Usability Evaluation of Digital Malaysian Traditional Games

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Graphical abstract
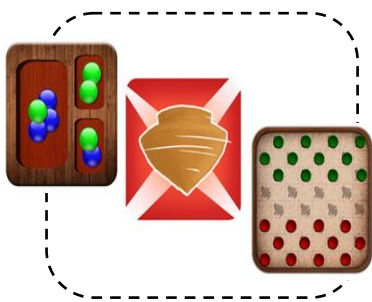
Abstract

Focusing on measuring the engagement towards digital Malaysian traditional games, this paper presents usability evaluation on three digital versions of Malaysian traditional games; Dam Haji, Congkak and Gasing-X. Usability is a significant contributing factor towards engagement of digital games. Usability helps in verifying the requirements, successes and functionality of the games which are missing. The usability evaluation adopted the heuristic instruments developed by Jakob Nielson in 1990. The instrument consists of 17 heuristic component protocols based on interface design. Evaluation involved 50 respondents who are IT and domain experts. Result analysis is discussed and presented for each game. Results suggested features and aspects to be improved in the development of Digital Malaysian Traditional Games towards better engagement of the games.

Keywords: Usability evaluation, Heuristic evaluation, digital games, digital traditional games

Abstrak

Memfokuskan kepada pengukuran penglibatan terhadap permainan tradisi digital Malaysia, artikel ini membentangkan pengujian kebolehgunaan tiga versi permainan tradisi digital; Dam Haji, Congkak and Gasing-X. Kebolehgunaan merupakan factor signifikan yang menyumbang ke arah keterlibatan terhadap permainan digital. Kebolehgunaan membantu mengesahkan keperluan, kejayaan dan fungsi-fungsi permainan yang tidak lengkap. Pengujian kebolehgunaan dalam kajian ini mengguna pakai instrumen heuristik yang dibangunkan oleh Jacob Nielson pada tahun 1990. Instrumen mengandungi 17 protokol komponen heuristik berdasarkan rekabentuk antaramuka. Pengujian melibatkan 50 responden yang terdiri daripada pakar domain dan IT. Analisis hasil kajian dibentang dan dibincangkan bagi setiap permainan. Hasil kajian mencadangkan ciri-ciri dan aspek yang perlu ditingkatkan dalam pembangunan permainan digital tradisi Malaysia ke arah kerterlibatan yang lebih tinggi permainan tersebut.

Kata kunci: Pengujian kebolehgunaan, pengujian Heuristik, permainan digital, permainan tradisi digital

1.0 INTRODUCTION

Digital game has become one of the most popular online content. A survey conducted by Pastore [1] revealed that people spent an average of 20 hours per week on the Internet in which 48% of the hours spent was to play digital or online games. Currently, the increased power and flexibility of the computer

technology has contributed to the vast advancement in game development. Whilst being the source of entertainment, certain games have also been utilized for educational purposes [2], [3], [4]. Game has found to be effectively used to provoke interest as well as teaching domain knowledge, strengthen engagement, information processing, problem-solving, social development and finally to increase academic abilities [3].

Most of the digital games available nowadays are contemporary games which have impressive interface design with minimum technical requirements which made them easy to be used. Combination of attractive interface, challenge, fantasy and curiosity of contemporary games makes users engaged to it [5]. Besides contemporary digital games, digital versions of traditional games have been developed as the effort of preserving the national heritage. Malaysia through the National Heritage department is taking the same effort in preserving traditional games by digitizing them. Digital version of traditional games available Google Play Store are Congkak, Dam Kapit, Gasing-X and Dam Haji.

Based on preliminary studies, digital traditional games however are far less popular than contemporary games, despite its importance to cultural heritage. Taking example of one most popular game from both genres (Candy Crush and Dam Haji),
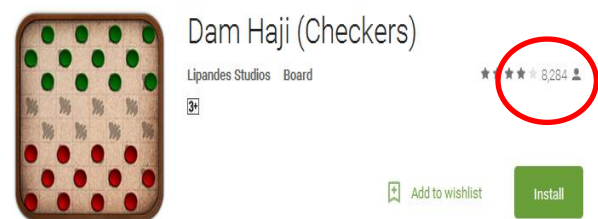
download rate for both genres shows a significant difference as illustrated in Figure 1. Candy Crunch Saga (contemporary game) has been downloaded for 13,107,503 times, while Dam Haji has only been downloaded for 8,284 times as recorded on 4th October 2015 on Google Play store. It shows how contemporary version is way popular than the traditional one.

A big gap of the download rate shows how contemporary game can attract more downloaders due to some contributing factors. Most of the games which are designed for children failed to maintain children's enthusiasm towards the applications, due to their attractiveness issue. This has been made exacerbated by the fact that some of the contents provided are not easily handled or understood by the children of age between 8 to 15 years old, making the application itself dull and boring. The need to understand what features players are looking for when playing digital traditional games is therefore emerged.

This paper discusses a usability evaluation study on three digital traditional games which are used to be among the popular traditional games in Malaysia in the past. The games, known as Gasing X, Dam Haji and Congkak which are now available in digital format at Google Play Store.
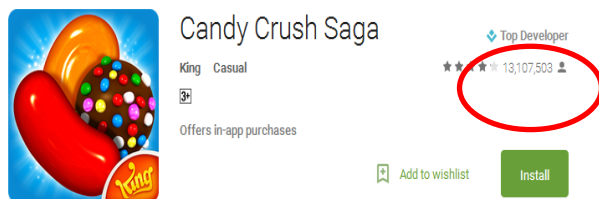
(a) Contemporary Game: Candy Crunch Saga　　　(b) : MalaysianTradidional Games: Dam Haji

Figure 1 Download rate for contemporary game vs tradiditional game

2.0 USABILITY EVALUATION

Usability is defined in the ISO 9241-11 as the extent of which a product can be used by the specified user to achieve the specified goal with efficiency, effectiveness and satisfaction in the term of the context that it is used [6. Usability evaluation is the process of evaluating a product to see, from users' point of view, whether it is easy to use, meets their acceptance and overall acceptability [7]. It also helps in verifying the requirements, successes and functionality the product is still lacking [8]. Interface design, interactivity design and technical issues are among the attributes commonly used in usability evaluation.

In the context of digital games, Pinelle [11] has defined the usability as the degree that the player is able to control, learnt and understand what the game's goal. Usability is an important part of a successful in games because to get users engaged to the game, it must increase the popularity by setting up the game and make the game experience fluent [7]. Second issue is about competition of the product in the so-called fierce market. Gamers usually prefer games which are usable to them. Recently, some contemporary games also suffer from similar issues; the character in the 2005 release Shadow grounds, for example, was criticized for moving too slow in some parts of the game. Hence, usability is the key to make sure the

traditional games can stand out of the crowd and make gamers engaged to it.

There are many factors in usability to evaluate. Clanton, in [7], summarized the attributes for usability evaluation into three areas which are game interface, game mechanics and game play. The game interface is about the interaction of the player and the game via controller such as keyboard, touch screen and joystick; game mechanics is about the combination of programming and animation while game play is about the process of the games. Game mechanics is one of the aspects that are tested by game companies for Quality Assurance (QA) to ensure no broken games or bugs in the programing aspect. Furthermore, player's log-on time at gaming site could be increased if the developers consider four critical design features during design, i.e. customer loyalty, flow, personal interaction and social interaction [9].

Heuristic is often used in usability evaluation as an evaluation tool [10] and [11]. Heuristics are defined as a set of the usability principles. Nielson [12] has also likened with them into finding the usability. The principles that are applied in the heuristic evaluations, where a small set of the evaluators examine the user interface (UI) of the product and then judge its compliance against the selected of the heuristics list. Heuristics are popular in the usability inspection method because it is cheap and quick compared to user testing. Since the evaluators are not using the system or program to perform the task, it is possible to perform the heuristic evaluation of the user interfaces that is only in the hard copy. It is suitable for evaluating products at the early stage in product development.

Heuristic evaluations sometimes described as the expert which is based on the usability method. Evaluators do not need the standard of usability training, knowledge of the usability principles that was preferred. The quality of the result is a key issue in judging the experience and knowledge of the evaluators. However, multiple evaluators can define the usability problems, their subjective view can also lead as the disagreement in defining usability problems [12].

3.0 METHODOLOGY

There are three main phases involved in conducting the research as illustrated in Figure 2.

Figure 2 Research methodology

Planning and analysis: Four main activities conducted in this phase are domain analysis, usability analysis, component analysis and game selection. Digital traditional game is chosen as the domain for the study. Several games were studied. Based on popularity, three were chosen which are Dam Haji, Gasing-X and Congkak.

Usability evaluation: Two main activities involved in this phase are instrument preparation and data collection. This study adopted the refined heuristic instruments developed by Jakob Nielsen in 1995. It is a widely used protocol for heuristic evaluation of any type of software which is based on factors related to instructional design. The instrument consists of three main heuristic components in evaluating usability; technical aspect, interface design and interactivity. The 17 components used are shown in Table 1.

Data were collected from 50 respondents from various age ranges where the lowest scale is below 20 and the highest scale is 51 and above. These respondents are from different background including IT executives (32%), game developers (20%), programmer (16%), software engineers (12%) and others (20%). Invitation email sent to the respondents to answer the prepared online web-based questionnaire and we managed to get 100% of it returned and answered.

Table 1 The heuristic components (H)

H	Description
1	Visibility of system status
2	Match between system and real world
3	User control and freedom
4	Consistency and standards
5	Error Prevention
6	Recognition rather than recall
7	Flexibility and efficiency of use
8	Aesthetic and minimalist design
9	Helps users recognize, diagnose and recover from errors
10	Help and documentation
11	Interactivity
12	Message design
13	Assessment
14	Performance support tools
15	Learning Managements
16	Feedback
17	Content

Data analysis: Data of 17 Heuristic components were analyzed using SPSS 16.0. Mean and standard deviation were used in analyzing the data. Details of

the analyzed data are covered in the following section.

4.0 RESULT AND ANALYSIS

Results are based on the analysis of 17 heuristic components for the three selected games. Results of every component were analyzed using mean and standard deviation. Figure 2, 3 and 4 show the mean score for Dam Haji, Gasing X and Congkak respectively.
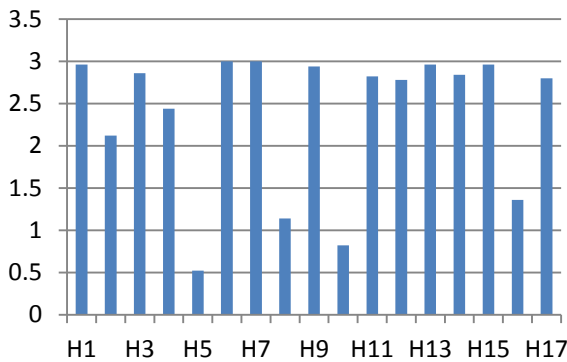

Figure 3 Heuristic components of Dam Haji

The overall mean for Dam Haji is 2.37 in which H6 (recognition rather than recall) and H7 (flexibility and efficiency of use) scored the highest. This indicates that Dam Haji is at the average in terms of its heuristic components. It also indicates that Dam Haji is a usable game, however it needs improvement for some components that achieved minimum scores, i.e. H5 (error prevention), H8 (aesthetic and minimalist design), H10 (help and documentation) and H16 (feedback).
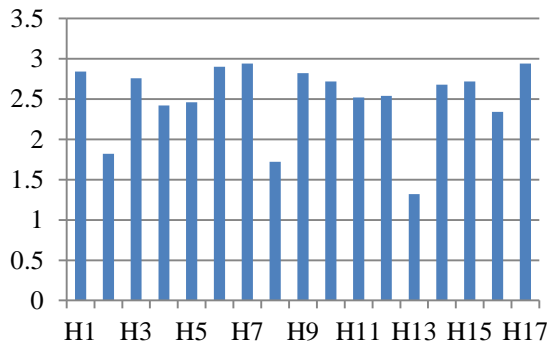

Figure 4 Heuristic components of Gasing –X

As shown in Figure 4, the overall mean for Gasing-X is 2.50. The highest score is H7 (flexibility and efficiency of use) and H17 (content), showing that Gasing-X is also at the average in terms of its heuristic components. Similar to Dam Haji, future development of this game also needs improvement on some heuristic components such as H2 (match between system and real world), H8 (aesthetic and minimalist design) and H13 (assessments).
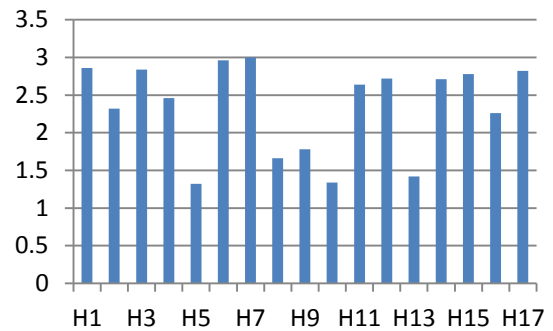

Figure 5 Heuristic components of Congkak

The overall mean for Congkak is 2.35. Figure 5 shows that the highest heuristic component is H7 (flexibility and efficiency of use). In general, it can be concluded that this game is usable to play. However, in order to encourage better engagement, some heuristic components need to be improved. These are H5 (error preventions), H8 (aesthetic and minimalist design), H9 (helps user recognize, diagnose and recover from errors), H10 (helps and documentations) and H13 (assessments). Respondents suggested that helps of the games should be improved.

A comparison of means scores between the three games are shown in Table 2. Besides, standard deviation (SD) is calculated to show how spread the responses are.

Table 2 Mean and Standard Deviation for Dam Haji, Gasing X and Congkak

Heuristic	Dam Haji		Gasing X		Congkak	
	Mean	SD	Mean	SD	Mean	SD
H1	2.96	0.20	2.84	0.51	2.86	0.45
H2	2.12	1.21	1.82	0.90	2.32	0.82
H3	2.86	0.50	2.76	0.60	2.84	0.47
H4	2.44	1.11	2.42	0.86	2.46	0.84
H5	0.52	1.07	2.46	0.88	1.32	0.68
H6	**3.00**	0.00	2.90	0.42	2.96	0.28
H7	**3.00**	0.00	**2.94**	0.31	**3.00**	0.00
H8	1.14	1.40	1.72	0.90	1.66	0.87
H9	2.94	0.24	2.82	0.56	1.78	0.95
H10	0.82	1.30	2.72	0.64	1.34	0.72
H11	2.82	0.63	2.52	0.83	2.64	0.72
H12	2.78	0.65	2.54	0.81	2.72	0.67
H13	2.96	0.20	1.32	0.65	1.42	0.78
H14	2.84	0.51	2.68	0.71	2.71	0.68
H15	2.96	0.28	2.72	0.70	2.78	0.62
H16	1.36	0.69	2.34	0.90	2.26	0.92
H17	2.80	0.57	**2.94**	0.90	2.82	0.52
Overall	**2.37**	**0.62**	**2.50**	**0.71**	**2.35**	**0.65**

The highest mean is 3.00 (H6 and H7) and the lowest is 0.52 (H5) while the highest standard deviation is 1.39 and the lowest is 0. As seen in the Table 2, results for mean and standard deviation for Gasing-X; the higher mean is 2.94 and the lowest is 1.32 in H13 (Assessments). Highest for standard deviation is 0.90 and the lowest is 0.31. Heuristics with values of mean and standard deviation below average are considered as need improvement.

5.0 DISCUSSION AND CONCLUSION

Results of heuristic evaluation for three selected digital traditional games are presented. Overall, it can be concluded that the selected games are usable but some of the heuristics can still be improved. For Congkak, heuristic to be improved are error preventions, aesthetic and minimalist design, diagnose and recover from errors, helps and documentations, and assessments. For Gasing-X, heuristics to be improved are match between system and real world, aesthetic and minimalist design and assessments. While for Dam Haji, heuristics to be improved are error prevention, aesthetic and minimalist design, help and design, and feedback.

Results can be considered by game developers in enhancing the games towards improving the usability hence better engagement towards the game. Future works might consider to involve gamers and players in evaluating the usability of the games.

References

[1] Pastore, M. 1999. Half of PC Time Spent Online. *CyberAtlas.* Internet Statistics and Market Research for Web Marketers. http://www.cyberatlas.com/big_picture/demographics/article/0,1323, 5931_211381,00.html.

[2] Von Ahn, L. 2006. Games with A Purpose. *Computer.* 39**:** 92-94.

[3] Hasibuan, Z. A., Isal, Y. K., N.C., B. A., Ahmad, M. & Selviandro, N. 2011. Preservation of Cultural Heritage and Natural History through Game Based learning. *International Journal of Machine Learning and Computing.* 1**:** 460-465.

[4] Amory, A., Naicker , K., Vincent, J. & Adams, C. 1999. The Use Of Computer Games As An Educational Tool: Identification Of Appropriate Game Types And Game Elements. *British Journal of Educational Technology.* 30**:** 311-321.

[5] Malone, T. W. 1984. Heuristics For Designing Enjoyable User Interfaces: Lessons From Computer Games. *In:* Thomas, J. C. & Schneider, M. L. (eds.). *Human Factors in Computer Systems.* New Jersey: Ablex Publishing Corporation.

[6] Laitenen S. 2006. Better Games Through Usability and Testing. 2(1): 64-75.

[7] Laitinen, S. 2005. Better Games Through Usability Evaluation And Testing. http://www.gamasutra.com/view/feature-/2333/better_games_through_usability_.php

[8] Pablo M., Javier T., Yichuan G., William T. 2012. Usability Testing for Serious Games: Making Informed Design Decisions with User Data. *Journal of Advanced in Human-Computer-Interaction-Special issue on User Assessment in Serious Games and Technology-Enhanced Learning.* 2012(4).

[9] Dongseong, C. & Jinwoo, K. 2004. Why People Continue To Play Online Games: In Search Of Critical Design Factors

to Increase Customer Loyalty To Online Contents. *CyberPsychology & Behavior.* 7(1): 11-24.

[10] Korhonen, H., & Koivisto, E. 2006. Playbility Heuristics For Mobile Games, Nokia Research Center, Finland.

[11] Pinelle, D., Wong, N. and Stach, T. 2008. Heuristic Evaluation For Games: Usability Principle For Video Game Design. *Proceedings of CHI*, Florance, Italy.

[12] Nielsen, J. 2011. Characteristic of Usability Problem Found by Heuristic Evaluation, http://www.useit.com-/papers/heuristics/usability_problems.html.

[13] Nielson, J. 1995. Ten Usability Heuristics, http://www-.useit.com/papers/heuristics/heuristic_list.html.

[14] Jorgansen, A. H. 2004. Marrying HCI "Usability and Computer Games. Department of Digital Aesthetic and Communication IT. University of Copanhagen.

[15] Maria T. Linaza, Kieran Moran, Noel E. O'Connor. 2013. Traditional Sports and Games: A New Opportunity for Personalized Access to Cultural Heritage. *6th International Workshop on Personalized Access to Cultural Heritage (PATCH 2013), Rome, Italy, June 10-14, 2013.*