

Can the Success of Mobile Games Be Attributed to Following Mobile Game Heuristics?

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Abstract. The mobile game industry is increasing in market share and becoming saturated with hundreds of products. This rises competition to gain user's satisfaction for fun and easy to use mobile games. In fact, the main concern of mobile game development is the usability due to smart phones restrictions (screen size, processing power, storage, etc.). To identify such usability problems, heuristic evaluation is applied. In this paper, we evaluated a popular mobile game, "Hay day", using heuristic evaluation conducted by six evaluators to examine 44 heuristics. The results of this study provide insights to game developers in order to improve usability.

Keywords: Heuristics evaluation · Usability · Mobile games

1 Introduction

With the widespread of mobile phones, game applications became one of the main entertainment methods. This expand in game industry led researches and game developers to study the reasons behind games success, which they discovered to be dependent on users' first experience (Delone and McLean 2003). Mobile users get their first impression after interacting with the game thought its interface. However, the interface efficiency alone does not determine the game success, because there are other factors like amusement and challenge which must be present to grab user's interest (Federoff 2002). Therefore, to produce successful games, developers need to focus on 'user experience', a term coined by Federoff to describe game usability. It can be defined as the degree to which a player is able to learn, control, and understand a game (Pinelle et al. 2008). There are three areas of game usability, which are game interface, game play, and game mechanics. Evaluation methods for game usability varies and they range from interviews, questionnaires or observation. However, the most common method to evaluate game usability is through heuristic evaluation.

In this paper, we attempt to evaluate one of the popular mobile game (Rajanen and Nissinen 2015), "Hay Day", using heuristics evaluation from the literature to measure the correlation between the success of mobile games and its application of these heuristics, and we suggest improvements when applicable. The paper proceeds as follows. First, we discuss the background of usability evaluation and an overview of heuristics specifically designed for games. Second, we explain the methodology used to

undergo this study. Third, the results are presented and discussed. Finally, we conclude the implication of this study.

2 Background

Usability is the main factor for ensuring the success of a system. In order to identify usability issues, usability evaluation is performed at different stages of system development (Nielsen 1994). There are different usability evaluation methods. One of the most common methods in Human Computer Interaction (HCI) field is heuristic evaluation. It was first introduced by Nielsen and Molich in 1990. Later in 1994, Nielsen introduced a set of 10 usability heuristics to evaluate interfaces of software. However, because of the unique characteristics of mobile games, there is a need to include additional heuristics that specifically measure the usability in mobile games.

Several researchers have used Nielsen's measures as a basis for mobile game heuristics evaluation. For example, Federoff (2002) developed a set of 40 heuristics for game usability, some of them were based on Nielsen's heuristics. The heuristics was divided into three categories: game interface, game mechanics and game play. Desurvire et al. (2004) developed the HEP – Heuristic Evaluation for Playability – which identifies four game heuristic categories: game play, game story, game mechanics, game usability. In a follow-up study, a refined list called Heuristics of Playability (PLAY) is introduced with three categories. The first category is game play; while the second includes coolness, entertainment, humor, or emotional immersion. The third category covers usability and game mechanics (Desurvire and Wiberg 2009). Pinelle et al. (2008) proposed 10 heuristics to identify usability issues in video games focusing on single user issues. In addition, Hochleitner et al. (2015) proposed a framework for video games consist of 49 heuristics categorized into two sets: game play/game story, virtual interface.

Most of video games requires multiplayer, which makes the interaction between the players more challenging. Pinelle et al. (2009) developed 10 networked game heuristics (NGH) to evaluate multiplayer game usability. These measures support coordination, communication and social interactions between the players. In addition, Korhonen and Koivisto (2006) introduced playability heuristics for multiplayer mobile games. The model consists of three modules: Game Usability, Mobility, and Gameplay.

3 Methodology

The most popular heuristics developed for game design are presented in the following papers (Desurvire et al. 2004; Federoff 2002; Pinelle et al. 2008). Desurvire and Federoff studies have strong similarities where they focus on player engagement and fun. However, they do not consider usability in detail. Therefore, Pinelle found a gap in their study and introduced similar heuristics for video game with usability as the focus. Although, previously mentioned studies were designed for video games, applying them on mobile games may not cover all aspects. Therefore, Korhonen and Koivisto (2006) proposed a model focused on mobile games.

In this study, we have consolidated heuristics models from (Desurvire et al. 2004; Pinelle et al. 2008; Korhonen et al. 2006). To conduct the study, we follow a technique used in a previous study on “Farmville”, where they identified 5 objectives. However, since “Hay Day” is a mobile game we add a sixth objective for mobility.

1. The game should have mechanisms that facilitate the player’s learning process and general gameplay.
2. The game should be easy and enjoyable to play but have some complexity to engage the player.
3. The player should be able to identify his actions in the game and respective feedback.
4. The game should be graphically appealing without overriding game play and be customizable.
5. The game should be accessible to any person or player.
6. The game should be suited for mobility.

After defining the objectives and supporting heuristics, evaluators are chosen to undergo the study. The literature suggests three to five evaluators, each spend time to test the game interface and produce a list of heuristic violations (Nielsen 1994). In this study, we used six evaluators, three users who are familiar with the game, while the other three have no experience with the game. Table 1 shows evaluators details.

Table 1. Evaluators details

	Gender	Age	Game experience
Evaluator 1	Female	27	Yes
Evaluator 2	Female	18	Yes
Evaluator 3	Male	34	Yes
Evaluator 4	Male	34	No
Evaluator 5	Male	20	No
Evaluator 6	Female	15	No

According to Nielson, *heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the “heuristics”)* (Nielsen 1994). The evaluation session goes as follow: each evaluator examines the interface several times and goes through all the elements. Then, he/she is asked to evaluate the game by answering yes (Y) or no (N) to a list of usability heuristics.

4 Results and Discussion

The results of the evaluation show that 23 of the 44 heuristics were verified as shown in Tables 2, 3, 4, 5, 6 and 7. The first objective is concerned about game mechanism and the player’s learning process and general gameplay. It was analyzed with 12 heuristics, 4 of them were verified as shown in the table below with the green highlights. All the

Table 2. Objective 1 evaluation

Heuristic	Objective 1	Evaluators					
		1	2	3	4	5	6
H1	Tutorial provided at beginning of the game	Y	Y	Y	Y	Y	Y
H2	Tutorials are repeatable.	Y	N	Y	Y	N	N
H3	Help is clear and informative.	Y	Y	Y	Y	Y	Y
H4	Match between system and real world.	Y	Y	Y	Y	Y	N
H5	Customizable controls.	Y	Y	Y	Y	N	Y
H6	Errors are prevented with warnings and messages.	N	Y	Y	Y	Y	Y
H7	Player is involved quickly and easily.	Y	Y	Y	Y	Y	Y
H8	Game gives hints and suggestions.	Y	N	Y	Y	Y	Y
H9	A game manual is not required to play.	Y	Y	Y	Y	Y	Y
H10	Non-playable content can be skipped.	Y	Y	Y	Y	Y	N
H11	Information is displayed in various forms.	Y	Y	Y	N	Y	Y
H12	Player has full control over game.	Y	Y	Y	Y	Y	N

Table 3. Objective 2 evaluation

Heuristic	Objective 2	Evaluators					
		1	2	3	4	5	6
H1	Game difficulty can be changed.	N	N	N	N	N	N
H2	There are multiple game goals.	Y	Y	Y	Y	N	Y
H3	Game is balanced: no definite way to win.	Y	Y	Y	Y	Y	Y
H4	Challenge, strategy, and pace are in balance.	Y	Y	Y	Y	N	Y
H5	Game gives rewards.	Y	Y	Y	Y	Y	Y
H6	The first-time experience is encouraging.	Y	Y	Y	Y	N	Y
H7	Game is re-playable.	Y	Y	Y	Y	Y	Y
H8	Player does not rely on memory to play.	Y	Y	Y	Y	Y	Y
H9	Player experiences fairness of outcomes.	Y	Y	Y	Y	Y	Y
H10	There are no repetitive or boring tasks.	N	N	N	N	N	N
H11	The player sees the progress in the game and can compare the results	Y	Y	Y	Y	Y	Y

evaluators agreed that tutorials are provided in the beginning of the game; however, three of them think that tutorials cannot be repeated again. The remaining seven heuristics have 5 positive responses with one negative response. For “Errors are prevented with warnings and messages” heuristic, one evaluator did not agree with that, she stated that network errors are not recognized immediately which lead to losing the

Table 4. Objective 3 evaluation

Heuristic	Objective 3	Evaluators					
		1	2	3	4	5	6
H1	Player score/status is identifiable	Y	Y	Y	Y	Y	Y
H2	Feedback provided through sound.	Y	Y	Y	Y	Y	Y
H3	All feedback is immediate.	Y	Y	Y	Y	Y	Y
H4	There are multiple forms of feedback.	Y	Y	Y	Y	Y	Y

Table 5. Objective 4 evaluation

Heuristic	Objective 4	Evaluators					
		1	2	3	4	5	6
H1	Interface is consistent in color & typography.	Y	Y	Y	Y	Y	Y
H2	Screen layout is efficient and visually pleasing.	Y	Y	Y	Y	Y	Y
H3	The player understands the terminology and art used in the game.	Y	Y	Y	Y	Y	Y
H4	All relevant information is displayed.	Y	Y	Y	Y	Y	Y
H5	The interface is non-intrusive.	Y	N	N	Y	Y	Y
H6	Navigation is consistent, logical, and minimalist.	Y	Y	Y	Y	Y	Y
H7	The game story supports the gameplay and is meaningful.	Y	Y	Y	Y	Y	Y
H8	Visual and audio effects arouse player interest.	Y	Y	Y	Y	N	Y
H9	Audio, video and graphics settings are customizable.	Y	Y	Y	N	Y	N

session. Figure 1 shows a screenshot of the game interface, with the settings button on the top left, and Fig. 2 shows the settings menu.

The second objective, game should be easy and enjoyable to play but have some complexity to engage the player, has 11 heuristics. Overall, 6 heuristics were verified, 2 were not verified, and 3 heuristics have different answers. The first heuristic concerned about changing the game difficulty, all evaluators agreed that the player cannot change the difficulty at all. In addition, all evaluators think that the game has repetitive and boring tasks. For heuristic H4, one evaluator who is new to the game finds it hard at the beginning.

The third objective focuses on identifying player's actions in the game and respective feedback. This objective was analyzed with four heuristics. All the heuristics

Table 6. Objective 5 evaluation

Heuristic	Objective 5	Evaluators					
		1	2	3	4	5	6
H1	Icons size are adjustable	N	N	N	Y	Y	Y
H2	Game has accessible language	Y	Y	Y	Y	Y	Y
H3	Game actions description can be turned on/off	N	N	N	Y	N	N
H4	The player cannot make irreversible errors	Y	Y	Y	N	N	Y

Table 7. Objective 6 evaluation

Heuristic	Objective 6	Evaluators					
		1	2	3	4	5	6
H1	The game and play sessions can be started quickly.	Y	Y	N	Y	Y	Y
H2	The game accommodates with the surroundings.	Y	Y	Y	Y	Y	N
H3	Interruptions are handled reasonably.	Y	Y	Y	Y	Y	Y
H4	The Player can easily turn the game off and on, and be able to save games in different states.	Y	Y	Y	Y	Y	Y

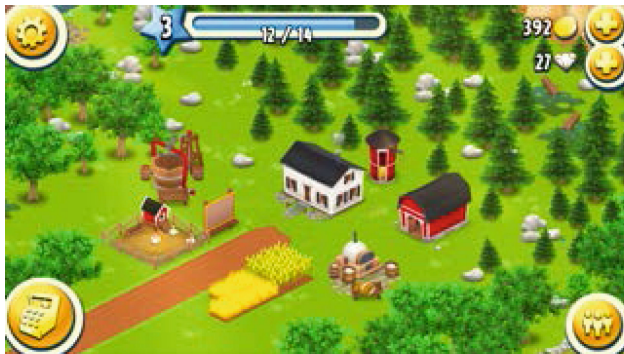


Fig. 1. Screenshot of “Hay Day” main interface.

were verified by evaluators. They agreed that the game provides multiple forms of feedback (written or by sound or visual feedback) and they can identify their score clearly.

Objective four states that the game should be graphically appealing without overriding game play and be customizable. Six heuristics were verified for this objective; evaluators approved that the interface is visually pleasing with its colors and

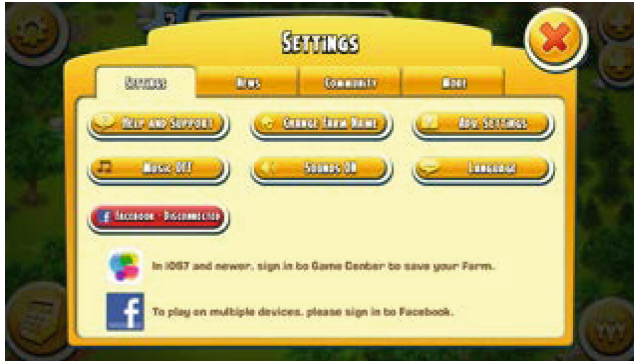


Fig. 2. Screenshot of the “Settings” menu

typography, all information needed is shown, and game has clear and understandable navigation, terminology and art. The remaining three heuristics received diverse answers. Two evaluators did not agree that the interface is non-intrusive. While one evaluator did not find the video and audio effects appealing to his personal taste. For the last heuristic, two evaluators did not agree that graphics settings are customizable.

Objective five measures the game accessibility to any person or player was analyzed with four heuristics. Only one heuristic was verified while the remaining heuristics received different answers. The experienced evaluators disagreed that icon size can be changed while first time evaluators stated they could zoom in or out to adjust icon size. Most evaluators disagreed that game description can be turned off. However, one experienced evaluator stated description messages has a close button, which can be pressed to remove the message instantly.

The last objective measures game mobility with four heuristics to verify game can be played anywhere anytime. Two heuristics were verified, “Interruptions handled reasonably” and “game can be easily turned on or off”. One evaluator does not agree that the game accommodate with the surrounding, in which animals in the game emit unexpected sounds that may cause embarrassment to the player. However, other evaluators mentioned the game sound can be disabled when the player is in public places. For the remaining heuristic, evaluators stated that game-lunching time depends on the internet speed. However, game developers have no control on internet connectivity.

Based on the above evaluation, percentage of heuristics verified for each objective is calculated in the below table. Objective 3 was 100% verified, while most heuristics in objective 2 and 4 were verified. However, objectives 1 and 5 had few heuristics verified. This result is compared to the statistics obtained from the Google play market for “Hay Day” where the number of downloads exceeds eight million and rating reaches 4.5. We conclude that if a mobile games do not satisfy some usability heuristics, it does not necessarily lead to an unsuccessful product (Table 8).

Table 8. Percentage of heuristics verified for each objective

Objective	% of heuristics verified
1	33%
2	55%
3	100%
4	67%
5	25%
6	50%

5 Conclusion

This study evaluates “Hay Day” mobile game by using six objectives, consisting of 44 heuristics. Six evaluators were chosen to carry out this study. The results show that 23 heuristics were verified. Only one objective was fully verified “objective 3: the player should be able to identify his actions in the game and respective feedback.” Based on our results, we provide some suggestions to improve the game. Half of evaluators did not know that tutorials are repeatable; this might be because the tutorials are in the help section. It is better to make tutorials accessible from the settings section. Some evaluators think that interface is intrusive, icons on the sides are blocking some of the content. In addition, most of evaluators agreed that actions description cannot be turned on/off, some of the tasks are repeated which make it boring. We suggest providing the player the ability to opt-out such actions.

It is evident that first time evaluators were not able to verify certain heuristics due to their lack of experience. For example, the game accommodate with the surrounding was not verified because the evaluator thinks the sounds emitted may cause embarrassment in public. However, the game provides options in the settings as shown in Fig. 2, which allows the user to turn off animal sounds, and another option to turn off music. Moreover, another evaluator, who used the game for the sake of this study, did not find it interesting, which may have affected his evaluation since he did not agree that first time experience is encouraging and visual, audio effects arouse his interest.

Although not all heuristics were verified, only 2 received consensus negative evaluation, while the rest 19 heuristics received diverse answers. This suggests that “Hay Day” developers have considered most heuristics to accomplish a positive user experience. In fact, not complying with all usability heuristics does not necessarily lead to lower ratings. This is reflected in the statistics showing the number of downloads that exceeds eight million and excellent user ratings. However, heuristics evaluation presented in this study shows that there is room for improvement specifically to enhance the experience of first time users.

Acknowledgements. We would like to express our gratitude to the evaluators for the valuable time they dedicated to this study.

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Social Computing and Social Media. Human Behavior
9th International Conference, SCSM 2017, Held as Part
of HCI International 2017, Vancouver, BC, Canada, July
9-14, 2017, Proceedings, Part I
Meiselwitz, G. (Ed.)
2017, XXII, 413 p. 105 illus., Softcover
ISBN: 978-3-319-58558-1