Comparative Evaluation Unity and Unreal, Using Nielsen's 10 Heuristics as an Evaluation Parameter

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Abstract

This work study two similar and competing tools for creating games, using Unity and Unreal Engine Development (UDK) as a comparison, through Nielsen's 10 (ten) heuristics, for your evaluation, this article being of Human Computer Interaction, to help the analysis of heuristics, the MCDA Macbeth methodology was used, and the scores of both tools were balanced. With a difference of only 5 points, while the Unity tool had 209 points, the UDK tool had 214 points. The Macbeht Methodology predicts the comparison of each one of the 10 heuristics against all the others, indicating binarily which one is the most important, always assigning 1 the most important between the two in comparison and zero the least important. Then the sum is made and the highest score is assigned Very strong, followed by Fleet, Weak and Very Weak, establishing intermediate ranges of points. So after this calibration and summation, there was a difference of 5 points only between the two tools. So it can be concluded that both Unity and UDK tools are great tools for game development, each tool has its purpose and function, excelling in specific things, but in general, they are very similar. Unity is aimed at the more lay user and the UDK is aimed at professionals in the area, with both tools operating in the same market segments.

Keywords
Unity; Unreal Kit Development, Heuristic, Nielsen, HCI.

1. Introduction
There was a growing demand for developing new games, many companies were created to meet this market need. And for such promotion, many tools made available for the business model were available for the user model. Often free, or being free to some extent.

According to Brazil, Agência (2019) the games sector reached 1.5 billion dollars in Brazil alone. With a growth of around 5% predicted until 2022, according to PwC, revenues could rise from $324 million dollars to $878 million dollars for the year 2022. Only with mobile games, according to PwC.

Jakob Nielsen created parameters for the usability of systems, in order to evaluate some characteristics, these characteristics being essential for interoperability with the user.

1.1 Objectives
This present work aims to use the heuristic models, defined by Nielsen, to evaluate two software Unity and Unreal. Both are used in the game development scenario, as a proposed objective in the field of Human Computer Interaction

2. Literature Review
Jacob Nielsen, born in 1957 in Copenhagen, Denmark, is a computer scientist, where he completed his Ph.D. in human-machine interaction. He pioneered the "engineering and usability at a discount" movement, where the focus was on cheap and quick improvements to user interfaces. One of his works is the heuristic evaluation, which will be used in this work (Macedo, 2017).

The heuristics are defined in 10 different models, which are related to the usability of the product, that is, ease of use of the technology or object, each with its function, namely:
1) Visibility of the system status: visually show where each task is in progress, in addition to showing the steps of the same.
2) Compatibility between the system and the real world: Use world references in digital environments, for example: use the floppy disk icon to show the user where the save option is.
3) Control and freedom for the user: Allow the user to have control of his actions in most of the actions in which he is inserted. For example: the user can delete items from the cart when buying products
on a website.
4) Consistency and standardization: Concept in which the user needs to learn only once, to perform a certain task. For example: all time the user makes a purchase, he already knows how the system works, as it has already learned it once. This heuristic also applies to patterns visuals.
5) Error prevention: Protecting the user from actions that could harm him, even if done by himself.
6) Recognition instead of memorization:Prevent the user from having to use their memory for actions within the site or program. For example: notify the user every time you pass the mouse over an icon within the program, identifying the item or showing its function.
7) Efficiency and flexibility of use: All users, whether lay or not, can efficiently use the interface.
8) Aesthetics and Minimalist Design: Your website or program initially shows only the essentials for its operation, so that the user can quickly make a choice.
9) Help users to recognize, diagnose and recover from errors: Allow users to find and correct errors that may be basic or critical to the operation of certain parts of the site, systems, program.
11) help and documentation: Provide help and documentation for the site, software, so that the user can solve their doubts and do not need to access third-party sites.

3. Methods
In order to have a better understanding of the characteristics that most please or least please on the websites, we must carry out a qualitative analysis, with the objective of seeking to understand the individual experiences of the users.
In this article, the macbeth method was used, where it was analyzed which heuristics had the greatest importance and then the weight per heuristic was defined from this study, where very strong has a weight of 5, and ends in very weak with a weight of 1.

4. Data Collection
The survey was carried out in June 2022 and, as a result, another table was created where scores were given for the two sites for each heuristic, where the value of the score was multiplied by the weight, thus obtaining a final result as shown in Table 1.

Table 1. Heuristic in the Macbeth method

ORDER	HEURISTIC NUMBER	%	A-Z	WEIGHT
1	5 and 10	17,8	1	VERY STRONG (5)

2	3	15,6	2	STRONG (4)
3	2	13,3	3	
4	6	8,9	4	MODERATE (3)
5	1 and 8	6,7	5	WEAK (2)
6	4, 7 and 6	4,5	6	VERY WEAK (1)
TOTAL		100,0		

Unreal software was released in 1998 by the company Epic Games. This development kit has always been known for developing AAA games (they are high production games, with beautiful graphics and a great production team), through the price, it ended up becoming more accessible as the
time(Guilherme, 2019).

The Unreal software was written in the C++ language, which allows portability to different platforms, such as Windows, Linux and Mac and to different devices, such as Playstation 2, Wii, Xbox One, etc. The development of the projects is carried out using the C++ language. The Figure 1 is the Unreal Engine.
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Figure 1. Unreal Engine (docs.unrealengine.com, 2020)

According to Guilherme (2019), Unity began in 2004, focusing on all audiences, since its launch, until the present day, Unity is the main tool for independent developers. Unity is a development kit, operating in the most diverse sectors, from game development, automotive, movies and animations to architecture and engineering. Having 2D and 3D resources and distributing to different platforms, such as computers, Smartphones, TVs etc (Unity, 2020).

The language used by the tool is C#, whose learning time is relatively fast compared to the same language. Figure 2 is the Unit Software.
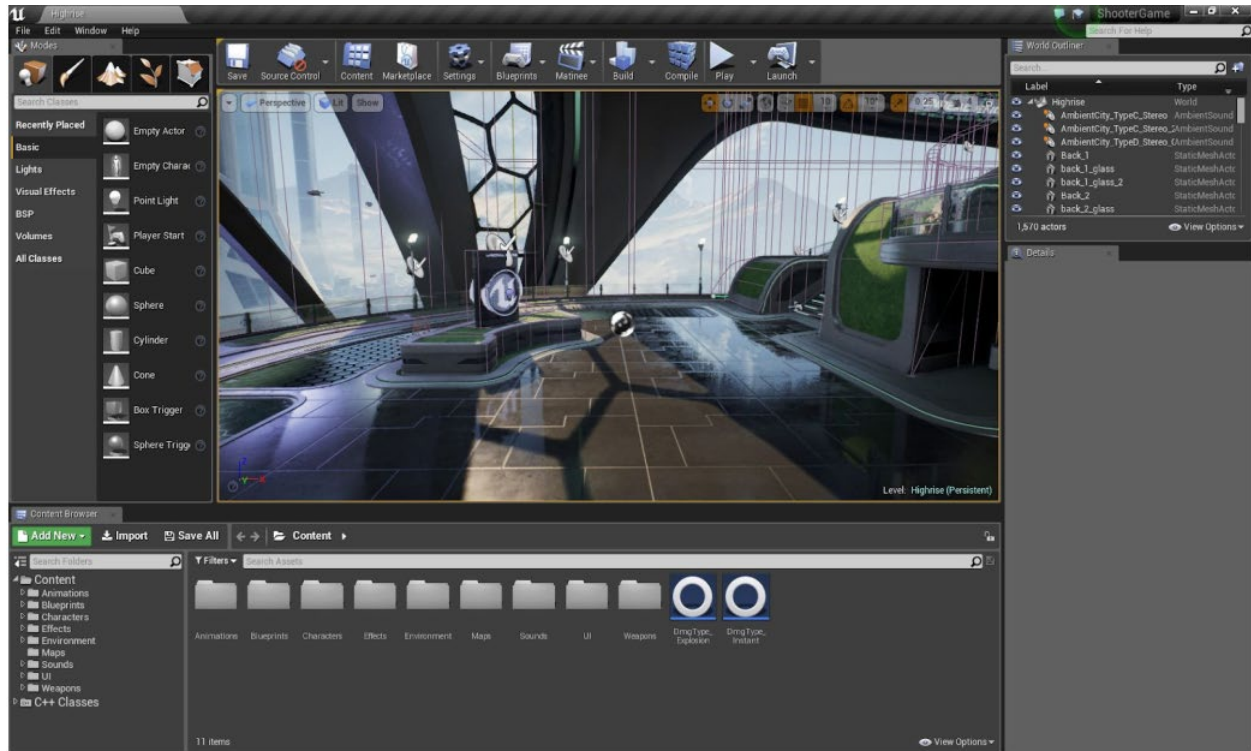
Figure 2. Unit Software. (unity3d.com)

5. Results and Discussion
5.1 Numerical Results
After the survey, another table was created where scores were given for the two sites for each heuristic, where the value of the score was multiplied by the weight, thus having a final result according to Table 2.

Table 2. Heuristic in the Macbeth method

Nr.	HEURÍSTIC	WEIGHT	UnityNote	Points	Unreal Note	Points
1	System state visibility	Strong (4)	7	28	8	32
2	Correspondence between System and real world	Moderate (3)	5	15	6	18
3	User control and freedom	Moderate (3)	8	24	9	27
4	Consistency and Standardization	Moderate (3)	5	15	4	12
5	Error Prevention	Strong (4)	7	28	6	24
6	Help to recognize, diagnose and remedy errorsModerate (3)	Moderate (3)	7	21	6	18
7	Recognition instead of memorization	Moderate (3)	8	24	5	15
8	Flexibility and efficiency in use	Very Weak (1)	6	6	8	8
9	Design estético e minimalista	Strong (4)	6	20	7	28
10	Help and documentation	Very Strong (5)	7	28	8	32
	TOTAL		Unity	209	Unreal	214

5.2 Graphical Results

The graphical results in Figure 3 has the heuristic´s points about the Softwares Unity and Unreal in line system.
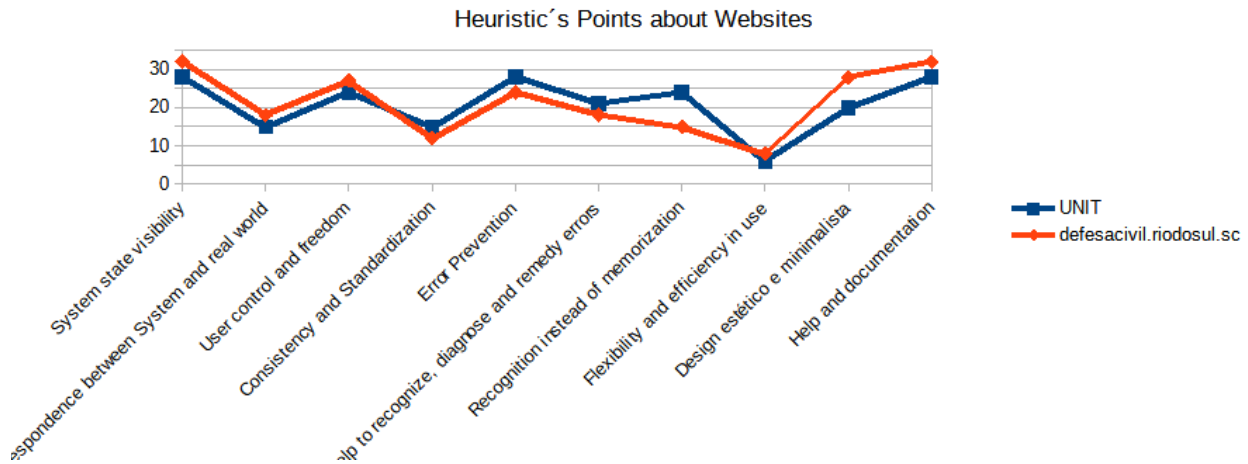

Figure 3. Line graph of dots in website heuristics

5.3 Proposed Improvements

Unity, through MacBeth's heuristic, acquires a total of 209 points, in contrast to Unreal UDK acquires a total of 214 points, showing a balance between the two tools.

Performing the comparison using Machbeth between the two tools Unity and Unreal, using Nielsen's heuristics, to verify which one adapts better to the user, the following comments were obtained:

1) Visibility of the system status: Unity deals with the data to be analyzed, through the console tab, where errors are reported. Other parameters such as project performance are in the profile tab. Unreal handles errors through a console screen, so all errors

are found in the same location.

2) Compatibility between the system and the real world: Unity and Unreal work with elements that make up the real world to portray options in their menus, each with its icon and layout defined.

3) Control and freedom for the user: Both tools have freedom to edit projects. Unity has a limiter to block any parameter that hinders the execution of the project, either by code or objects in the scene.

4) Consistency and standardization: Unreal works with standardization in its closed versions, that is, each version has standardized elements until the next generation of the tool. To better exemplify, version 3 of the kit is different from version 4, regarding the layout and some functions. Unity started working with versions of numbers, similar to Unreal, but migrated to versions based on years, that is, the layout and functions pattern changes few things in its updates, but the way this is informed to the user is totally up to date. according to the need to update the tool, making it a little confusing

depending on the situation.

5) Error prevention: As previously mentioned, Unity works with error prevention in relation to the project, that is, it does not allow the execution of the program if it finds an error, either in the code or in other components of the project. Unreal is a little more permissive, allowing some individual aspects to work, allowing the project to run even with some errors.

6) Recognition instead of memorization: Both tools work with recognition, Unity chooses to use different locations to show the same function, Unreal chooses to leave each function centralized.

7) Efficiency and flexibility of use: In some versions of Unity there is a change of layout location making it difficult to use some functions, Unreal maintains the layout within each core version, facilitating long-term use. In terms of learning, Unity stands with its

users, a quick learning curve compared to Unreal, both in functions and in the Interface.

8) Aesthetics and Minimalist Design: Unity works with the minimalist model where anything beyond the basics needs to be imported from your online store, or through third parties. Unreal starts from the idea of having everything centralized in a single tool, having countless tools,

which initially will not be used by its users.

9) Help users to recognize, diagnose and recover from errors: Both tools work with similar models, informing the error and the location where the error occurred, through a console window.

10) help and documentation: unity works with the idea of providing all the necessary material for your tool, from tutorials, articles, projects, etc. Unreal has the necessary documentation for its use but on a smaller scale compared to Unity.

5.4 Validation
For additional validation, it is proposed to increase the number of people evaluating the two software Unity and Unrea UDK.

6. Conclusion
The analysis of the 10 heuristics proposed by Jakob Nielsen were achieved in this article, thus managing to verify differences between two software for game developing. Unity, through MacBeth's heuristic, acquires a total of 209 points, in contrast to Unreal UDK acquires a total of 214 points, showing a balance between the two tools.

Both Unity and Unreal UDK tools are great tools for game development, each tool has its purpose and its function, standing out in specific things, but overall, they are very similar. Unity is aimed at the most lay user and Unreal UDK for professionals in the area, both tools being active in the same market segments

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