Towards Evaluation Method of Usability Engineering for Web Application Sites Using 3D Approach

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ABSTRACT
This paper proposed approach to evaluate the usability of the websites based on the usability evolution methods, where the usability requirement is one of the major factors in website if the website makes success or failure. Many of the current websites are very complex and not easy to use , as a result of that the researchers start developing the mechanisms or methods to evaluate the website if its usable or not. Many papers clarify these methods, according to the point of view of the author.
This research proposed approach based on evaluations methods, where this method designed to pass the site in 3 phases during the evaluation process. There will be a certain degree of each stage, where the first two phases Represents 40%, and the last one Represents 20 % due to its importance. The total of the three phases are 100 percent this number gives the percentage of the website usability where it's a way evaluative comprehensive and detailed, so it's not only focus on a certain direction evaluation, but it take into account all the trends assessment such as design principles, user satisfaction and the process of inspection and testing.

KEYWORDS:
Usability, Usability Evaluation Methods (UEM), Websites Usability Evaluation.

1. INTRODUCTION
Usability is a critical factor in web application development, the easy or difficult user experience in websites will determine their success or failure [1]. The challenge of developing more usable Web applications has motivated the appearance of a variety techniques, methods and tools to address Web usability issues [2]. Although there are many proposals for supporting the development of usable Web applications, too many developers are not aware of it and many organizations do not properly apply it. As it shown in the figure 1 usability is a public concept consist several special characteristics that must be present at each website to result that it is easy to use or not.

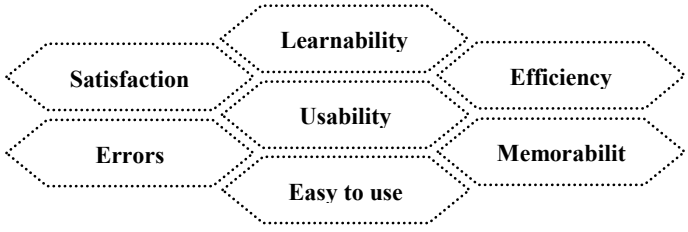

Figure 1: Usability characteristics

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This research will propose an evaluation methods based on the previous methods to decide if the website is easy to use or not, where it's a way evaluative comprehensive and detailed, so it's not only focus on a certain direction evaluation, but it take into account all the trends assessment such as design principles, user satisfaction and the process of inspection and testing. Where many of the previous research have focused on a specific direction in the evaluation process, for example, that which only adopted on the inspection, examination of the user or the questionnaire as a steam explained later in related work. This research proposed approach based on evaluations methods, where this method designed to pass the site in 3 phases during the evaluation process. There will be a certain degree of each stage, where the first two phases Represents 40%, and the last one Represents 20 % due to its importance. The total of the three phases are 100 percent this number gives the percentage of the website usability.

2. RELATED WORK
There are many studies about evaluation usability of websites. The use of evaluation usability methods has become heavily diffused in the research and the specialized research studies, but there are a few of these studies have talked about evaluation websites in other methods of evaluation usability.
Farid and Wawan [3], present an approach questionnaire survey to use in the evaluation of Web sites, also identified kind of an E-Commerce Website. The result of this method "questionnaire survey" is an analysis of the survey using a multi-dimensional which comprises the usability testing and feedback from user's path. Then, set of the recommendations that should be carried out e-commerce site to enhancement the organization performance. Evaluation in a four dimensional approach: usability testing, user feedback, user data, and web and internet performance data .The approach used in this paper includes two things; usability testing and user feedback analysis. This study is focused on enhance web structure and make it easier to use.
Ilker, Adem and Dilek [4], present in their study using satisfaction in the process of evaluating e-learning sites. One of the factors that influence the usability of the system, which also directly affect the performance of the users of this kind of sites. The final model was obtained from this study called "e-learning success model for satisfaction coaches". The authors consider that the success of any software or software system mainly depends on user satisfaction.
Helen and Nigel [5], present a book that provides a range of evaluation methods that helps software developers to produce a new business, develop and maintain the existing E-Systems. to defined the usability in this chapter according to the book its : the extent to which a product (service or environment) can be used by a specific user to achieve specifics goals with effectiveness , efficiency and satisfaction in a specified context of use. In This part the authors was cared of the usability by several aspects: safety, memorability, flexibility and learnability.

Renato, Cristian and Silvana [6], in this study have put in order, to develop a methodology for the usability evaluation of transactional web applications. Most of usability methods were used in the evaluation of Web applications transactions. They mentioned two classifications of usability evaluation methods: usability inspection methods (involving only usability professionals) and usability testing methods (involving

test users). This research, offers a comprehensive and detailed way about usability of Web sites through appropriate evaluation methods to verify the websites usability. This study does not focus on a particular aspect, its look at more than one direction about the usability of electronic sites such as design principles and user satisfaction and process of inspection and testing. Combining these elements is central to around it to achieve the goal of this study, so that separate each of these aspects to check if it usable or not.

3. RESEARCH METHODOLOGY

In this research, we have identified three major trends; first inspections, user participate in the evaluation and take the feedback and finally determine if the website achieves of the usability characteristics, since the evaluation of any site must go through three major phases to determine if the website is easy to use or not, the stages fall below variety processes.

As shown in Figure 2, the evaluation process including all evaluation process directions which in the first part is based on experience of the inspector and his earlier experiences in the evaluation, either the second phase gives the user a main role in the evaluation process, it's also know that user satisfaction is the main objective of the evaluation process, while the third phase focus on the concept of quality where it's give the website result if it is easy to use or not. Based on the previous division of the evaluation phases and the type of websites included in this research e-commerce, e-learning-government and academic website such as university site , There will be a certain degree of each stage where the first two phases Represents 40%, while the last one represents 20 % due to its importance. The total of the three phases is 100 percent used to clarify the mechanism of grading distribution for each stage.

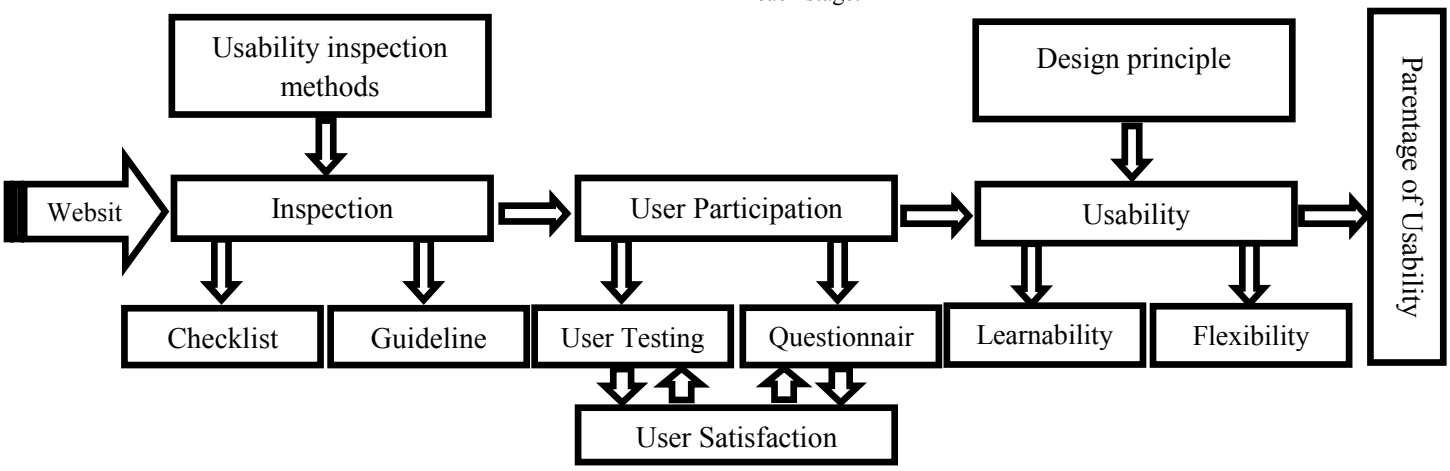

Figure 2: Research Methodology

3.1 INSPECTIONS

Usability inspection refers to set of evaluation techniques that are an evolution from prior function and code inspection methods used in Software Engineering for debugging and improving code[7], this part of evaluation mainly based on inspectors experience, they last project and the evaluation direction they flowed.

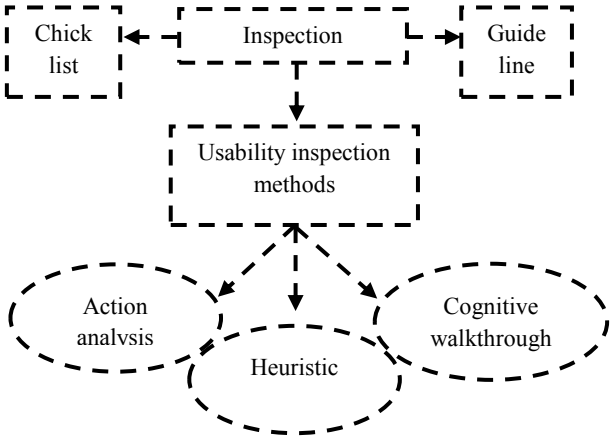

Figure 3: Usability inspection

As mentioned the inspection process is based on the experience of the Inspector. He adopts the checklist and the guideline for the inspection process which wants to start. The evaluation process at this stage depends on three methods; action analysis, heuristic and cognitive walkthrough as described in the previous painting. Each evaluation method has a degree, the sum of the three methods degrees will give a result of 40 degrees achieved depending on several conditions that will be clarified later.

Some possible sites can be evaluate according to 35 of 40 to achieve that result conditions should give a result of 30 degrees achieved by all the conditions.

3.1.1 Heuristic evaluation

This section will clarify the mechanism division of 10 degrees on each valuation method of the three methods. As we know heuristic evaluation is a team of evaluators inspects[8], the interface design based on the usability, Principles and other things based on the last project or evaluators experience. This research, adopting 10 criteria must be met. This part of research has all the standard degrees. As shown in the figure 4. The figure describes the criteria used in this way, all the standards has two points so the total that we must get from this Firecracker is 20 points if all criteria have been achieved.

3.1.2 Cognitive walkthrough evaluation

The cognitive walkthrough is a technique for evaluating the design of a user interface that is mean this part is a practical evaluation (an easy of learn analysis), This part has a four steps with four questions, these steps are shown in figure 5. At this stage, there are four standards adopted, where each standard have four degrees, the total of these standards are 16 degrees, where these stages have a high rated. The basic stages must be available at each website and it depends mainly on researchers to assess the website if it easy to use or not, as in figure 6.

3.1.3 Action analysis

It's a quantitative analysis of actions to predict time required for tasks, based on time. The rates of this phase are 4 degrees, where it heavily relies on the earlier phases. Where are these 4 points from the viewpoint of the Inspector? At the end, the website that has been evaluated will get result of 40, the site that has been evaluated as a result of 40 based on previous methods and standards contained in .For example, it's possible to get the location that was evaluated on the outcome of 34 - 40 then the result will be collected, the results of two major localities gives the output of 100%.

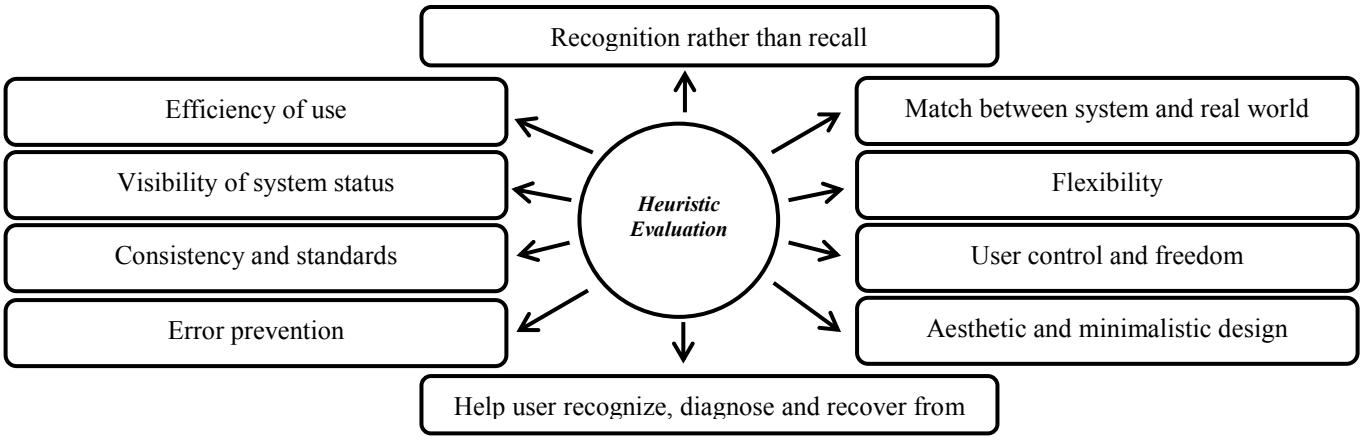

Figure 4: Heuristic Evaluation View

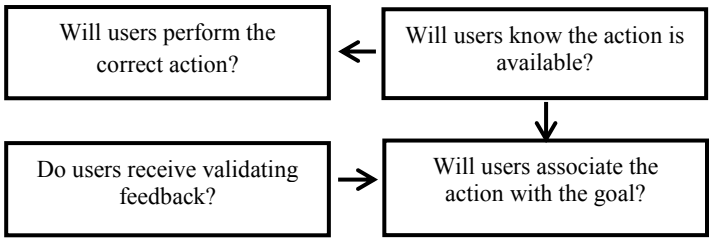

Figure 5: Cognitive walkthrough evaluation

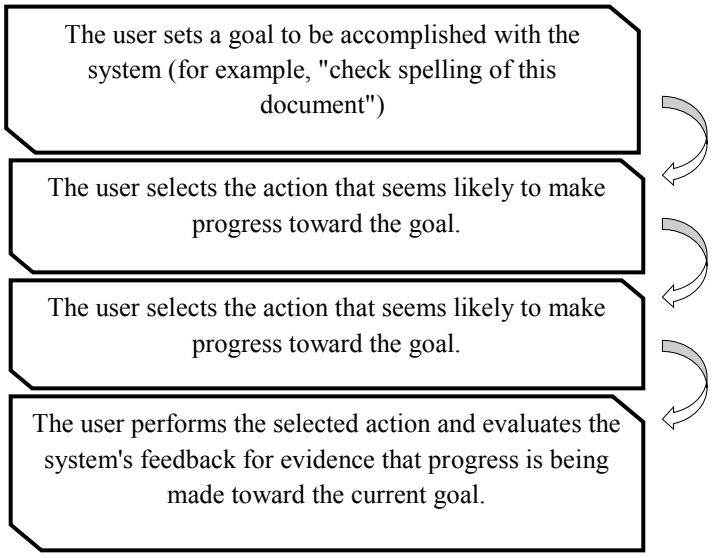

Figure 6: International Standards View

3.2 USER PARTICIPATION

The main objective of the assessing process is the easy use of the website to ensure that the product achieves high levels of satisfaction for the user, where the user satisfaction is the main factor that leads to the success of any project, therefore it was necessary to involve the user in the evaluation process to take feedback from; Is the site will satisfy the user or not. At this stage, we used two methods in evaluation process, the first way is the questionnaires .it's a set of questions distributed to the user to give his opinion about the ease of use this website, the second way is the user testing it's give a set of tasks and taking feedback from the user. The total score of the two ways together is 40 degrees, the next part will clarify methods and how the process of distribution of grades works and what are the criteria that we used for the distribution of grades.

3.2.1 User testing

User testing deals with real behaviors observed from some representative of real users. Where it is the best way to understand how real users experience your website or application [9], it requires that the users perform a set of tasks through web site, Whether been prototypes or real systems, while the experimenter observes users behaviors and collects empirical data about the way that users execute the assigned tasks, typical data collected during user testing and user execution time, number of errors and user satisfaction. After the test accomplished, the collected data interpreted and used to ameliorate the level of the application usability, since this method must go through several stages its satellites to avoid inability use of the site to prevent any defect that can be happened during this stage explanation in figure7.

- Defining the goals of the test: Identify the main aim of the test and this goal should be generic for example the improvement of end user satisfaction and the design of product easy to use.
- Defining the sample of users that will participate in the test: Identify Sample of users who will be participating in testing process. This sample is selected according to the type of the website who wants to Rated.
- Identify tasks and scenarios for users: Define a set of tasks for the user to be implemented and taking feedback from the user during the performance of these tasks, these tasks must be pre-defined and organized according to their importance.
- Collect empirical data:
- Collection of empirical information obtained through the testing such as user execution time, number of errors, and user satisfaction to be analyzed late
- Analysis of the test results and finds the final result.
- At this stage, all the information and observations taken from the user testing must be analysis, to Determine if the website easy to use or not.

In this way we have adopted five criteria must be achieved through a user-testing , we adopts these standards and take into account many aspects that were mostly related to the user such as the Speed in tasks performance and design etc., as shown below: No errors and distraction, Secure, Memorable steps, Learn ability and Speed. Each criterion has 5 degrees where the total score is 25 degrees if the website achieves all previous criteria's.

3.2.2 Questionnaires:

A series of questions puts to demonstrate usability of the website and user satisfaction[10], this part adopts questionnaire consist of 15 Question Where we identified and collect these questions by relying previous questions such as SUS,QUIS,CSUQ[10]. After distributed the questionnaire to the users, results are collected and analyzed to determine the points that did not satisfy the most users in order to be

processed, where the user score adopted for this phase is 15 degrees, and it is given by the evaluators based on the results of analysis tests that resulted from the questionnaire and it depends on the experience of evaluators.

3.3 USABILITY CHARACTERISTICS

We can tell that the site is easy to use or not after take into account all the trends that must rely on the evaluation process. In the last part we will focus on the design principles and HCI concepts Since the total score at this point is 30 degrees , a set of criteria's will be selected depend on usability ISO such as ISO/TR 16982 (2002), In addition to the ISO 9241 standard, another international standard – ISO 9126 –

Table 1: Usability Questioner

#Q	Question	First answer		The second answer		The third answer	
1	How frequently do you use this website?	☐	Almost daily	☐	Sometimes	☐	Just the once
2	How user friendly did you find this website?	☐	Anyone can use it	☐	It requires specialized knowledge	☐	It requires basic knowledge
3	How do you feel using this website?	☐	Too cumbersome	☐	Confusing	☐	Easy to use
4	Did you find the information you wanted?	☐	Yes	☐	No	☐	Partially
5	How would you describe the organization of information?	☐	Clear	☐	Confusing	☐	Moderate
6	Was reading characters on this page	☐	Difficult	☐	Slightly cumbersome	☐	Easy
7	How would you describe the terminology and website information?	☐	helpful	☐	inconsistent	☐	Insufficient
8	As a new user how would you describe learning to use this website?	☐	Difficult	☐	Easy	☐	Moderate
9	This website introduced many new features. How would you them?	☐	Easy to explore by trial and error	☐	Initially difficult, need to get the hang of it	☐	Utterly confusing
10	This website is visually appealing.	☐	Yes	☐	No	☐	Partially
11	Considering my work I find the use of this website	☐	comfortable	☐	sufficiently good	☐	utterly useless
12	Speed of this website	☐	fast	☐	Moderate	☐	Slow
13	Reliability of this website	☐	reliable	☐	let me down	☐	I am satisfied
14	Does the web satisfy your purpose?	☐	It always does	☐	It never does	☐	sometimes yes sometimes no , depends!
15	Would you use this website in the future?	☐	Yes	☐	No	☐	Maybe

also takes usability as one of the basic characteristics of software quality and defines it as: “the capability of the software product to be understood learned, used and attractive to the user, when used under specified conditions”.

3.3.1 Design Principles

This section adopts a list of design principles that must be available at each site to make it easy to use as follows:

1. Purpose: each page of your website needs to have a clear purpose, and to fulfill a specific need for your website users in the most effective possible way.
2. Communication: The user needs to obtain information quickly and clearly, and the information should be easy to read and organized.
3. TYPEFACES: In general, Sans Serif fonts such as Arial and Verdana are easier to read online (Sans Serif fonts are contemporary looking fonts without decorative finishes)." The ideal font size for reading easily online is 16px and stick to a maximum of 3 typefaces in a maximum of 3 points size to keep your design streamlined".
4. COLOURS: the colors have a key role to influence the user satisfaction, the colors should be balanced and harmonious with each other, and contrasting colors should be used for the text and background to make it easier to read.
5. IMAGES: A picture can speak a thousand words, so choosing the right images for your website can help with brand positioning and connecting with your target audience [15].
6. NAVIGATION: Easy of movement and take action in the website, Some tactics for effective navigation include a logical page hierarchy, using bread crumbs, designing clickable buttons, and following the ‘three click rule’ which means users will be able to find the information they are looking for within three clicks.
7. LOAD TIME: ensure that the site load as fast as possible to make that happen try to reduce the images size and Attached Files.
8. Information provided on the "home" page
   - a "who we are" or "who I am" message
   - a mission or purpose statement
   - contact information
   - update notice

9. Protect your privacy and reputation online
   - Don't disclose private information about yourself or others.
   - Don't give out home phone numbers or home addresses.
   - What you link to helps define who you are and what your organization represents.
   - Avoid exaggerated claims if promoting a product or organization.
   - Cite sources of information.
   - Observe copyright rules.
   - Use original graphics or free graphics or clipart.

10. Resolution: The standard for screen resolution is 800 (width) by 600 (height). If you design for a higher resolution the user may have to scroll back/ forth or up/ down to view the full content.

In this part we adopt 10 design principles each one take 2 degrees since the total gives 20 degrees if achieved all criteria.

3.3.2 Usability characteristics check list

At the end we have to propose a list of the usability characteristic, choice of these properties to cover all aspects of website usability. This list gives 10 degrees in the evaluation process.

- Effectiveness: Time to learn and Retention.
- Flexibility: Easy navigation process, Understandable site direction and Easy to get back option.
- Attitude.
- Language customization.
- Memorability.
- Efficient.
- Engaging and Accessibility.
- Error tolerant and Responsive.

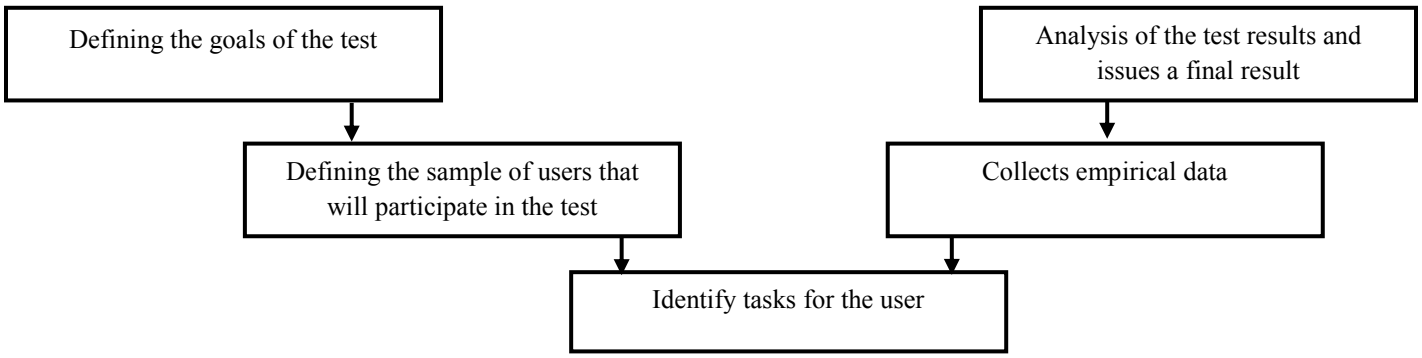

Figure 7: User testing

4. CONCLUSION

This paper presents approach to carries the idea of a new usability measure of Web sites by using Usability Evaluation Methods. We did not focus on a single method or one direction in the websites evaluation, but we did search for another ways than evaluating such as inspection and user participation and usability characteristics.

In this paper we identified three major trends involves inspection, user participation in the evaluation and take the feedback then determine if the website achieves of the usability characteristics . The evaluation of any site must go through three major phases to determine if the website is easy to use or not. The research also detail and present the three stages, each stage has been given percentage as follows: the first and the second stages 30%, and the third stage 40%. Where the ease of use of the site based on the percentage obtained after measuring usability through stages of this proposed approach.

The future work will focus attention on improvements to proposed similar models and develop their uses depending on the advantages and methods prescribed in this search and we want to apply this method on website as a case study.

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