A Development of Quality Model for Online Games Based on ISO/IEC 25010

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***Abstract*— In the modern era, online games are still popular with all groups. But over time and game updates, sometimes the quality of online games decreases. This is because the motivation of the player's decreases, the facilities provided are not very helpful, many bugs and cheaters appear in online games. Therefore, a quality model is needed that can analyze every aspect related to the online game. Previous models have disadvantages. It was no evaluation criteria for the player's experience aspects. So in this paper, we proposed a quality model that is designed specifically for online game quality requirements based on the indicators of online game characteristics. The proposed quality model develops based on the latest standards by ISO / IEC 25010. The model was evaluated on several online game types. The result is the quality model can evaluate the online games and we can know all the characteristics, strengths and weaknesses of an online game**

Keywords*— *quality model, online games, user experience, ISO/IEC 25010,

I. INTRODUCTION

In the modern era, online games are still popular with all groups. Old young people still play online games because they can be used as a medium of stress relief, a medium of interacting with other people who are far away and a tool of making money. Therefore, many types of online games are made to grab the attention of the players. But over time and game updates, sometimes the quality of online games decreases. This is because the motivation of the player's decreases, the facilities provided are not very helpful, many bugs and cheaters appear in online games. Therefore, a quality model is needed that can analyze every aspect related to the online game.

Ventureli [1] proposed the development of a metric previously made by Denieffe [2]. The development lies in the calculation of Game Rating Factor (GRF), the effect of the hardware used, the effect of network interference, and player experience. Then tested on Team Fortress 2. The online game is of the First Person Shooter type. These developments can show specific results in each aspect assessed. However, this model has three disadvantages. First, the rating scale in each aspect does not have clear information. Second, this model is tested on one type of online game, First Person Shooter (FPS). Finally, the important thing is that there are no evaluation criteria for the player's experience aspects.

User experience according to ISO 9241-210 is a person's perceptions and responses that are generated after using a product, system or service that is related to the form of interaction between humans and computers. For example, what users feel is related to convenience, comfort, efficiency, and benefits in using a product. Therefore user experience is very important in assessing the quality of a product, system or service. But in this field player experience is more complex than user experience [3]. This is because analyzing the quality of games (video games, online games, mobile games) purely in terms of usability is not enough, not only analyzing functional values but also non-functional values, given the specific characteristics of video games. Therefore, a series of criteria or attributes are needed in identifying the player's experience. So that these results can show the quality of a game.

In this study we proposed an analysis of quality requirements of online games and build a quality model based on ISO/IEC 25010.

II. LITERATURE REVIEW

Ubicom [4] proposed a quality assessment model with the name Online Playability Score (OPScore). OPScore describes the level of decline in the quality of online games caused by network interference. Network disruption such as latency, jitter, and packet loss. This valuation model calculates the value of interference received when using a network in the surrounding environment.

Wattimena [5] proposed a quality assessment matrix for the game First Person Shooter (FPS) Quake IV with the name Quake IV G-Model. This matrix is made to provide deeper knowledge about the quality experience of players. The advantages of this model make it possible to predict the quality rating of online games based on the measured ping and jitter values and can show a fairly high correlation with subjective data. From the results of the tests, it was shown that ping and jitter had a significant negative effect on the Mean Opinion Score and game objectives.

Denieffe [2] proposes an assessment of the quality of objective game that can estimate the player's overall perception of the quality of the game by adding aspects of the player's experience or knowledge. Aspects used in online quality assessment include 1) user experience, 2) the effect of the hardware used (mouse, processor, graphics card, RAM, and monitor resolution), 3) the effect of network interference (delay, packet loss, and jitter), and 4) the effect of the game server. The four aspects are called Game Rating Factor (GRF).

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Ventureli [1] proposed the development of metrics from Denieffe's research. The development of these metrics lies in the calculation of Game Rating Factor (GRF), the effect of the hardware used, the effect of network interference, player experience. Then tested on Team Fortress 2 (FPS). The results showed the quality of the game in sufficient detail.

III. METHODOLOGY

There are two stages in developing a quality model.

A. *Determine the quality requirements for online games.*

At this stage it begins by gathering information about the quality requeriments for online games. The information collection techniques used are literature studies and surveys. The survey was conducted by interviewing respondents or players who had playing experience. The respondents used were informatics students of Institut Teknologi Sepeluh Nopember and Surabaya State University.

After gathering information, make a table of quality and validation needs. The reason the table needs to be validated is based on ISO 25010 [10] document explains that Quality in Use requirements establish the level of quality requirements from the end user perspective. These requirements originate from users and other stakeholders. Quality In Use Requirement used as a target for software product validation by user. Quality In Use characteristics should be declared in specification of quality requirements using Quality In Use Measurement used as a criteria when product is in evaluation. Table I displays the results of gathering quality requirements for online games.

TABLE I. THE RESULT OF GATHERING QUALITY REQUERIMENT FOR ONLINE GAMES

No.	Indicator
1.	Online game show clearly goals and players can complete the goals [3], [6]
2.	Player does not see error at the online game[3], [6]
3.	Online games easily learned by players[3], [6],[7]
4.	Online games have clear guide and help features[3], [6] ,[7]
5.	Online games provide motivation to play[3], [6] ,[7]
6.	Online games always update well (survey)
7.	Online games have a comfortable display[3], [6]
8.	Sounds on online games are comfortable to hear and according to conditions[3], [6]
9.	Player get appropriate reward from game[3], [6]
10.	Online games have a variety of game models[3], [6]
11.	Free from the use of applications that cause cheating[8]
12.	The game can be played with the device in general [1], [2]
13.	The game can adapt to existing network disturbances[1][9]
14.	Online games have good server quality (survey)
15.	Players did not get affected by health and safety issues [3], [6]

B. *Mapping the online games quality requirement based on ISO/IEC 25010*

In mapping quality requeriments, we followed the quality model guidelines made by Trisnadoli model [6]. Table II displays the results of mapping the quality requirements based on ISO / IEC 25010.

TABLE II. THE RESULT OF MAPPING QUALITY REQUIREMENTS OF ONLINE GAMES

Quality Requirement	ISO 25010 Characteristic	ISO 25010 Sub – Characteristic
Online game show clearly goals and players can complete the goals	Effectiveness	
Player does not see error at the online game		
Online games easily learned by players	Satisfaction	Usefulness
Online games have clear guide and help features		
Online games provide motivation to play		
Online games always update well		
Online games have a comfortable display		Comfort
Sounds on online games are comfortable to hear and according to conditions		
Player get appropriate reward from game		Pleasure
Online games have a variety of game models		
Free from the use of applications that cause cheating		
The game can be played with the device in general	Context Coverage	Flexibility
The game can adapt to existing network disturbances		
Online games have good server quality		
Players did not get affected by health and safety issues	Freedom from Risk	Health and Safety Risk Mitigation

Based on Table II, it can be concluded that the characteristics of the online game quality model are:

- Effectiveness, is the level at which users can achieve their goals with the accuracy and suitability of their use.
- Satisfaction, is the level at which a user gets satisfaction and comfort when using software.
- Context Coverage, is the level at which a product or system can be used effectively, efficiently, satisfied and free from risks in the context of the specified usage.
- Freedom from Risk, is the level at which the quality of a product or system alleviates or avoids potential risks for the user,

IV. EXPERIMENT

In this case, we have to prepare something to evaluate the quality of the game online. We use three online games with different genres. They are Atlantica Online Indonesia (MMORPG), Point Blank (MMOFPS), and DoTA 2 (MOBA).. Then, we make a questionnaire based on Table III.

TABLE III. INDICATOR OF QUALITY MODEL

ISO 25010 Sub Characteristic	Quality Requirement	Evaluation Method
Effectiveness	Online game show clearly goals and players can complete the goals	Measuring Player Performance
	Player does not see error at the online game	Measuring Player Performance
Usefulness Scale	Online games easily learned by players	Questionnaire
	Online games have clear guide and help features	
	Online games provide motivation to play	
	Online games always update well	
Comfort Scale	Online games have a comfortable display	Questionnaire
	Sounds on online games are comfortable to hear and according to conditions	
Pleasure Scale	Player get appropriate reward from game	Questionnaire
	Online games have a variety of game models	
	Free from the use of applications that cause cheating	
Flexibility	The game can be played with the device in general (External factor)	Measuring Player Performance and Questionnaire
	The game can adapt to existing network disturbances (External factor)	
	Online games have good server quality	
Health and Safety Risk Mitigation	Players did not get affected by health and safety issues	Measuring Player Performance

A questionnaire will be given to thirty players. The player must have the experience of playing the game for 3 – 4 months. We use a Likert scale (1 – Very Bad, 2 – Bad, 3 – Medium, 4 – Good, and 5 – Very Good).

On the quality requirements of the devices used, we use three laptops with different specifications. The table shows all three laptop specifications. We use an application, namely MSI Afterburner to make an assessment to get accurate values. Table IV shows the specification of the three laptops.

TABLE IV. SPECIFICATION OF THE THREE LAPTOP

No	Spesification
1.	Laptop 1, 8 GB RAM, Graphic Card GeForce GTX 1050, Processor Intel Core i7-7700 HQ 2.80GHz
2.	Laptop 2, 6 GB RAM, Graphic Card NVIDIA GeForce 705M 1GB, Processor Intel Core i3-3110M 2.41GHz
3.	Laptop 3, 4 GB RAM, Graphic Card Intel(R) HD Graphics, Processor Intel(R) Celeron N2830 2.41GHz

On the quality requirement of adapting from network interference, we use two parameters (delay and packet loss) and a software. The software is NetDisturb. NetDisturb is used to simulate a network condition. Tabel V and Tabel VI display the values of each paramater.

TABLE V. DELAY PARAMETER

Test	Condition (ms)
1	150
2	300
3	450

TABLE VI. PACKET LOSS PARAMETER

Test	Condition (ms)
1	10
2	20
3	30

In this case, we use spesific rating scales in order to be able to asses accurately. Tabel VII show the spesific rating scales for this case.

TABLE VII. SPESIFIC RATING SCALES

Scale	Description
5	There is no delay
4	Delay < 1 seconds between player actions and response to online play (delay) Delay in display (lag) < 1 seconds of information received by the player
3	Delay 1 - 2 seconds between player actions and response to online play (delay) Delay in display (lag) 1 – 2 seconds of information received by the player
2	Delay > 2 seconds between player actions and response to online play (delay) Delay in display (lag) > 2 seconds of information received by the player
1	The game cannot be played because it stopped completely or was disconnected from the game

V. RESULT

TABLE VIII. MEASUREMENT RESULT

ISO 25010 Sub Characteristic	Online Games		
	Atlantica Online	Point Blank	DoTA 2
Effectiveness	Medium	Medium	Good
Usefulness Scale	Good	Good	Good
Comfort Scale	Good	Good	Good
Pleasure Scale	Good	Medium	Good
Flexibility	Medium	Good	Good
Health and Safety Risk Mitigation	Good	Good	Good

From Table VIII, we can see DoTA 2 can be said the best online game among other online games. DoTA 2 has a clear goal and a small value of error appears, the level of flexibility is good, many players are satisfied, comfort and pleasure when and after playing the game. Atlantica Online predicate medium in Effectiveness because this game has an unclear goal and many minor errors or bug. This game got medium in flexibility because a problem appears when the server cannot accommodate the number of players. Furthermore, Atlantica Online has good quality. Point Blank has a clear goal but many bug and error appear. This game can use illegal software when playing but not all players can use it. Moreover, it has good quality.

TABLE IX. RESULT OF QUALITY ON THE THREE LAPTOP

Hardware	Online Game		
	Atlantica Online	Point Blank	DoTA 2
Laptop 1	Good	Good	Good
Laptop 2	Medium	Good	Medium
Laptop 3	Bad	Medium	Bad

The evaluation results on the devices used can be seen in the Table IX. From Tabel IX, we can conclude that Atlantica online and Dota 2 are games that require a fairly high device specification. In addition, Point Blank is an online game that can be played on general device specifications.

Figure 1 shows that Atlantica Online can play with a delay value of 150 ms and the score starts to decrease when the value of delay increases. Point Blank cannot survive when a delay is coming so we cannot enjoy the game. We can still play DoTA 2 but there is a slight delay (<1 second) in response from player interaction with the system. When a value of delay increases, we cannot enjoy the game.

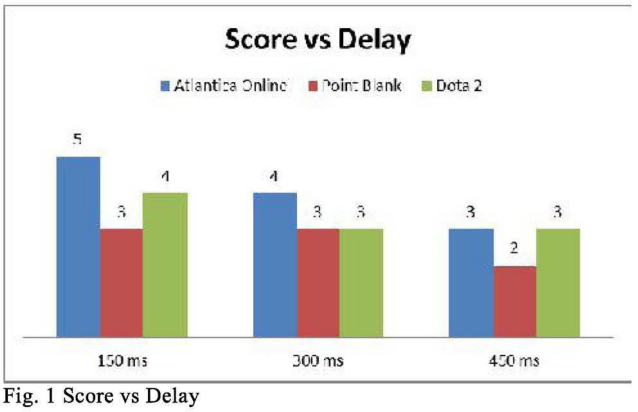

Fig. 1 Score vs Delay

Figure 2 shows about the effect of packet loss on game quality level. Atlantica Online can play with a value of packet loss of 10% and 20%. Point Blank cannot survive when a delay is coming so we cannot enjoy the game. DoTA 2 can still survive at 10% but appear a little bit delay information (<1 second) from system. When a value of packet loss increases, we can feel a delay information from system around 3 – 8 seconds.

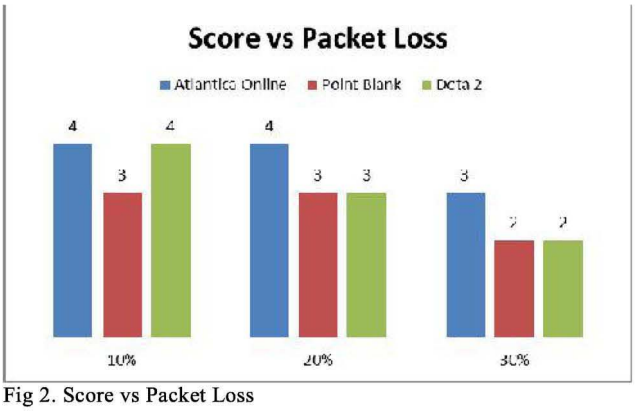

Fig 2. Score vs Packet Loss

We can conclude from Table VIII, Table IX Figure 1 and Figure 2 that our model can evaluate a online game specifically. Atlantica Online and DoTA 2 has a good score, can survive from a value of delay and packet loss given and require a high device spesification for play it. Conversely, Point Blank has a standard score, it cannot survive from network interference but can be played on general devices.

VI. Conclusion

In this paper we proposed a quality model is designed specifically for online game quality requirements based on the indicators of online games characteristics. The proposed quality model develops based on the latest standards by ISO / IEC 25010.

Gathering information about quality requeriments for online games by means of literature studies and surveys to informatics students of Institut Teknologi Sepeluh Nopember and Surabaya State University. After that, mapping quality requeriments, we followed the quality model guidelines made by Trisnadoli model. Then the quality model try to evaluate three online games. The result is the quality model can evaluate the online games and we can know all the characteristics, strengths and weaknesses of a online game. For future work, we will find another quality requirements, more type of online games and also more number of player. So the quality model can evaluate more specific.

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