A Study on User Centered Game Evaluation Guideline Based on the MIPA Framework

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Abstract. The purpose of this experiment was to identify the relative benefits of the usability checklist and to investigate how the identified usability problems varied by groups. From our experience, there are no structured game frameworks for user interface design. This is why evaluation methods are important in the game development process. The MIPA framework can perform efficient evaluations and correctly identify as many usability defects as possible. Also, accurate evaluations earlier in the design phase can save money and time. Therefore the result is an effective task-oriented usability evaluation checklist that is easy to learn and apply for not only experts but also non experts.

Keywords: MIPA framework, user interface, game design.

1 Introduction

Game designers face the challenge of creating games that can be effectively played, easily learned, and emotionally enjoyed by gamers. With very limited theoretical foundation research on gamers, they have to entirely depend and rely on their intuition and experience. This is why about 80% of games fail on the market each year [1]. While technologies have improved rapidly, game design has evolved slowly.

Given the fact that the game market is so competitive, every aspect of game design and development has been studied carefully to find better ways to design more successful games. It is interesting to notice that other game software industries have invested a lot of time and effort in finding new methods and processes to design and evaluate user interface.

Human Computer Interaction has been a thriving field in recent years where a lot of innovative ideas have been generated. These ideas lead to a variety of processes, methodologies, techniques, and tools being developed and successfully practiced in other game software industries. They have helped developers solve many of their problems which are closely related to the problems of game design. Once they are learned and used by game designers, these processes and methods can greatly improve their work. Game designers need to restructure their design processes, redefine their design strategies, and reorganize their teams to reflect these new ideas.

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Therefore the proposed framework is based on game mechanism, game interface, game play, and game aesthetics to understand the user perspective of games. The main purpose of this framework is to 1) bridge the gap between game design, development, and research 2) clarify and strengthen the iterative process 3) make it easier for all parties to decompose, study, and design a broad class of game designs and artifacts. The study analyzes the usability methods used in games and provide insights and guidelines to improve game design in order to sustain and enhance players' motivation. This new approach can be used by researchers to understand design issues seen in other types of specialty software. It can be used in further studies of games and new heuristics can be developed.

2 Background

2.1 Game Design and User Interface

Usability has multiple components and is traditionally involved with these five usability attributes: learnability, efficiency, memorability, errors, and satisfaction. In the case of game usability, effectiveness and efficiency are secondary considerations in relation to satisfaction. Games are about enjoyment rather than efficiency [2]. Player enjoyment is a very important goal for computer games. Csikszentmihalyi [3] found that optimal experience is flow, and classifies them into eight elements. Malone has attempted to develop a set of heuristics to the unique software category of games. The focus of his research was instructional games concerning the development of games with the primary objective of entertaining the user. Since the concept of a game, implies that there is an 'object of the game'[3], or goal, it is not surprising that Myer's study of Game Player Aesthetics [4], found that 'challenge' was the most preferred characteristic of a favorite game. As Karat and Ukelson [5] point out in their discussion of interfaces and motivation, people find satisfaction in mastery of a tool to reach a desired goal and so are willing to invest a great deal of time in doing so. Offering challenge and the opportunity to master a skill seems to provide sufficient motivation for people to engage in games.

Clanton [6] offers a way to encapsulate the different usability issues of games into three areas: game interface, game mechanics, and game play. Game interface is the device through which the player interacts with the game. This includes whatever is used to physically control the game such as a controller, joystick, mouse, or keyboard. Also, it is the visual representation of software controls that players use to set up their games, engage in a tutorial, move through a game, obtain their status in the game, save their games, and exit the game. Game mechanics are the physics of the game, which are developed through a combination of animation and programming. They are used to describe how players interact with rules, game goals, player actions and strategies, and game states. This includes the way the player is allowed to move through the game environment such as walking, running, jumping, driving. Game play is the process by which a player reaches the goal of the game. All three relate to the game being both functional and satisfying and require design and evaluation. This includes the problems and challenges a player must face to try to win the game. Crawford [7] defines game play as pace and cognitive effort, and Shelley [8] agrees by equating fun with interesting

decisions having to be made in a required amount of time. Current literature on usability on games presents many heuristics for designing and evaluating games. Although many useful and valid heuristics are presented below in the chart, there is no integrated user centered framework.

2.2 Perspectives on Games

The usability of a game is similar to other software in this manner; the usability of the product cannot be evaluated without taking context into consideration. When working with games, it is helpful to consider both the designer and player perspectives. It helps to observe the small changes in one layer that can cascade into others. As Haddon points out, in the case of computer games there is a thin line between user and designer. The game designer approaches the creation of the game from the Mechanics-end where the designer creates the game. The player experiences the game from the Aesthetics-end where the gamer consumes the game. But as the game progresses, the aesthetics become irrelevant and the player starts to focus on game play, in other words, how the player plays the game. As time passes the player begins to understand the mechanics by analyzing the dynamics to achieve the best understanding of the game. This is the dynamics in MDA model. The MDA framework provides insights into the relations between the formal, algorithmic elements of games and how they are presented to and manipulated by players. Nevertheless, it is a model that does not allow for the description and analysis of a mechanic due to a relative inconsistency in the formulation of the definition.

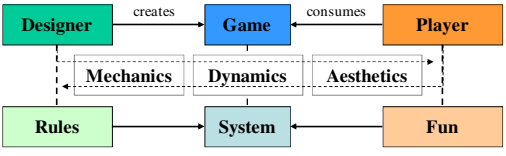

Fig. 1. Designer/Player Perspectives of Game System

Also considering about the user encourages a player centered design. A player centered approach to design can contribute to the success of a project targeting the main player. Game design process needs to consider the profiles of the gamers especially when the game production is not solely intended for entertainment but is also meant to inform, advertise, or educate.

In the end, the player focuses on how to understand and use the mechanics, because they determine what is relevant. However we believe that this is primarily the case when pacing is high, which it often is in FPS games. Games with a lower pacing gives the player time to examine the aesthetics, whereas the high demand for constant response in FPS games, shooters makes the player ignore the aesthetics and focus on the dynamics or mechanics.

2.3 Game Design and User Evaluation

Game designers don't have enough time to research the design methods from scratch. The game designer is not necessarily a graphic designer or a programmer but a person that identifies, develops and refines the game idea, mechanics of gameplay, and

Table 1. Heuristics from Literature

Game Interface	Customizable controls	(Bickford, 1997; Sanchez-Crespo Dalmau,1999)
	Pla y the game without reading the manual	
	Non-intrusive interface	(Sanchez-Crespo Dalmau,1999)
	Include online help	
	Identify score/status in game	(Malone,1982; Shneiderman,1992)
	Sense of control over the game interfaces	
	Shorten the learning curve	(Sanchez-Crespo Dalmau,1999)
	Support in recovering errors	
	Consistent in control (color, typo, dialog design)	(Sanchez-Crespo Dalmau,1999)
	Players should always know their status and score	
	Minimize menu layers and control options	(Shelley,2001)
	Use meaningful sound feedback	(Norman,1990)
	Do not expect the user to read a manual	(Norman,1990)
Game Mechanics	Immediate feedback to display user control	(Bickford, 1997; Malone, 1982; Sanchez-Crespo Dalmau, 1999)
	Sense of control over the game shell(starting, stopping, saving…)	
	Easy to learn and use	
	Get the player involved quickly and easily	(Bickford, 1997)
	Sense of control over the input devices	
	Controls should be intuitive and a natural mapping	
Game Play	Variable difficulty level	(Malone,1982; Norman,1990; Shneiderman,1992)
	Provide new challenges at an appropriate pace	
	Multiple goals on each level	(Malone,1982
	Level of challenge should increase the player	
	Easy to learn and hard to master	(Crawford, 1982; Malone, 1982)
	Overriding goals should be clear and presented early	
	Artificial intelligence should be reasonable yet unpredictable	(Bickford, 1997; Crawford, 1982)
	Should feel viscerally involved in the game	
	Maintain an illusion of winnability	Crawford, 1982)
	Provide stimuli that are worth attending to	
	Give hints, but not too many	(Clanton, 1998
	Quickly grab the players' attention and maintain their focus throughout the game	
	Give rewards appropriately	(Bickford, 1997;Clanton, 1998;Shelley, 2001; Shneiderman,1992)
	Pace the game to apply pressure, but not frustrate the player	(Clanton, 1998;Shelley, 2001)
	Allow players to build content/ Make the game replayable Create a great storyline	(Shelley, 2001)

technologies involved in the game. What they can do, however, is to look at related research fields and other software industries and to borrow ideas from them.

User centered design is an established practice in product and digital media design but is not a common practice in game design. HCI is the closest research field to game design. It is the study of how people use computers, and how to design, implement and evaluate computer systems so that can be used easily, effectively, and enjoyably. User testing can be a very important component of good game design, and is often performed when the game ides is already established. Game usability testing has evolved into a more detailed and thorough process. Among these methods, Heuristic Evaluation (HE) and Cognitive Walkthrough (CW) are valuable and can be adapted to help UI game designers.

Heuristic evaluation is a method for structuring the critique of a system using a set of general heuristics [9]. The heuristic evaluation method requires a group of people to act as evaluators and independently critique a system and suggest usability

problems. The evaluators use the list of heuristics to generate ideas while critiquing the system. This guideline for heuristic evaluation was considered appropriate for use in the present study as they provide a broad overview of interface design. It is also task-free which allows them to be applied universally to a variety of games.

Cognitive Walkthrough is a method that focuses on evaluating interface design for ease of learning by exploration. Its focus is motivated by the observation that many users prefer to learn software by exploration. This is the case for games, for example when gamers start playing the games they generally know nothing about it. They learn how to play and use the interface by trial and error. Another example is that this can be used to evaluate level designs of action adventure games. Action adventure games consist of a set of levels with various goals.

The player has to explore a level to achieve that goal, then proceed to another level for another goal. This scenario matches the idea behind the cognitive walkthrough very well [9], the intent of which is to evaluate a design for its ease of learning through exploration.

3 Case Study on Game Usability Evaluation

3.1 Procedure

The users were to note any usability errors they found that were out of sequence, confusing, and did not understand or make any sense. The time required to complete the checklist was recorded upon completion (M=60mins, Range 45-75mins), so that the tests could be of reasonable duration. The usability evaluation was conducted by two groups. Group (A) are classified as expert gamers and Group (B) as non-gamers.

Table 2. Classified Participant Group

	Group (A) Expert Evaluation	Group (B) Non-Expert Evaluation
Age	Average 28	Average 28
Sex (male : female)	3 : 3	3 : 3
Game Experience	5~8 yrs.	0~1 yrs.
Game Play	4~7 times/week Every 8 hrs.	0~2 times/week Every 3 hrs.
Game Knowledge	Expert in Online, Console, Mobile	Beginners in Online, Console, Mobile

The materials of the evaluation were World of Warcraft (commonly known as WoW) which is a MMORPG game. The user controls a character avatar within a persistent game world, exploring the landscape, fighting monsters, performing quests, building skills, and interacting with NPCs, as well as other players. The game rewards success with in-game money, items, experience and reputation, all of which in turn allow players to improve their skill and power.

Fig. 2. Gameplay in Usability Evaluation

The user evaluating the checklist looked at the actions for each task and evaluated on the usability problems. The groups played the game and wrote notes on the usability issues they found while playing. The findings were based on the developed framework of game usability heuristics. The groups were told to evaluate the game neither had any specific instructions given on what to focus in the game. But before starting to evaluate the game they were instructed how to play the game and reminded that in games some issues are supposed to be challenging whereas everything else should be as easy as possible.

After the evaluation, the groups presented their findings to the evaluation moderator and discussed the reasons behind the problems, severity classifications and the possible solutions. Then the moderator(evaluation leader) collected the problems. The problems were grouped within predefined categories. After the categorization, similar problems within each category were grouped together. This categorized and grouped list served as the basis for the final framework.

3.2 Results

In this section we describe quantitative results from the case study. First, we examined the total number of problems by severity on a scale of 1(minor) to 7(major) and found the means of the problems per person(mean1) and also the means of the severity of the problem(mean2). The summary of the results are presented in the chart below.

Table 3. Total number of Problems Found

Severity / Evaluation	1 Minor	2	3	4	5	6	7 Major	Mean(1)	Mean(2)
Group (A)	13	2	3	36	48	22	2	21	4.41
Group (B)	9	5	0	23	28	17	1	13.8	4.33

It shows that Group(A) and Group(B) had difference on finding the total number of problems but there was no significant difference in the severity of the problem.

Second, we identified the number of accurate problems detected in tests finding the accurate problem numbers per person(mean1) and the severity of the problem(mean2). Then we discussed the accuracy rate of the two groups on finding the usability problems.

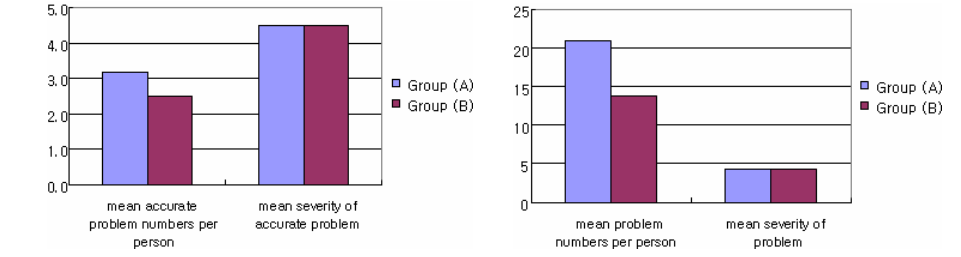

Fig. 3. Means of problem /person and severity of problems & Means of accurate problem /person and severity of accurate problems

Table 4. Accurate Problems Found

Severity / Evaluation	1 Minor	2	3	4	5	6	7 Major	Mean(1)	Mean(2)
Group (A)	2	1	0	6	8	4	1	3.14	4.5
Group (B)	1	1	0	5	3	5	3	2.5	4.5

From the above figure and chart, accurate problems found by the expert Group(A) was 3.14 whereas the mean for the non-expert Group(B) was 2.5. There was no significant difference between the severity of the accurate problems of both of the groups which have the means of 4.5.

Table 5. Accuracy Rate

Severity / Evaluation	1 Minor	2	3	4	5	6	7 Major	Mean Accuracy
Group (A)	15%	50%	0%	17%	17%	18%	50%	17.62%
Group (B)	11%	20%	0%	13%	18%	18%	0%	18%

When the numbers of the usability problems that did have a difference between the two groups, it was found that there was no significant difference between the accuracy of the expert and non-expert. Also the performed evaluation was based on the concerns of the user's success rates in completing the tasks, and their ability to find the problems. We did not expect to measure user's speed of task performance.

4 MIPA Framework

From the above usability evaluation results of the case study, the MIPA framework has two main roles in the game design process.

First, the framework can serve as a set of game design principles that can be used during the pre-production phase or the formative stages of the game design and development. Second, this can be used to carry out usability evaluations where developers, evaluators, and designers could use to critique the design. This will help developers

derive valuable and useful data for the game development. The following detailed elements evaluation elements are shown below.

Function	Description	Elements	Evaluation
GAME MECHANICS	Physical elements of expressing the combination of animation and programming	Immediate Display	Display immediate visual and auditory feedback of the user control
		Physical	Provide natural weight of the mechanics Provide quantity of motion
		Participation	Rapid, swift, and easy participation
		Learnability	Continuous action mapping and response Short learning time, direct recognition
		Intuitive	Easy control and customizable Natural mapping Expandable in options

Fig. 4. Game Mechanics of MIPA Framework

The mechanics are evaluated on the display, physical attributes, participation, and response in action mapping, easy and customizable controls, and expandable options. Together with the game content (levels, assets and so on) the mechanics support the overall game play dynamics.

Function	Description	Elements	Evaluation
GAME INTERFACE	Interaction with the game on all devices	Consistency	Consistency in naming, structure, expression... Consistency in icons and look and feel of the style
		Control	Initialization of game control Freedom of game initialization Immediate operation in game control
		Feedback	Easy to remember the number of icon in the screen Communicate the optimal amount of information
		Natural Correspondence	Support a natural response between action and result, control and its effect
		Affordance	Show the actual realistic characteristics
		Mental Model	Easy to remember Appropriate grouping and naming Visualize the leveling structure
		Help / Support	Appropriate help info Appropriate expressions Not too much frequent game hints
		Navigation	Precise leveling structure Appropriate depth and breadth of menus Provide a variety of paths

Fig. 5. Game Interface of MIPA Framework

The interface is classified into the consistency of structures and representation, initialization of game control, freedom of key control, easy memorable information, natural correspondence of the control and its effect and result of the action, affordance of objects, clear and distinct structure, diverse paths of navigation, complete mental model of the internal mechanics of the game.

It is important to recognize that the user interface is closely related to game play. No matter how beautiful the 3D images are, or how involving the story is, without good game play a game definitely cannot succeed. But game play is a rather vague concept and hard to describe. So it is very important to find away to define game play.

Function	Description	Elements	Evaluation
GAME PLAY	Achieving the player's goal in every process	Goal	Definite goal in the opening of the game Many goals in each of the levels
		Learnability	Easy to learn
		Compensation	Pertinent compensation
		Fun	Provide hedonic experiences Raise awareness in visual/auditory effects Provide multiple paths
		Hint	Appropriate hints
		Tutorial	Show interest and enthusiasm
		Challenge	Apt challenges
		Pressure and Speed	Adjust the pace for appropriate pressure so the player doesn't get frustrated
		Reconnection	Desire to have reconnecting to the game
		Empathy	Empathy through game play Empathy in the character image
		Difficulty Level	Pertinent difficulty levels in the player's level
		Fairness	Fair play in gamer vs. gamer
		Balance	Appropriate victories to the number of matches in the game

Fig. 6. Game Play of MIPA Framework

The game play should have a definite goal in the opening part of game and at each level, easy to learn, provide fun and multiple paths, give hints at the right point, offer challenge. Also the player should be at the range of appropriate suspense or tension in order to adjust the pace, feel empathy through game play and characters, have fair game play between the players, and balance of game percentage of victories.

Aesthetics describes the desirable emotional responses evoked in the player, when the player interacts with the game system. The detailed elements are aesthetics of the menu, layout, controls, and also minimize inputs and expression, easy to understand, visual affordance, transparency, and visual metaphor.

Function	Description	Elements	Evaluation
GAME AESTHETICS	Emotional and visual elements in the game	Aesthetic	Provide aesthetics in menu, layout, control option…
		Concise	Minimum expressions Minimum input
		Visual Affordance	Easy to understand and straightforward
		Transparency	Immersed in the virtual world
		Metaphor	Provide pertinent metaphor

Fig. 7. Game Aesthetic of MIPA Framework

Attractive graphics are important, but it attempts to find predictive metrics of user preferences for esthetic qualities are risky. We know that alignment and grouping is important for rapid performance. Balance and symmetry are classic notions for graphic design, but when do they also increase preference and improve performance Smooth transitions and zooming are enjoyable and helpful, principles of rapid, incremental, and reversible actions with immediate visibility of results, also increases satisfaction and performance

5 Conclusion

The purpose of this experiment was to identify the relative benefits of the usability checklist and to investigate how the identified usability problems varied by groups.

From our experience, there are no structured game frameworks for user interface design. This is why evaluation methods are important in the game development process. The MIPA framework can perform efficient evaluations and correctly identify as many usability defects as possible. Also, accurate evaluations earlier in the design phase can save money and time. Therefore the result is an effective task-oriented usability evaluation checklist that is easy to learn and apply for not only experts but also non experts.

The framework continuously needs to be modified and therefore will be greatly improved. Other case studies in other development game companies could provide valuable data to compare. Ongoing research of this study is to make a evaluation tool based on the MIPA framework.

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