associated smart toys Additionally, a Hauppauge 1212 HD PVR was used to record gameplay during each session. A laptop computer was used to run video capture software included with the HD PVR.

3.4 Independent Variables

The independent variables utilized in this research study include: (1) immersion and (2) play preference.

In order to measure immersion, a post survey was offered based off similar research on serious educational games, shown in Table 1 [2]. The Game Immersion Questionnaire (GIQ) was modified for this research. The immersion section contained 24 items consisting of three dimensions: engagement (A), engrossment (B) and total immersion (C). The subcategories were included and compiled as a single immersion score. An additive score was utilized for data analysis with a minimum score of 24 and a maximum score of 120, based on a similar questionnaire [13].

Additional subcategories were included for play preference (P) and average amount of gameplay experience (E). These sections included Likert scale and free response questions. Responses for smart toy use (S) were analyzed manually and coded based on frequency of response categories. User responses that fell into multiple categories were counted once for all applicable categories.

Table 1. Modified Game Immersion Questionnaire item and descriptions

A1	**I would like to spend time playing the game.**
A2	I like the appearance and style of the game.
A3	I like to play the game because it is novel and interesting.
A4	Generally, I can handle the game as the degree of its difficulty is appropriate.
A5	It is easy for me to control the game.
A6	The user interface of the game makes me feel comfortable.
A7	I like the type of the game.
A8	I would like to spend time collecting the information of the game and discussing it with friends.
A9	The time I spend playing the game is more than I expected.
B1	My ability to perceive the environment surrounding me is decreased while playing the game.
B2	I would be impatient when someone interrupted me to play the game.
B3	I feel nervous or excited because of the game.
B4	I forget the passage of time while playing the game.
B5	I feel I could easily forget my schedule and/or to-do things in the real world while playing the game.
B6	While playing the game, I would feel unhappy if someone interrupted me.
C1	When I am playing the game, I feel as if I have experienced the context of the game in person, just like I am who the Disney Character is in the game.
C2	My consciousness completely transfers from the real world to the game world while playing the game.
C3	I lose perceptions of time and the real world surrounding me, as if everything just stops.
C4	I feel happy or sad according to what the Disney Character experiences, and sometimes I even feel as if I am who the Disney Character in the game is occasionally.
C5	I feel so integrated into the Disney Character in the game that I could feel his/her feelings.
C6	All of my senses, including vision, learning, and my mind, are concentrated on and engaged in the game.
C7	I lose the ability of perceiving the surroundings around me; however, it seems natural for me to be totally immersed in the atmosphere of the game.
C8	I used to feel that the Disney Character in the game is controlled by my will, and not by the controller, so that the avatar does just what I want to do.
C9	It seems like the thoughts and consciousness of the Disney Character and me are connected.
P1	I prefer playing the Disney Infinity video game with the Disney Characters (i.e. Smart Toys) physically present.
P2	I would interact the Disney Characters even when I'm not playing the Disney Infinity video game.
P3	I care about or am interested in the Disney Characters I played with during this research session.
P4	I am very knowledgeable about the Disney Infinity characters I played with prior to this research session.
S1(a-b)	(a) Which Disney Character/s did you play with? If you played with more than one, please list them all. (b) Why?
S2(a-b)	(a) Which power disc/s did you play/interact with? If you played with more than one, please list them all. (b) Why?
S3(a-b)	(a) Of the Disney Characters available, which character did you like the most? (b) Why?

E1	Place rate your experience with video games.
E2	Have you played the video game Disney Infinity prior to this research session?
E3	Please rate your experience with the video game Disney Infinity.
E4	Please rate your experience with the video game Disney Infinity and/or video games similar to it.
D1	What is your gender?
D2	How old are you?
D3	Is English your first language?
D4	What is your ethnicity?

3.5 Dependent Variables

The dependent variables utilized in this research study include: (1) game element used, (2) average amount of gameplay experience, and (3) number of smart toys used.

Game element used was defined as the number of digital game elements used while accessing the "Toy Box". A game element was defined as any object the user placed into active gameplay through use of the "Toy Box", or any object that was customized by the user during active gameplay through use of the "Magic Wand".

The "Video Game Experience" subcategory asked about the users' average amount of gameplay experience including general video game experience as well as experience with Disney Infinity and games similar to it.

The number of smart toys used included all Disney characters and Power Discs outlined previously. The "Smart Toys" subcategory asked users' to list the number of smart toys used while playing Disney Infinity (2.0 Edition). Number of smart toys used was measured manually and was utilized for quantitative data analysis. Use of a smart toy was defined as any Disney character or Power Disc and was counted when a user placed the smart toy on the Disney base for gameplay and the smart toy appeared virtually during the gameplay session.

3.6 Results

An independent samples t-test was used to analyze the results for both hypothesis one (H1) and hypothesis two (H2). A Pearson's r correlation was used to analyze the results for hypothesis three (H3), hypothesis four (H4) and hypothesis five (H5). A total of 53 users participated in the research study. Five users (n = 5) were excluded from data analysis due to technical issues during testing. Reasons for exclusion were outlined in Sect. 3. A total of 48 users (n = 48) were recruited for data analysis, including 24 males (n = 24) and 24 females (n = 24). Users were divided randomly into two conditions: the Disney character group (n = 24) and the Control group (n = 24). A total of 12 males (n = 12) and 12 females (n = 12) participated in the Disney character group. A total of 12 males (n = 12) and 12 females (n = 12) participated in the Control group. The Disney character group participated in 30 min of gameplay with smart toys, and the Control group participated in 30 min of gameplay without the associated smart toys.

Table 2 provides descriptive statistics for both independent and dependent variables, where applicable.

Table 2. Descriptive statistics for independent and dependent variables

Variable	Min.	Max.	Positive Response	Negative Response	Neutral Response	Mean	Std. Deviation
Immersion	39	110	-	-	-	76.83	14.406
Play preference	1	5	28	10	10	3.50	1.20
Average game experience	-	-	35	5	8	-	0.857
Number of smart toys used	1	15	-	-	-	5.6	4.088
Game element used	0	54	-	-	-	9.00	12.237

For hypothesis one (H1), an independent samples t-test revealed there was no significant difference between immersion scores for either group (M1 = 75.88, SD1 = 13.671; M0 = 77.79, SD0 = 15.340; t = −0.457, p = 0.650, df = 46). Hypothesis one (H1) is not upheld, shown in Tables 3 and 4.

Table 3. Descriptive statistics for hypothesis one

Variable	Condition	N	Mean	Std. Deviation
Immersion	Disney Character	24	75.88	13.671
	Control	24	77.79	15.34

Table 4. Independent samples t-test for hypothesis one

Variable	df	t	p
Immersion	46	-0.457	0.65

For hypothesis two (H2), the average score for users in both groups revealed there was a neutral to positive preference for playing with smart toys (M1 = 3.58, SD1 = 1.18; M0 = 3.42, SD0 = 1.25), shown in Table 5. An independent samples t-test revealed there was no significant differences between play preferences for either group (t = 0.476, p = 0.636, df = 46), shown in Table 6. Hypothesis two (H2) is upheld.

Table 5. Average score for hypothesis two

Variable	Condition	N	Mean	Min.	Max.	Std. Deviation
Play preference	Disney Character	24	3.58	1	5	1.18
	Control	24	3.42	1	5	1.25

Table 6. Independent samples t-test for hypothesis two

Variable	t	df	p
Play preference	0.476	46	0.636

For hypothesis three (H3), a Pearson's r was computed to assess the relationship between game element used and immersion. There was no significant correlation between the two variables (n = 48, M = 9.00, SD = 12.237, r = −0.077, p = 0.601). Hypothesis three (H3) is not upheld. See Tables 7 and 8.

Table 7. Descriptive statistics for hypothesis three

Variable	N	Mean	Std. Deviation
Game element used	48	9.00	12.237

Table 8. Pearson's r for hypothesis three

Variable	r	p
Game element used	-0.077	0.601

For hypothesis four (H4), a Pearson's r correlation revealed the correlation is not significant (n = 48, M = 1.23, SD = 0.857, r = 0.143, p = 0.333). While a small or larger correlation was found (r = 0.143), the results indicate the correlation was not significant (p = 0.333). Hypothesis four (H4) is not upheld, shown in Tables 9 and 10.

Table 9. Descriptive statistics for hypothesis four

Variable	N	Mean	Std. Deviation
Average game experience	48	1.23	0.857

Table 10. Pearson's r for hypothesis four

Variable	N	r	p
Average game experience	48	0.143	0.333

For hypothesis five (H5), the largest number of smart toys used was 15 (n = 15) and the smallest number of smart toys used was one (n = 1). In the Control group (M = 2.83), the largest number of smart toys used was seven (n = 7) and the smallest number of smart toys used was one (n = 1). In the Disney character group (M = 8.38),

the largest number of smart toys used was 15 (n = 15) and the smallest number of smart toys used was two (n = 2). Pearson's r correlation analyzing data in both conditions revealed the correlation is not significant (n = 48, M = 5.60, SD = 4.088, r = 0.065, p = 0.659). While a small or larger correlation was found when analyzing data from both conditions (n = 48, r = 0.065), the results indicate the correlation was not significant (p = 0.659). Pearson's r correlation analyzing data in the Control group revealed the correlation is not significant (n = 24, M = 2.83, SD = 1.685, r = 0.180, p = 0.399). Pearson's r correlation analyzing data in the Disney character group revealed the correlation is not significant (n = 24, M = 8.38, SD = 3.910, r = 0.164, p = 0.445). Hypothesis five (H5) is not upheld, shown in Tables 11 and 12.

Table 11. Descriptive statistics for hypothesis five

Variable	Condition	N	Mean	Min.	Max.
Number of smart toys used	Disney character	24	8.38	2	15
	Control	24	2.83	1	7

Table 12. Pearson's r for hypothesis five

Variable	Condition	N	r	p	M	Std. Deviation
Number of smart toys used	Both	48	0.065	0.659	5.60	4.088
	Disney character	24	0.164	0.445	8.38	3.910
	Control	24	0.180	0.399	2.83	1.685

3.7 Discussion

Overall, results from data analysis show hypothesis one (H1), hypothesis three (H3), hypothesis four (H4), and hypothesis five (H5) was not upheld. While both hypothesis four (H4) and hypothesis five (H5) show a small or larger correlation (r = 0.2 or larger), the data analysis indicated the correlation was not significant. Therefore, data is not adequate to conclude that the small or larger correlation was not due to chance. While these hypotheses were not upheld, both qualitative and quantitative data supports hypothesis two (H2), showing preference for playing with smart toys was present in both groups.

In addition to analyzing data quantitatively, various observations were noted during research sessions. This qualitative analysis aids in fully understanding UX, shedding light on various areas of the users' experience such as emotional responses, perceptions, and usability issues.

Qualitative analysis does show users prefer playing the game with the smart toys, and analysis of free response questions could shed light on some reasons why this preference exists. During the gameplay session, some users played with specific smart

toys due to personal preferences and associations with the character or associated movie. For example, one user made note, "Tangled is my favorite movie" when using the Rapunzel's Birthday Sky Power Disc. Another user stated, "My best friend is obsessed with Frozen, so I feel very connected with Elsa." Several others made note of liking Disney characters because they remembered them from movies or TV shows growing up. These comments support the quantitative data and help explain, to a certain degree, why these play preferences exist for specific users. For these users, connectedness, relatability, and reminiscence played a role.

3.8 Limitations

Given the complexity of Disney Infinity (2.0 Edition) gameplay and mixed methods research, several limitations arise. UX can be very challenging, often requiring multiple methods of analysis as well as several iterations before yielding a positive user experience. Thus, these limitations should be seen as a stepping-stone to further research, aiding the field of UX and helping to improve gameplay with smart toys.

This research was designed utilizing a predesigned area of Disney Infinity (2.0 Edition) gameplay called "Introduction to the Toy Box". This area of gameplay was designed to be a tutorial space, teaching users how to use the game in "Toy Box" mode. This area also includes intermittent voice prompts, directing the user verbally to speak to certain "Toy Box" hosts or complete specific tasks within the tutorial area. These voice prompts could have influenced or guided user actions. While this selection was made specifically in order to promote autonomy and volition during the gameplay session quantitative analysis was not conducted in this research.

This specific research design also utilized a selection sheet. This sheet provided users with a visual representation of the smart toys available to them during gameplay. Users in the Control group may have been inhibited because they are required to ask the researcher proctor in order to access the smart toys. Additional analysis is needed to determine if these factors and any confounding effects.

3.9 Conclusion

As described, this research sought to determine if the unique gameplay environment formulated with Disney Infinity (2.0 Edition) increased immersion by studying the affect of associated smart toys. However, the research design could be expanded upon for future research possibilities. Research could be conducted to study gameplay and learning or social disorders, such as children with autism, or gameplay could be controlled or modified to teach scientific concepts. Additionally, given the vast array of platforms available for gameplay, there are a number of research possibilities comparing game-play UX between platform types and/or input styles.

Games like Disney Infinity, already offer the medium and the tether needed to write new immersive stories. While physical location may be the primary tether connecting the virtual world to physical experience, smart toy based games like Disney Infinity (2.0 Edition) may take that argument a step further. While some may argue that these

new expansive virtual worlds will destroy distance by destroying closeness, this research argues that these new video games can help to further develop this connection between a seemingly impersonal and geographically independent virtual worlds and the physical experience by utilizing smart toys.

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