INTERNATIONAL STANDARDS AND USABILITY MEASUREMENT

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Abstract: The current trend of increased web usage has recognized the need of usable websites. A site containing relevant information may not gain user acceptance if the user finds it difficult to use. A quantifiable measure of usability can provide a measurable estimate of improvement required in the website. It can also help in comparing different websites. This measure would gain wider acceptability, if obtained, by applying the international standards of measurement. This paper measures usability quantitatively using the international standard ISO/IEC TR 9126-2. Metrics specified in the standards are used to measure the four sub-characteristics of usability, "Learnability", "Operability", "Understandability" and "Attractiveness" for an academic website. It was found that the "Learnability" level of the website was very low, as compared to the Understandability level. This is not in conformation with the standards, which mention the latter to be an indicator of the former. The significance and relevance of each metric to usability of the website was then examined in this light. The study also highlight the long due need of standardizing the process of usability measurement.

1 INTRODUCTION

Websites can have different level of acceptance by users, depending on their sensitivity towards the needs of users. A site containing all relevant information may not gain acceptance if the user finds it difficult to use. This issue attains significant relevance for an academic website which addresses the technologically aware new generation.

Studies of different websites of universities have been conducted in the past. (Strauss, 2000) identified the need of web portals, for universities, which can provide information as required by the users. In order to make these more useful, the website designers need to identify different class of users and their specific requirements. Usefulness, as discussed by (Nielsen, 1993), includes both utility and usability. The term "utility" of a site implies the presence of features, required to achieve the specific goals. "Usability" refers to the capability of utilizing these features efficiently and effectively to achieve desired goals with complete user satisfaction.

(Corry, Frick and Hansen, 1997) studied effect of issues such as ease of information location, scrolling and key presses on usability of Indiana University website. (Dhillon, 2001) stressed upon the need of organizing relevant information on the university websites to improve upon their user-friendliness. (Rao, 2002) explored the best possible information presentation style for a particular web portal for a specific class. All these attempts were made to enhance the usability of a website. However, no study was undertaken to measure and improve usability of a website using the international standards.

Researchers across the globe have developed various qualitative and quantitative methods to measure usability. It is felt that a quantifiable measure of usability can affect the process of planning and designing of websites. It allows for a measurable estimate of each sub-characteristic and the overall usability of the product. This measure gains wider acceptability and reliability, if obtained, by applying the international standards of measurement.

This paper is an attempt to highlight the need of standardizing the process of usability measurement. The sub-characteristics specified in the standard

ISO/IEC 9126-2[5] are measured on a website. The relationship between these was explored and was found to be in non-conformation with the standards. This could be attributed towards the non-measurement of all metrics specified by the standards. The priority and significance of each of the usability metric is hence questioned.

The following section discusses the site studied and the method adopted for measurement. The measures obtained are analyzed in the next section. The impact of the study is explained in the final section where we outline the significance of this study.

2 METHOD

This paper applies the international standard ISO/IEC TR 9126-2 to measure the usability of Indira *Gandhi National Open University (*commonly known as *IGNOU)* website*.* The URL for this site is www.ignou.ac.in. IGNOU has been a pioneer in distance education in India. It is the recipient of the Center of Excellence in Distance Education award, in 1993, conferred by the Commonwealth of Learning. It was amongst the first universities in India to host a website. Students (prime users) scattered geographically across the country, find the website a forceful, reliable platform for interaction between them and the university. The study of usability of such a website is relevant, as it is the most timely and reliable form of communication between the users and university.

Usability measurement of IGNOU website was done by employing the external usability metrics specified in the international standard ISO/IEC TR 9126-2. These metrics measure the extent to which a given software product is compliant with usability regulations and guidelines.

The standard specifies measurement of five sub-characteristics of usability: *Understandability, Learnability, Operability, Attractiveness and Compliance.* However, we measured only the first four, because of non-availability of compliance standards, being followed by the university. Since links are central to a website functionality, the term functions is interpreted as links in the metrics.
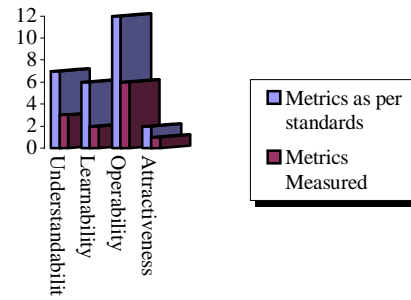

Figure 1: Number of metrics, measured v/s specified in the standards

Initial study of the site revealed the absence of certain features due to which all the metrics specified in the standards could not be measured. Fig 1 depicts the number of metrics measured as against the total number of metrics specified in the international standards. Table 1 lists the 12 metrics that were measured.

The standards specify two types of method for measurement of metrics. In "User Test" method a sample set of users, representative of the actual users, are requested to use a function. In the other method, "Test of Product in Use", the usage of function, during a general use of the product, is observed. However certain functions may be hardly used during normal use. These might not be measured using the "Test of Product in Use" method. Therefore we adopted the "User Test Method" of measurement. Eight users (as per the standards) representing the student user group were selected. We assigned specific tasks to each of these eight users. Measurements were taken, based on observations made during the test session.

There are two main categories of metrics, the *Performance* metrics and the *Preference* metrics (Nielsen and Levy, 1994). Preference metrics provide a quantifiable measure of the user preferences whereas the performance metrics provide a measure of the actual use of the system by the user, Constantine and Lockwood (1999).

We measured the preference metric "Attractive Interaction", on a preferential scale (Fig 2). The users were asked to rate the attractiveness of the site, by the following question.

Q. How would you rate the site?

| 1 | 2 | 3 | 4 | 5 |

Least   Very
Attractive   attractive

Figure 2: Scale to measure the attractiveness of the site

Table 1: List of metrics measured for IGNOU website

S.No	Metric Name
1	**Understandability**
1.1	Evident functions
1.2	Function understandability
1.3	Understandable input and output
2	**Learnability**
2.1	Ease of Function learning
2.2	Ease of learning to perform a task in use
3	**Operability**
3.1	Operational consistency
3.2	Error correction
3.3	Error correction in use
3.4	Default value availability in use
3.6	Self explanatory error messages
3.8	Time between human error operations in use
4	**Attractiveness**
4.1	Attractive Interaction

Table 2: List of tasks designed

Task number	Task
Task 1	Observe the home page and identify all the possible links (functionalities) which website provides
Task 2	Observe the home page and interpret the meaning of each link
Task 3	Get the Result for specified course
Task 4	Identify the centers at specified place
Task 5	Subscribe to E-journal
Task 6	Send complaint about non-receipt of starter kit of course
Task 7	Check for admission announcement for Entrance examination for year 2005
Task 8	Fill examination form for a course

The performance metrics were measured by observing the users perform a set of tasks. A survey of the actual targeted users was done to identify the most critical, important and frequently performed tasks. Table 2 lists the set of tasks, which were designed based on this survey

3 RESULTS

The mean of measures obtained while users performed the assigned tasks, are listed in Table 3. The absence of certain features in the website inhibited the measurement of all metrics. Prominent features not available in the website are the *Help facility*, *Demonstration capability*, *Customizability* and *Accessibility features for physically challenged.* Fig 3 shows the measured values (except the time metrics) against the value range specified in the standards. The metric numbers as per table 1 are

specified on the X-axis (names have not been given due to space constraint). The figure indicates that the measures for features like input and output, default value and self-explanatory error messages approximate the ideal value of 1. This corroborates that an information oriented website (Banati, Grover 2004) has limited scope for input/output and hence default values and errors Although the users could interpret the links (metric "Function understandability") the low value of metric "Evident functions" indicated difficulty in identifying links and hence in navigating through the website.

Low values are recommended for metrics measuring time, except for the metric "Time between human error operation". However, it is evident from table 3 that users spend a lot of time in learning to use a function, performing task or correcting error. Users found the site to be moderately well designed, in terms of cosmetic appearance (a value of 3 for the Appearance metric in Table 3). During the process of measurement, we failed to measure the metric "Error correction in use". Usability of the website was measured to be approximately 26%.

4 DISCUSSION

The site under study is predominantly an information-oriented website where the user activities are directed towards search and/or retrieval of information rather than input and output. Such websites should provide for a good comprehension, quick learning, and easy navigational facilities. The measured values of metrics indicated that the site was lacking this. Fig 4 depicts the percentage level contribution of each sub-characteristic (what it should be as per standards v/s what it is in the IGNOU website).

Table 3: Results

| Metric Name	Mean value
Evident functions	0.10
Function understandability	0.80
Understandable input and output	0.96
Ease of function learning	15.22(sec)
Ease of learning to perform a task in use	41.52(sec)
Operational Consistency	0.35
Error Correction	15.94(sec)
Error Correction in use	-----
Default value availability in use	0.82
Self explanatory error messages	0.70
Time between human error operations in use	49.37(sec)
Attractive interaction	3
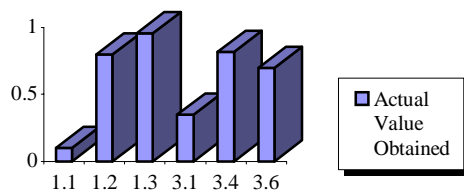
Figure 3: Measured values against the standard range

The significantly low value of Learnability is alarming. The standards mention that Understandability is an indicator of Learnability. However, the measurements indicate that does not hold true for this site. This could be attributed to non-measurement of certain metrics due to non-availability of the relevant features in the website. However, the metrics measured are almost in the same ratio, as to what could have been measured (Fig 1). The question raised is "Are the metrics, that could not be measured, more significant than those, that could be measured". The issue of priority of metrics therefore gains significance. In case certain metrics have higher relevance than the others, neglecting features relevant to those metrics might be critical.

5 CONCLUSIONS

The usability of an academic website was measured by applying international standards. The study helped us obtain quantitative measure of usability and it's sub-characteristics. The standards mention Understandability as an indicator of Learnability. This was not corroborated by the measurement obtained in the study. The issue of relevance and criticality of each metric towards the total usability of the website needs to be looked into. The case study also exemplifies that the process of standardizing usability measurement can help in quantifying the amount of improvement required in usability of a website, which cannot be achieved by non-standardized methods. A singular study cannot conclusively comment on this, but the question raised is crucial, as it can influence future usability studies. We are in the process of examining such websites to substantiate the findings of this paper.
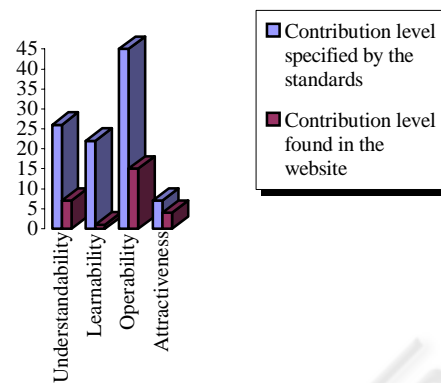

Figure 4: Comparison of percentage contribution of usability characteristics (Standard v/s Measured)

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