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# Usability Heuristics as an Assessment Parameter:

for performing Usability Testing

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***Abstract*--As the field of Usability Engineering gains more importance day by day, the phenomenon of testing the Usability of software and hardware products is becoming popular too. But, in presence of so many usability testing techniques, selecting an assessment parameter for performing usability testing is considered to be a great challenge for testers. The aim of this research is to suggest usability heuristics as an assessment parameter to Usability testing. To achieve the aim and objectives of this research, renowned Usability expert Jakob Nielsen's 10 Usability Heuristics have been chosen for assessing usability of some public sectors universities websites. In the second step, by using these Heuristics as an assessment parameter, Usability Survey and Heuristic Evaluation techniques are applied on these websites. It has been found that Heuristics are key attributes of software products and considered good measuring parameters to assess usability. Meanwhile this research is also a contribution towards rating the Usability of some academic websites. And hence, in this research, Usability Heuristics have been chosen as an assessment parameter for performing Usability Testing.**

***Keywords-Usability, Usability Testing, Usability Heuristics, Heuristic Evaluation.***

## I. INTRODUCTION

It is important to perform Usability Assessment of different software and hardware products before delivering it to its users. So, the cost of maintenance and training of software can be reduced and will definitely increase the Usability of the product. There are many techniques for performing Usability Testing and some of these have been explained in this section. But the challenge is the selection of appropriate assessment parameter for testing the Usability of software product(s).

This paper is a contribution towards introducing an assessment parameter for performing Usability Testing. To achieve this goal, some public sector universities' websites of Pakistan have been chosen for Usability Testing, and then Nielsen's 10 Usability Heuristics are selected as an assessment parameter for performing Usability Testing. Usability Testing techniques i.e. Usability Survey and Heuristic Evaluation, have been selected and applied by using Nielsen's Heuristic as an input for Usability assessment. Research findings and results from the experiments have been concluded. In the conclusion the advantages of choosing key product Heuristic, as an assessment parameter have been strongly recommended. The organization of the paper is as follows: Section I is about introduction to the domain of Usability Engineering and Usability Testing. Section II will describe an experiment of performing Usability Testing of academic websites. And in section III, the key ideas will be justified and favored along with the different findings and results from the experiment.

### WHAT IS USABILITY?

Renowned Usability expert Jakob Nielsen has defined Usability as "Usability is a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process." [1].

According to him Usability is defined by five quality components :

- *Learnability:* How easy is it for users to accomplish basic tasks the first time they encounter the design?
- *Efficiency:* Once users have learned the design, how quickly can they perform tasks?
- *Memorability:* When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- *Errors:* How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- *Satisfaction:* How pleasant is it to use the design?[1]

### JAKOB NIELSEN'S 10 USABILITY HEURISTICS

These are ten general principles for user interface design. They are called "heuristics" because they are more in the nature of rules of thumb than specific usability guidelines. [2]

*1. Visibility of system status*

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

*2. Match between system and the real world*

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

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*3. User control and freedom*

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

*4. Consistency and standards*

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

*5. Error prevention*

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

*6. Recognition rather than recall*

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

*7. Flexibility and efficiency of use*

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

*8. Aesthetic and minimalist design*

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

*9. Help users recognize, diagnose, and recover from errors*

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

*10. Help and documentation*

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large. [2]

## WHAT IS USABILITY TESTING?

Usability testing is a technique used to evaluate a product by testing it on users. This can be seen as an irreplaceable usability practice, since it gives direct input on how real users use the system. [3]

## SOME USABILITY ASSESSMENT METHODS

Here is description of some Usability Assessment Methods in practice.

*Surveys and Questionnaires*

Many aspects of usability can best be studied by simply asking the users. Questionnaires and interviews are useful methods for studying how users use systems and what features, they particularly like or dislike. [4]

*Observation*

Simply visiting the users to observe them during performing their tasks in the real world environment is very important usability method for both task analysis and for information gathering about the true field usability installed systems.[Diaper 1989] Observation and Ethnography is the simplest usability methods since it involves visiting one or more users and then doing as little as possible in order not to interfere with their work. [5]

*Heuristic Evaluation*

Heuristic evaluation (Nielsen and Molich, 1990; Nielsen 1994) is a usability engineering method for finding the usability problems in a user interface design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognized usability principles (the "heuristics"). [6]

## II. EXPERIMENT

In this research four public sector websites of Pakistani universities have been chosen as a case study i.e. Allama Iqbal Open University, Quaid-e-Azam University, International Islamic University and Virtual University. The usability of these universities' websites has been assessed by applying Usability Survey and Heuristic Evaluation techniques. To perform Usability Testing under chosen assessment techniques Nielsen's 10 Usability Heuristics has been taken as a Usability assessment parameter.

### *A . Usability Survey*

To evaluate and assess the existing websites of Pakistani universities from users' perspective, the technique of Usability Survey has been chosen and performed. Usability survey has been conducted by applying the following steps:

1. To conduct Usability Survey, a Usability Questionnaire was prepared.
2. Usability questions were asked against each Usability Heuristic by Jakob Nielsen.
3. Fifty university level students were selected to perform Usability Survey.
4. For the assessment of all four Universities' websites, Usability questionnaires were given to each student; in this way, a single student had to fill four questionnaires.
5. Students had to rate Usability questions from the values of Poor to Excellent, or between the rating values of 0 to 10. Format of assessment is as follow:
   - Poor 0-2
   - Fair 3-5
   - Good 6-7
   - Excellent 8 and above

Students rated the Usability of existing university websites from 0 up to the value of 10 against each Usability Heuristic. Average of ratings from all fifty students against each Usability Heuristic is presented in the Figure 1 to Figure 4.

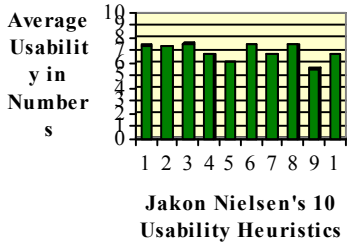


Figure 1. Usability Survey of Allama Iqbal Open University

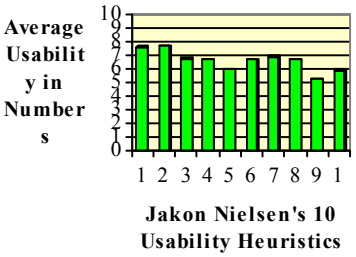


Figure 2. Usability Survey of Virtual University

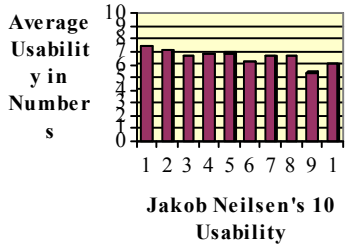


Figure 3. Usability Survey of Islamic International University

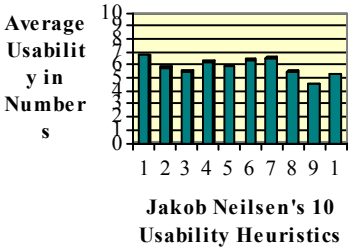


Figure 4. Usability Survey of Quaid-e-Azam University

Figures from 1 to 3 show that students had rated websites "Good" or near "Good" but in case of Quaid-e-Azam University, the situation is a bit different. QAU website was rated as "Fair" or near "Good". The overall usability *(including all 10 Usability Heuristics)* of all four Universities' Websites is shown in Figure 5.

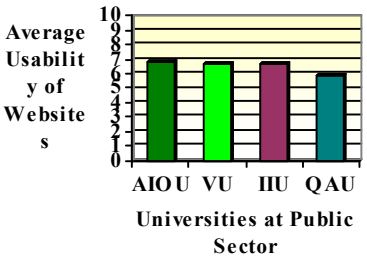


Figure 5. Overall Usability of University Websites

Like Figure 4, figure 5 is also presenting the fact that Quaid-e-Azam University's Website is the lowest in Usability ranking and Allama Iqbal Open University website is at the highest level in terms of Usability.

### *B. Heuristic Evaluation*

After getting users' opinion about the current universities' websites, it is also essential to know what experts feel about the Usability of current websites. For this purpose a Usability Evaluation methodology called Heuristic Evaluation is chosen. And in this case also, Nielsen's 10 Usability Heuristics are chosen as an assessment parameter for Usability Testing. Four Usability experts participated voluntarily for Heuristic Evaluation of university websites. Why four experts for testing existing websites? Nielsen answered it in [7]. Each Usability Expert had to find Usability bugs against each Usability Heuristic; hence one Usability Expert had to assess four websites.

Three of ten *(from 10 Usability Heuristics)* figures presented below show the result of Usability testing by applying the technique of Heuristic Evaluation against Nielsen's 10 Usability Heuristics.

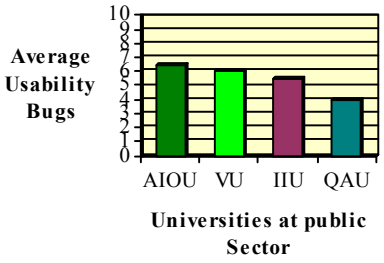


Figure 6. Visibility of System Status

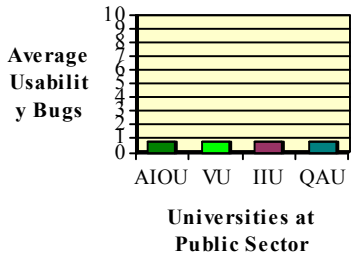


Figure 7. Match between System and the Real World

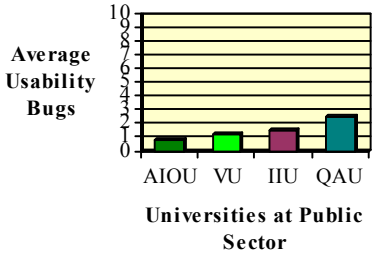


Figure 8. User Control and Freedom

## III. FINDINGS

In Usability Survey it is found that majority of the participants feel problems in Heuristics 4, 5 and 9. This is what the users' view. Experts feel that universities' websites have lots of deficiencies in Heuristic 1 e.g. "Visibility of the System Status". Variance came in the results asks testers to see both side of picture e.g. the user's and the expert's end. So both techniques are equally important to evaluate software products and websites in this case. But the thing which should be the main focus is Usability Heuristics. They have been used here to assess and hence find out Usability bugs.

After performing Usability it has also been exhibited that how many improvements in university websites are needed in terms of Usability. Ratings from users' and experts' point of view are a good source to see where things are lacking and where not.

Hence, it is found that Usability Heuristics are a good scale to measure and assess the Usability of products and in this case websites.

Advantages of choosing Usability Heuristics

Here are some advantages of applying Usability Heuristics.

After conducting Usability Testing of existing websites against Usability Heuristics, we have a clearer picture of the fact that Usability Heuristics give opportunity to Usability Tester to peep into the every Usability aspect of a software product.

The bugs against each heuristic, their nature and severance can be classified and categorized. Meanwhile this technique is very cheap and can be easily adopted for testing those products which have low budget for testing.

If testers or evaluators, and particularly those testers who are involved in testing the Usability of a Software Products, adopt Usability Heuristics as an assessment parameter, a big issue of choosing an assessment parameter can be resolved. Meanwhile, cost on testing can be reduced and as a result the usability of the product will improve. Uniformity in conducting tests can be achieved by using a specific criterion.

Categorizing usability attributes and using them to assess websites provides an opportunity to account all views of the picture of a software product.

As discussed, Usability Heuristics enable Usability experts to categorize the software product's Usability attributes. In this way Usability Testing can be performed by keeping each and every Heuristic in focus.

So, Usability Heuristics as an assessment parameter (while performing Usability Testing) are a very simple parameter to apply, instead of writing huge test cases. It is an easy way to analyze and assess the users' feedback and Usability Tester's assessment, hence it is good to apply, good to use as a parameter and good to see what is wrong in a product.

## CONCLUSION

This research was basically a contribution towards choosing assessment parameter for testing the Usability of software products and websites particularly. For this purpose, as an experiment, assessments of existing websites have been performed under Nielsen's 10 usability heuristics. In Usability survey, university level students had to rate their university website and in Heuristic Evaluation, expert had to find Usability bugs.

After performing Usability testing, it is not only clear which university's website is good or bad but also the importance of Usability Heuristics for performing Usability testing has been increased. It has been found that there are methods to deeply analyze the nature of a software product. Heuristics can be helpful for future improvements in the Usability of the software products.

Hence it is found that for conducting usability testing and especially when there is budget and time constraints, an efficient and effective choice is Usability Heuristics.

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