

# Investigating the Applicability of Generic Game Evaluation Heuristics

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**Abstract**—The expanding games market has created the opportunity for serious research into game evaluation. Game researchers use evaluation heuristics to evaluate games either via the user or an expert; most existing heuristics focus on different aspects, such as playability and usability. In this paper, a generic evaluation framework will be applied, which will take into account the majority of characteristics found in games as a means to provide validity to real games. The selection of games explored will include the majority of genres so that most common and critical issues can be detected. The first task in this paper was to create a full procedure for the use of heuristic evaluations by a user and by an expert evaluator. The results indicated that heuristics can assist evaluators in their evaluations of different aspects of games, the data from which will be beneficial to game designers when preparing initial prototypes and identifying problems in newly developed games. The second task involved comparing reports from the evaluations of different games to those from a game review website to check that the evaluation framework could detect the most prominent problems in each game. The goal of this work is to contribute positively to the game design process and to develop sets of heuristics, which will make game evaluation more effective and problems in games detectable in a way that is both easy and accurate.

## I. INTRODUCTION

Heuristics are design guidelines, which serve as useful evaluation tools for games.

The evaluation of games is one of the few areas in which an expert review method is not commonly applied, but interest in using such a method in game evaluation has increased, and there are several domain-specific heuristic sets available that are targeted towards evaluating games. [1]. Game designers have relied predominantly on player feedback when evaluating video games [2],[3],[4]. Focus groups are used to collect ideas and evaluate game concepts in the early stages of game development, while at later stages, playtesting is used to uncover design problems in a game and collect feedback from players [1]. However, for the effective conduction of evaluations, there should be a complete working game prototype available that players can try out during the process.

When evaluating games, the traditional evaluation heuristics lack comprehension and cannot be directly applied, as gaming is a primary objective and only effective in terms of

completing a specific task; rather, they need to succeed in providing an overall high level of fun to the user [5].

In this paper, generic evaluation heuristics have been applied which are specifically designed for evaluating the majority of games across the existing genres [6]. Five commercial games have been evaluated in order to ensure that a range of different game genres have been explored thoroughly; prior to which the evaluation process was tested by users and by expert evaluators. Knowledge concerning game genres is important because each one demonstrates a different set of characteristics. Thus, the generic evaluation encompasses the most popular characteristics across all game genres.

In this work, the aim was to achieve some clarity with regard to the different game evaluation methods and their usefulness in evaluating games, as based on expert and user evaluations. Furthermore, the results were later compared with a specialized website to maximize the quality of game assessment [7],[8].

The contribution of the paper to the domain of game research will include an investigation into how heuristic sets can be used and where in identifying and analyzing the strengths and weaknesses of a game, how designers and users could benefit from this evaluation, and how it could be used by game developers in the beta testing stage of a game, or even in the first prototype during the game's creation. The outcome will provide an idea as to how the expert review method results could correspond to user-testing results, and finally will create a clear set of procedural steps that could be used in the game-evaluation phase. In the next section, the related work within game evaluation heuristics will be previewed. Section 3 briefly describes the primary elements of the generic evaluation framework, while Section 4 takes the concept from the previous section and applies it to various commercial game genres. Section 5 elaborates on the selection of users and expert evaluators who then participated in the evaluation, followed by section 6 detailing the game evaluation procedure; section 7 then presents a dissection of the subsequent results. Section 8 presents how the evaluations have thus been used within the competitive gaming industry in order to select the best game. Finally, the conclusions and suggestions for future work are put forward.

## II. HISTORY OF GAME HEURISTICS AND APPLICATION

In the game evaluation, a few approaches linked the results of the evaluation method for application in a real or prototype game[9]. Nielson and Mack offered a heuristics evaluation in 1990, which was used to evaluate the user interface of software productivity [10]. These heuristics are useful in terms of the development phase as a means of achieving design guidelines, and several authors have since noted that games can require an individual heuristic[11], [12], [13]. Federoff's thesis [11] presented a heuristics model that could be considered as the first specific heuristic model due its structure and method of design. Federoff presented forty different heuristics, which he categorized into the following three groups: game interface, game mechanics and gameplay. They appear be concentrated on role-playing games (RPG), however, and are therefore not applicable to all game genres.

Desurvire [14] presented his Heuristics for Evaluating Playability (HEP), based on Federoff's sub-criteria; he incorporated gameplay and game mechanics, and added to his sub-criteria usability and game story, which contributed to his total of forty-three heuristics. He applied his work to a new game at the beginning of its development cycle in order to study the efficacy of the heuristics.

TABLE I: Korhonen and Koivisto [12] also considered playability heuristics, with a focus on mobility games. Like Desurvire, they employed gameplay and usability, and added to their sub-criteria mobility; their total number of heuristics came to twenty-nine. They validated their work by evaluating five mobile games across different companies, and Korhonen [15] later covered another important aspect in game evaluation by presenting a comparison between play-testing and expert review methods within mobile game evaluation

Schaffer [16] presented his heuristics based on his own expertise from HCI fields, which resulted in his set of heuristics being divided into five categories: general, graphical user interface, game play, control mapping and level design. His total came to twenty-one heuristics.

Pinelle's [17] heuristics were based on the usability principles for video game design, and their development stemmed from the game reviews of a popular gaming website. After one year, Pinelle [18] introduced his ten usability heuristics, which were designed for multi-player games, and applied his evaluation in evaluating a sample version of a PC game; this was based on only five people.

Al-Azawi [6] presented a general heuristic framework that encompasses the majority of the previously mentioned heuristics and also adds to their quality and sub-criteria, which consists of adaptability, functionality and efficiency. This general heuristic framework additionally included enjoyment, or the 'fun factor', which is an important factor in helping the user decide whether to continue or to quit the game. This particular evaluation framework contains around a hundred heuristics.

From the previous works detailed above, it can be noticed that a great deal of the authors focused predominantly on introducing their set of heuristics and gave less attention to how those heuristics would be applied in the real world. Some of them utilized a real game as an example, while others based their work around a prototype game. Furthermore, only a

small number of authors displayed any differentiation between expert and user evaluations, such as [15].

Author Year	GP	GS	GM	UI	GS	Mobility	AD	EF	FU	Enjoyment
Nielson 1994				X						
Federoff 2002	X	X		X						
Desurvire 2004	X	X	X	X						
Korhonen 2006	X			X	X	X				
Schaffer 2007	X			X						
Pinelle 2008				X	X					
Al-Azawi 2013	X	X	X	X	X	X	X	X	X	X

Fig. 2.Categories of each set of heuristic

### III. DEFINITION OF GAME HEURISTIC SETS

As is evident from the previous section, there are multiple heuristic sets available and it is thus important to choose carefully the variables to be measured, as well as selecting the correct methods to collect them [19].

This study is influenced by the generic evaluation heuristic framework set, as described in this researcher's previous work[6],in order for it to be integrated into the game-design process and especially for it to be used for the evaluation of User Experience (UE) and expert evaluator. This heuristic set has been selected because it is composed of generic heuristics and covers the majority of the different game genre criteria, as shown in Table I, which uses the following abbreviations [20]: GP=Game Play, GS=Game Story, GM=Game Mechanism, UI=User Interface, GC=Game Control, AD=Adaptability, EF=Efficiency and FU=Functionality. In order to enhance ease of use, some slight changes were made with regard to the numbering of the original sets; for example, with Game Story, instead of writing a direct number, the numbering starts with GS, for ease of evaluation and analysis of results.

The primary objective of this study was to answer the following questions: firstly, how will the evaluation support the designer and developer in the game-creation process? Secondly, what are the suitable procedures that need to be followed over the course of the evaluation? Thirdly, what are the differences between the expert and user evaluations for the

same game? Finally, how could a generic purpose evaluation to cover the game characteristics of all game genres be found? For purposes of this experiment, the generic purpose heuristics were adopted from [6], [21] which encompasses the five main criterion as shown in Figure 1. The following body of text offers a general explanation of the heuristic framework criteria.

- Quality:** One of the most important measurements is the quality of the game through the development of the life cycle. The quality evaluation process starts with a careful planning phase, which includes the purpose of the evaluation, the timing of the evaluation and who should conduct the evaluation process[22]. This game quality evaluation contained twelve heuristics and dealt with three major issues: game functionality, game efficiency and game adaptability, as shown in Table A.0.3.
- Usability:** There were also heuristics to cover the game control and the game interface through which player interacts with the game; a high level of game usability ensures that the player will have fun and enjoy their gaming sessions. The game usability evaluation contained twenty-five heuristics, and dealt with two major issues: game interface and game control, as shown in Table A.0.5
- Enjoyment:** Player enjoyment is a further important goal for games in order to be successful, as if the player does not enjoy the game, they are unlikely to play it again [21],[23]. The game enjoyment measurement contained twenty-one heuristics, as shown in Table A.0.7.
- Mobility:** A mobile phone is an excellent way to pass spare time or to fill short breaks in the day, because it is always with the user. Mobility is defined by how easily the game can be played, and is included in most of the usability heuristics; it contains three heuristics itself, as shown in Table A.0.6.

#### IV. APPLICATION OF GENERIC EVALUATION HEURISTICS

##### A. Game Genre Selection

Five games have been selected in order to explore fully the different game genres and thus validate this work. The selected games

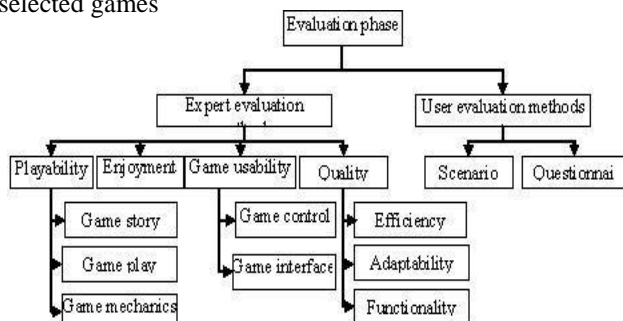


Fig. 1. Game evaluation criteria

Fig. 2. Game Evaluation Details

will be used as a case study as a means of evaluating them. The characteristics of the set of five games are listed in Table II, such as game genre, game platform, game company, number of expert evaluators, number of user evaluators and the game manufacturing year. The games cover various genres, including adventure, mobile, action role playing, first-person shooter, third-person shooter and social games. Social games are a new genre of game which is played within a web browser through a social network service such as Face book. Those games were selected according to the following criteria:

- To be well known and professionally developed. To be covered different game genres.
- To be referred by specialized web sites such as [7], [8] for game quality assessment.

##### B. Game Evaluator Selection

Several studies suggest that having an evaluation phase which deals with the majority of the details required in the evaluation of games helps designers to find detect the most important classes of problems, most of which cannot be found through user testing [17],[24].

Expert evaluator- and user-experience research provides a variety of established research methods and procedures, such as heuristics evaluation based on the special characteristics of individual games [25].

In this paper, two types of evaluators have been explored: expert evaluators and user evaluators. Each game in the evaluation was tested by both and with a specific number of each, as shown in Table II. The average age of the user evaluators was twenty-five, ranging from twenty to thirty. They were all university-level students who described themselves as frequent game-players. The average age of the expert evaluators was thirty-five, ranging from thirty-two to forty-one, all of whom were experienced in the fields of computers and gaming.

TABLE II: Categories of each set of heuristic

Game name	Game genre	No. of player	platform	publisher/year	no. of user	no. of expert
Dead Space	Adventure Action TPS	Single	Pc, PS,Xbox	Electronic Arts 2008-2011	4	3
Halo	FPS, Cooperative	Single	Pc, Xbox	Primary 2001-2013	3	4
Skyrim	Action Role Playing	Single	PC,Ps, Xbox	Bethesda 2011-2013	3	3
Minecraft	Adventure, Mobile	Single Multi	PC,Ps, Xbox Mobile	Mojang 2004-2013	4	4
Candy Crash	Social, Mobile	Single Multi	PC, Mobile	King 2012-2013	3	3

**C. Game Evaluating Process**

In each of the evaluated games, the user and expert evaluators were assisted by the researcher in filling out the personal information questions at the beginning of the form, along with the game details, as shown in Figure 2. The next step was completing the questionnaire in its entirety; the answers for each question were scored by number from 1 to 5 (1 being worst; 5 being best) and the priorities from 1 to 3 (1 being the highest priority; 3 being the lowest priority). A group usually consisted of three-to-four players; and each game was submitted to a different user group and expert group. The evaluation procedure is detailed in the following steps:

Two arrangements were made in terms of location; firstly, the user experience was conducted in a place similar to a sitting room, because it was key for the users to feel

comfortable. Naturally, in some cases, the surroundings were more important than in others, depending on the game platform, genre and gaming community. For the same reason, the participants were additionally provided with some food and beverages during their playing. Secondly, the expert evaluators conducted their work in the university laboratory in order to process the games as professional examiners.

The participants, both users and experts, were divided into groups (each group was comprised only of users or evaluators), and the people in each could have a discussion between themselves as they filled out the questionnaire.

All the participants were given the opportunity to start to play the games several times prior to starting the questionnaire. A standard questionnaire was designed specifically to capture the games' quality.

The data could be analyzed and evaluated, followed by a presentation of the findings.

**V. EVALUATION**

Evaluation heuristics help game designers to evaluate games at two different stages of game creation: firstly, at the point of the initial prototype, when the evaluators collect ideas and evaluate the game's concept; and secondly, at a later stage before the game's release. Through a weight-average of scores and priority of values obtained from our questionnaire, the results from the study will be considered in the following subsection.

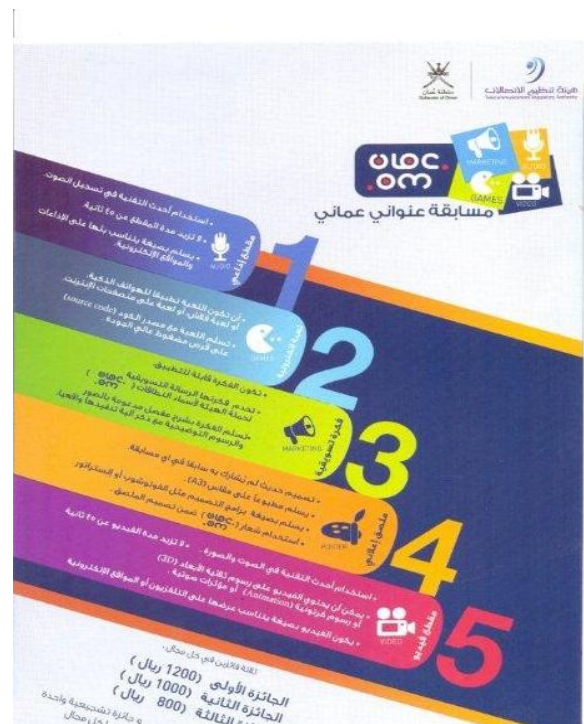


Fig. 3. Game Competition Poster

**A. Industry Competition**

The game industry is broad and has continued to grow dramatically over the time. The Telecommunication Regulatory Authority has organized a competition between undergraduate university students in the Sultanate of Oman, which is a country in the Middle East.

1) Competition Overview : The competition is structured to cover different areas, such as audio, posters, games and short films. Figure 3 illustrates the competition poster and costs.

The participating students are required to submit creative work that must contain the competition logo, with the objective of the competition in game section being to design a game which best reflects the theme of "my address is Omani".

The competition poster has been sent out to all Oman universities and colleges, and the competition itself dictates a period of four months during which to submit the work. The participator must be a university student with the ability to submit their work individually or as a group. For the game competition section, the Telecommunication Regulatory Authority asked this researcher for permission to use the evaluation method detailed above, and to be the head of the game community judges, which included five members. Three of them have an aca-demic background and two have an industry background.

The prizes are subject to a final evaluation score; first prize is around 3,000US Dollars, second prize is around 2,500 US Dollars, third prize is around 2,000 US Dollars and there is an encroaching prize of around 1000 US Dollars.

2) Results of the Industry Competition : The judges received a great deal of usable gaming software by being involved in the competition, some of which was not nominated because it did not encompass the competition concept.

The evaluation of the heuristic sets detailed previously was used to evaluate the games submitted, and each game received a score out of 100 based on the evaluation criteria. With regard to the games having been created by undergraduate students, it was noticed that they could be classified as having a 'simple' game design and were in that sense unlike commercial games.

For the previous reason, it was decided that the judgment committee would reduce the number of evaluation criteria required in order to fit more appropriately with the competition concept and the quality of the students' work. Table A.0.8 illustrates the abbreviated list of evaluation criteria used for the competition.

The judgment committee noted that adding a score with a specific priority to each evaluation criterion simplified the

Finally, the majority of the user evaluators failed to successfully complete the quality-based section. From the above analysis, it can be noticed that users are mostly interested in game interface and enjoyment, and are less able to detect any issues regarding game mechanics or quality.

judging process and allowed it to be more professional. The total number of criterion was forty, along with some details which took level of priority into account. The games themselves each received as core out of 100. Furthermore, the judgment committee found that the evaluation was able to cover all necessary game characteristics, thus providing them with an easy and comparative measurement of results.

### B. Comparative Review of Expert and User evaluation

The researcher compared and analyzed the user results with the expert results as a means of distinguishing between the user evaluation and the expert evaluation criteria. The overall report between the expert and user evaluators demonstrated quite similar data, as shown in Figure 4. Both found common criteria and unique criteria through their own methods.

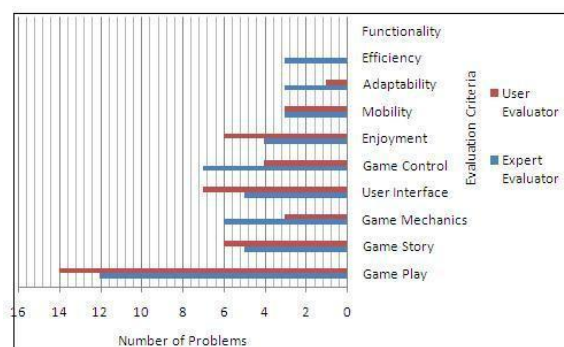


Fig. 4. Games Evaluation Results for User and Expert

Both the users and the experts proved themselves effective in exploring the playability issues in gameplay and the game story. Considering game mechanics, the expert evaluator analyzed and detected more problems than the user, as shown in Figure 4. Some users were not able to answer a number of the questions, such as GM5 and GM8.

In the game usability section, user evaluators suggested questions regarding the user interface higher, placing greater priority on it than the game control section; they also focused on screen layout, audio and game instructions. On the other hand, the expert evaluation focused on game control as having the highest priority, as opposed to the user interface; for example, they gave question GC4 higher priority than question UI8. The majority of the user evaluators gave the games they liked most the highest ranking in the enjoyment section.

The mobility section was only filled with games that are compatible with the mobile device platform, such as Minecraft and Candy Crush

### C. Comparative Review Against Other Game Evaluation Method

During the evaluation, the most easily identifiable results were related to the comparing of the study's results with those of the professional gaming website's scores. The greater

number of gaming websites provides their results based on reviews and comments from players. This study used the following websites [7], cite webpage3 in order to compare selected games with our evaluation sets, as shown in Figure 5.

The results are similar to the average rankings provided by those websites. It was noted that those gaming websites had not added to their rankings many games for which the main platform is a mobile device, such as Candy Crush. The ranks of these mobile games were thus obtained from websites containing mobile application ranking, such as [26], [27].

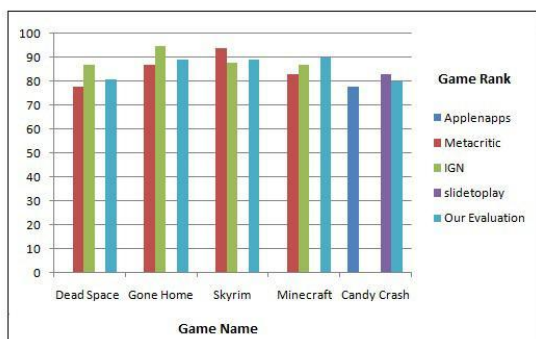


Fig. 5. Games Website Evaluation Results

## VI. CRITICAL REVIEW

In this paper, generic heuristics for games were applied in order to build a complete procedure based on the findings. This procedure encompassed evaluator selection, generic heuristics selection and how evaluation heuristics are dealt with in games. Five games were explored so that different game genres could be covered; this allowed the determination of weaknesses and problems. Although a number of studies have investigated separately some game factors, such as usability, playability and enjoyment, this work is the first attempt that explicitly investigates all of the game evaluation heuristics in one study.

It has therefore been proved that heuristics can be used to measure the level of user experience through a comparison of user and expert reviewer results. Both user and expert evaluators found that this evaluation considered all aspects of different game genres, but equally they found it to be a long evaluation process and they required some time to answer every question in a detailed manner.

Another element of comparison involved relating this study's results with those of a professional gaming website; the results indicated many similarities. The goal from this comparative was to in future utilize the generic evaluation for each game prototype before its eventual release, which will help designer to locate and solve any issues prior to the later stages.

As noticed in the industry competition, using a quantitative score from the reviewer rather than qualitative data allowed a clear conclusion to be drawn, which then helped the judges in selecting the best games. As a result of this study, suggestions for the future are as follows:

- We need to divide the questionnaire to user and expert section in order to minimize the number of questions for both user and expert.
- Minimize the number of question for user evaluator. Some of the users are not able to deal with big questionnaire questions.
- We need to give more attention to evaluator experience and background.

## VII. CONCLUSION AND FUTURE WORK

Evaluation of a game is one of the few areas in which evaluation methods are not applied commonly. Although multiple playability heuristic sets exist, there is no exact knowledge concerning how to use them during game evaluation.

In this paper, it was decided to evaluate a number of computer games through the use of generic heuristics and to compare the results by a different comparative method. To obtain meaningful results, three comparative methods were conducted in the course of this study: firstly, one which looks at industry completion; secondly, one which deals with a comparative between expert and user evaluators; and thirdly, one which considers comparative reviews from a professional website.

Any game evaluator or game designer can use the generic heuristic set in their evaluation, but it is important to ensure that it is understandable to the evaluator. Another important factor is how the results of the evaluation could be beneficial during the game-design phase, as any necessary changes are naturally easier to undertake prior to game release. In terms of future work, another interesting topic would be to explore longitudinal studies. This study in fact undertook several weeks of field testing in order to evaluate the long-term games.

## VIII. ACKNOWLEDGMENT

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**APPENDICES**

TABLE A.0.3: Quality Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Priority (1-3)
Quality	AD1	Adaptability	The game is easily integrated with other environments.		
	AD2		The game includes an evaluation system, during the		
	AD3		development process.		
	AD4		The game allows for new techniques and better learning.		
	AD5		The game allows for activities that keep the curiosity and the		
	EF1	Efficiency	Is there no extra information?		
	EF2		The game has a good program structure that allows easy access		
	EF3		to content and activities.		
	EF4		The speed of communication between the program and the user		
	EF5		is adequate.		
			The program execution is efficient and with no operational errors		
			The system has been developed with originality.		
	Fu1	Functionality	The information well-structured and does it adequately		
	Fu2		distinguish the objectives, context, results, multimedia		
			resources.		
			The game checked all the alert message.		



TABLE A.0.4: Playability Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
Playability	GP1	Gameplay	The game has varying activities and pacing during gameplay.		
	GP2		The game provides clear goals or supports player-created goals.		
	GP3		The game provide consistency between the game elements and		
	GP4		the overarching setting and story to suspend disbelief. There is an interesting and absorbing tutorial that mimics		
	GP5		gameplay.		
	GP6		The game is fun for the player and enjoyable to replay. Gameplay should be balanced with multiple ways to win.		
	GP7		Player is taught skills early that you expect the players to use		
	GP8		later, or right before the new skill is needed. Players discover the story as part of gameplay and holds		
	GP9		interest.		
	GP10		The games change strategy for same failure of player. The game should give rewards that immerse the player more		
	GP11		deeply in the game by increasing their capabilities (power-up), and expanding their ability to customize.		
	GP12		There are variable levels of difficulty and an unexpected		
	GP13		outcome.		
	GP14		There are multiple goals on each level. Players are able to save games in different states and resume		
	GP15		them later.		
	GP16		The game gives hints, but not too many. Game can be played multiple times using different paths		
	GP17		through the game. The player sees the progress in the game and can compare the		
	GP18		results.		
	GP19		The player is in control. There are no repetitive or boring tasks. The game supports different playing styles.		

TABLE A.0.4: Playability Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
	GP20		Allow players to build content.		
	GP21		There must not be any single optimal winning strategy.		
	GS1	Game Story	Player understand and interest in the story line as a single		
	GS2		consistent vision.		
	GS3		The Player spends time thinking about possible story outcomes. The Player feels as though the world is going on whether their		
	GS4		character is there or not. The Player has a sense of control over their character and is		
	GS5		able to use tactics and strategies.		
	GS6		Player experiences fairness of outcomes.		
	GS7		Player is interested in the characters.		
	GS8		Take other player into account. Don't waste the player time.		
	GM1	Game mechanics	Game should react in a consistent, challenging, and exciting		
	GM2		way to the player's actions (e.g., appropriate music with the		
	GM3		action).		
	GM4		Make effects of the Artificial Intelligence (AI) clearly visible to		
	GM5		the player by ensuring they are consistent with the player's		
	GM6		reasonable expectations of the AI actor.		
	GM7		A player should always be able to identify their score/status		
	GM8		and goal in the game.		
	GM9		Mechanics/controller actions have consistently mapped and		
	GM10		learnable responses. Controls should be intuitive, and mapped in a natural way; they		
			should be customizable and default to industry standard settings Player should be given controls that are basic enough to learn		
			quickly yet expandable for advanced options.		
			Camera views match the action.		
			There are predictable and consistent responses to a user's		
			actions.		
			Responses to user's actions are timely, allowing for successful		
			interaction.		
			Get the player involved quickly and easily		

TABLE A.0.5: Usability Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
Usability	UI1	User Interface	Use sound to provide meaningful feedback or stir a particular emotion. Players do not need to use a manual to play game. The interface should be as non-intrusive to the Player as possible. Controls are customizable. Menu layers are minimized, or can be minimized. Screen layout is efficient and visually pleasing. Device UI and game UI are used for their own purposes. The player understands the terminology. Control keys are consistent and follow standard conventions Provide users with information on game status. Provide instructions, training, and help. Follow the trends set by the gaming community to shorten the learning curve		
	UI2				
	UI3				
	UI4				
	UI5				
	UI6				
	UI7				
	UI8				
	UI9				
	UI10				
	UI11				
	UI12				
	GC1	Game Control	Player's should perceive a sense of control and impact onto the game world. The game should be easy to learn and hard to master. Provide immediate feedback for user actions. The Player can easily turn the game off and on, and be able to save games in different states.		
	GC2				
	GC3				
	GC4				
	GC5		The Player should experience the menu as a part of the game and should contain clear help Upon initially turning on the game, the player has enough information to get started. There are means for error prevention and recovery. The player cannot make irreversible errors. The player does not have to memorize things unnecessarily. Allow users to customize video and audio settings, difficulty and game speed. Provide predictable and reasonable behavior for computer controlled units. Provide controls that are easy to manage, and that have an appropriate level of sensitivity and responsiveness.		
	GC6				
	GC7				
	GC8				
	GC9				
	GC10				
	GC11				
	GC12				

TABLE A.0.6: Mobility Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
Mobility	MO1		The game and play sessions can be started quickly.		
	MO2		The game accommodates with the surroundings.		
	MO3		Interruptions are handled reasonably.		

TABLE A.0.7: Enjoyment Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
Enjoyment	EN1		Games should provide a lot of stimuli from different sources.		
	EN2		Games must provide stimuli that is worth attending to.		
	EN3		Games should quickly grab the player’s attention and maintain their focus throughout the game.		
	EN4		The player shouldn’t be burdened with tasks that don’t feel important.		
	EN5		Games should have a high workload, while still being appropriate for the player’s perceptual, cognitive and memory limits.		
	EN6		Players should not be distracted from tasks that they want / need to concentrate on.		
	EN7		Challenges in games must match the player’s skill level.		
	EN8		Games should provide new challenges at an appropriate pace.		
	EN9		Learning the game should not be boring, it should be part of the fun.		
	EN10		Games should include online help so the player doesn’t need to exit the game.		
	EN11		Overriding goals should be clear and presented early.		
	EN12		Intermediate goals should be clear and presented at appropriate times.		
	EN13		Players should receive immediate feedback on their actions.		
	EN14		Players should become less aware of their surroundings.		
	EN15		Players should become less self-aware and less worried about everyday life or self.		
	EN16		Players should feel emotionally involved in the game.		
	EN17		Players should feel viscerally involved in the game.		

TABLE A.0.7: Enjoyment Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior-ity (1-3)
	EN18		Games should support competition and cooperation between players.		
	EN19		Games should support social interaction between players (chat etc).		
	EN20		Games should support social communities inside and outside the game.		

TABLE A.0.8: Industry Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior-ity (1-3)
Quality	1	Adaptability	The game is easily integrated with other environments.		
	2		The game allow player to take decisions.		
	3	Efficiency	The game have a good program structure that allows easy access to content and activities.		
	4		The system been developed with originality.		
	5	Competition requirement	The game has competition logo.		
	6		The game has Omame or Arabic concept.		
	7		The game has cover the competition idea.		
Playability	8	Game Play	The game provides clear goals or supports player-created goals.		
	9		The game is fun for the player and enjoyable to replay.		
	10		Game play should be balanced with multiple ways to win.		
	11		Players discover the story as part of game play and holds interest.		
	12		There are multiple goals on each level.		
	13		The player sees the progress in the game and can compare the results.		
	14		There are no repetitive or boring tasks.		
	15		The game supports different playing styles.		
	16	Game Story	The Player has a sense of control over their character and is able to use tactics and strategies.		
	17		Player experiences fairness of outcomes.		
	18		Game don't waste the player time.		
	19	Game mechanics	A player should always be able to identify their score/status and goal in the game.		
	20		Player should be given controls that are basic enough to learn quickly yet expandable for advanced options.		
	21		Camera views match the action.		
	22		Get the player involved quickly and easily		

TABLE A.0.8: Industry Evaluation Sets

Criteria	No.	Sub Criteria	Description	Score (1-5)	Prior- ity (1-3)
Usability	23	User Interface	Use sound to provide meaningful feedback or stir a particular emotion.		
	24		Players do not need to use a manual to play game.		
	25		Menu layers are minimized, or can be minimized.		
	26		Screen layout is efficient and visually pleasing.		
	27		The player understands the terminology.		
	28		Control keys are consistent and follow standard conventions		
	29	Game Control	Provide immediate feedback for user actions.		
	30		The Player can easily turn the game off and on, and be able to save games in different states.		
	31		The Player should experience the menu as a part of the game and should contain clear help		
	32		Allow users to customize video and audio settings, difficulty and game speed.		
Enjoyment	33		Challenges in games must match the player’s skill level		
	34		Games should provide new challenges at an appropriate pace.		
	35		Learning the game should not be boring, it should be part of the fun.		
	36		Games should include online help so the player doesn’t need to exit the game.		
	37		Intermediate goals should be clear and presented at appropriate times.		
	38		Players should receive immediate feedback on their actions.		
	39		Players should become less aware of their surroundings.		
	40		Players should feel emotionally involved in the game.		

**Author Profile**



Dr. Rula Khalid Al-Azawi did PhD in De-Montfort university- UK, Msc in software engineering and Bsc in computer science from Baghdad-Iraq. My PhD research area focuses on game development methodology and agent-oriented software engineering methodology. Currently working as senior lecturer in the department of computing, Gulf college- Muscat- Oman and awarded as leader for the department since 2008 and a senior lecturer since 2005. Area of interest is soft computing and Game development methodology.