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THE USABILITY METRICS FOR USER EXPERIENCE

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Abstract : *The Usability Metric for User Experience (UMUX) is a four-item Likert scale used for the subjective assessment of an application's perceived usability. It is designed to provide results similar to those obtained with the 10-item System Usability Scale, and is organized around the ISO 9241-11 definition of usability. A pilot version was assembled from candidate items, which was then tested alongside the System Usability Scale during usability testing. It was shown that the two scales correlate well, are reliable, and both align on one underlying usability factor. In addition, the Usability Metric for User Experience is compact enough to serve as a usability module in a broader user experience metric*

Keywords -metric,system usability scale,usability,user experience.

I. INTRODUCTION

Usability can be measured, but it is rarely Metrics are expensive and are a poor use of typically scarce usability resources. Although measuring usability can cost fourfold the maximum amount as conducting qualitative studies (which often generate better insight), metrics are sometimes well worth the expense. Among other things, metrics can help managers track design progress and support decisions about when to release a product. As organizations increase their usability investments, collecting actual measurements is a natural next step and does provide benefits. In general, usability metrics let you: Track progress between releases. You cannot fine-tune your methodology unless you recognize how well you're doing. Assess your competitive position. Are you better or worse than other companies? Where are you better or worse? Make a Stop/Go decision before launch. Is the design ok to release to an unsuspecting world? Create bonus plans for design managers and higher-level executives. For example, you'll determine bonus amounts for development project leaders supported what percentage customer-support calls or emails their products generated during the year. Usability may be 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 planning process.

Usability is defined by 5 quality components:

Learnability: How easy is it for users to accomplish basic tasks the primary time they encounter the design?
Efficiency: Once users have learned the planning , how quickly can they perform tasks?
Memorability: When users return to the planning after a period of not using it, how easily can they re-establish proficiency?
Errors: what percentage errors do users make, how severe are these errors, and the way easily can they get over the errors?
Satisfaction: How pleasant is it to use the planning There are many other important quality attributes. A key one is utility, which refers to the design's functionality: Does it do what users need?

Usability and utility are equally important and together determine whether something is useful: It matters little that something is straightforward if it isn't what you would like

RELATED WORK

Software development organizations contains marketing, design, project management, development and quality assurance team. It's important for the various teams within the organization to know the advantages and limitation of incorporating various usability testing methods within the software development life cycle. Some reasons for poor usability include effort prioritization conflicts from development, project management, and style team. The part played by the usability engineer is to urge involved because the heuristic judge and facilitate the event and style efforts are supported usability principles and at an equivalent time adhering to the project period of time. Two approaches for usability inspection methods consist of user experience testing and expert review or more commonly referred to as Heuristic Evaluation (HE). This paper focuses on understanding the strength of HE as a strategy for defect detection. The results also increase the need for integrating traditional heuristics with modified heuristics customized to the domain or field of the project being tested such as E-Government. [1]

.Describes an innovative methodology developed for usability tests of the IEEE PCS internet site that combines heuristic evaluation and task-based testing. Tests conducted on the PCS Website has evaluated whether the location facilitated members' ability to seek out information and participate in discussions, also as developers' are capable to seek out, contribute, and manage administrative information on the location. The distinctive social characteristics of Communities of Practice (CoPs) provide context for tailoring design heuristics for informational internet sites that serve the requirements and interests of CoP members. The discussion gives important technical communication principles that apply not only to evaluating the effectiveness of the PCS internet site design but also to all or any centralized. f the PCS Web site design but also to all centralized technical communication products and media that increasingly demand user participation. [2] Here Proposes a usability testing method that alters a given usability testing method to form it less expensive and time consuming for the investigator. The usage of user-centred methods is stimulated and a mixture of two centralized methods suggested. Future this method is combined with other techniques to additionally detect the state of satisfaction within the participant.

User based features like emotions, opinions, cognitive and conative effects are therefore are considered. a way for the joint analysis of all data gathered is proposed. [3] More automated system testing might be instrumental in achieving these goals and in recent years testing tools are developed to automate the interaction with software systems at the GUI level. However, there's absence knowledge on the usability and applicability of these tools in an industrial setting. This study analyses two tools for automated visual GUI testing on a real-world, safety-critical software is developed by the corporate Saab AB. The tools are compared supported their characteristics also as how they support automation of system test cases that have previously been presented manually. The time to develop and the size of the automated test cases also as their execution times are evaluated. [4] Usability testing is important to be performed by software development companies to determine whether their products are usable or unusable. It's equally important for the end-users companies running usability studies also. This paper represents the event of Usability Management System (USEMATE), an automatic system as an alternate solution to assist usability tester or practitioner to run usability testing more efficiently and effectively. The main objective of USEMATE is to enhance the present systems which are paper-based, require manual score calculation using excel and manual reaction time recording into a web-based management system. The tools used for the event comprise Adobe Photoshop CS2, Adobe Dreamweaver CS3, Apache Web Server, and a private computer (PC). The modules and usefulness criteria included and therefore the approach utilized in the event of this automated system were replicated from a case study on usability testing of a webpage conducted earlier. USEMATE is envisaged to be ready to minimize the lengthy working hour and energy needed to manage the usability testing process from phase to phase. [5]

Usage of traditional UT techniques which aren't sufficient and suitable with the growing complexity of internet sites & constraints faced by usability practitioners. For a sample, the Lab Based Usability Testing (LBUT) is dear and has lesser coverage than Exploratory Heuristics Evaluation (EHE) while the EHE is subjected to false alarms. A hybrid usability methodology (HUM) comprising of LBUT and EHE is obtainable. Six experiments involving EHE and LBUT were performed at the first, in-between and future stages of the SDLC of websites, during which the simplest relative performance of every method were measured using the dependent variables followed by the planning of a HUM. To prove the HUM, four case studies were conducted, during which remarkable improvements were observed in website

effectiveness and efficiency. supported the findings, HUM may be a realistic approach for usability practitioners and also provides stakeholders a validated situational deciding framework for usability testing strategies taking under consideration world constraints.[6]

II. METHODOLOGY

usability may be a multidimensional concept that aims into the fulfillment of certain set of goals, mainly; effectiveness, efficiency and satisfaction” and without these goals, usability can't be achieved.

Effectiveness: this term refers to the accuracy and completeness of the user goal achievement.

Efficiency: refers to the resources exhausted by users so as to make sure an accurate and completed achievement of the goals.

Satisfaction refers to the subjective thoughts of the user regarding their attitude, level of comfort, relevance of application and therefore the acceptability of use.

A system or a product is completely hooked in to its specific and distinct context of use, the character of the task, the users appointed to require the task, and finally the equipment used to perform it.

Measuring the usability of a certain system can be done through the measurement of the three goals using a number of observable and quantifiable usability metrics.

In the light of the three goals mentioned earlier, we'll go through the different metrics used to measure each goal, however, our main focus will be on the Effectiveness It can be measured through using two usability metrics: Success rate, called also completion rate and the number of errors .Success rate/ completion rate: is the percentage of users who were able to successfully complete the tasks. Despite the very fact that this metric remains unable to supply insights on how the tasks were performed or why users fail just in case of failure, they're still critical and are at the core of usability.The success rate is one of the most commonly used metric for most of practitioners, where 79% of them reported using the success rate as the first metric to think about for simple use and through data collection and interpretation.

The success rate metric are often measured by assigning a binary value of 0 and 1 to the users; where 1 is assigned to those that successfully complete the task and 0 to the ones who fail to do so.”Once the test is over and you have all the data you need to calculate your success rate, the next step would be to divide the total number of correctly completed attempts by the total number of attempts multiplied by 100.The completion rate is easy to measure and to collect but with one major pitfall to consider; it happens frequently when a user stops at some point during the task and fails to end it or maybe finishes it but not in the expected way.Taking into account that they have completed some steps successfully in the task, how would you score what they have accomplished as an evaluator?I am getting to dive a touch bit into the small print on the way to score you users taking under consideration the various stages of their success or failure, using an example to illustrate.

Let's consider, for instance, that your user task is to order a box of dark chocolates with a card to their mother for mother's day.The scoring might seem simple at first glance, and you'll easily say; if the mother receives the box of bittersweet chocolate with the cardboard then it's a case of success. On the opposite hand, if the mother doesn't receive anything then we will simply say, that this is often a case of failure.

However, it's not that straightforward , there are other considerations:

Ordered a box of chocolate but not the dark one (white or milky or a spread of these) alongside card.

Ordered the proper chocolate box without a present card

Ordered quite one box of chocolate by mistake and a present card

Ordered a box of chocolate but didn't add delivery information or address

Ordered a box of chocolates and gift card successfully but to the incorrect address

All these cases entail a percentage of success and failure within the process of fulfilling the task, their failure is partial also as their success, which simply means that as an evaluator you would like to interact your own personal opinion within the scoring.

If you decided that there are no middle grounds in the estimated scoring, your success rate would be different from that obtained when you appreciate the effort they have made in spite of the task you planned for them.

The fact that there is not a steady rule when it comes to scoring your users, and oftentimes success rates become subjective; because different evaluators won't have the same scoring and estimate an equivalent percentage of failure or success for the above cases, within the same way. However, so as to mainstream the method , you'd like to work out the important aspects of the task and what score you would allot each a part of it.

Success rate remains the only usability metric and therefore the easiest among the entire range of those usability signals, mainly because it's quick and straightforward and doesn't require much preparation and time to gather

and most significantly it enables you from tracking the progress within your system being one among the overall areas commonly employed by marketers and designers right along, to ascertain the large picture of how well their system is doing at the extent of user experience, this doesn't change the very fact, that it remains subjective.

Help the designers and developers to ascertain that uncovering problems isn't a symbol of failure. Nobody does an ideal job the initially time only. Users always surprise us. It's much better to seek out about the issues with some users during a usability test than later when the design is being reviewed and is out there within the marketplace. [7]

2. The Number of Errors

This metric provides an idea about the average number of times where an error occurred per user when performing a given task. These errors can be either slips; where the user accidentally types the incorrect email address or picks the incorrect dates when making a reservation or booking a flight, or they will be mistakes where the user clicks on an image that's not clickable or even double clicks a button or a link intentionally. Normally any users of any interactive system may make errors, where 2 out of every 3 users err, and there's absolutely no such thing as a "perfect" system anyway. To help you measure and ensure obtaining great diagnostic results, it is highly recommended to set a short description where you give details about how to score those errors and the severity of a certain of an error to show you how simple and intuitive your system is.

3. Time-Based Efficiency

Or referred to as time on task, this metric helps in the measurement of the time spent by the user to complete the task or speed of work. This consequently means there's an immediate relationship between the efficiency and effectiveness, and that we can say, that efficiency is really the user effectiveness divided by the user time spent.

4. The Overall Relative Efficiency

This is actually measured through users who successfully completed the task in relation to the total time taken by all users. Let's consider that we have 2 users where each one of is supposed to complete a different task. The first user has successfully completed task (1) yet failed to complete task (2). While the second hand has did not complete task (1) but completed task (2) successfully.

5. Post Task Satisfaction

Once your users have finished the task and it doesn't matter whether complete it successfully or not, it's time to hand them over a questionnaire to have an idea about the difficulty of the task from the users point of view. Generally, these tasks consist of 5 questions, and the idea behind them give your users a space to judge the usability of your system.

6. Task Level Satisfaction

This metric helps into investigating the overall impression of users confronted with the system. To measure the level of satisfaction you can either use the smiley scale method where the user is expected to choose one of the 5 smileys as a reflection of their satisfaction or lack of satisfaction. The Word Method is also use to measure the user's level of satisfaction through listing a series of positive and negative connotations highlighted in green and red respectively.

In light of the conceptual framework we have discussed earlier, the user experience is highly influenced by everything that surrounds it. However, the tide might be turning on usability funding. I've recently worked on several projects to determine formal usability metrics in several companies. As organizations increase their usability investments, collecting actual measurements is a natural next step and does provide benefits. In general, usability metrics let you:

Track progress between releases. You cannot fine-tune your methodology unless you recognize how well you're doing. Assess your competitive position. Are you better or worse than other companies? Where are you better or worse? Make a Stop/Go decision before launch. Is the design ok to release to an unsuspecting world?

Create bonus plans for design managers and higher-level executives. For example, you'll determine bonus amounts for development project leaders supported what percentage customer-support calls or emails their products generated during the year.

How to Measure

It is easy to specify usability metrics, but hard to gather them. Typically, usability is measured relative to users' performance on a given set of test tasks. The most basic measures are supported the definition of usability as a top quality metric:

success rate (whether users can perform the task at all),

the time a task requires,
 the error rate, and
 users' subjective satisfaction.[8]

It is also possible to collect more specific metrics, such as the percentage of time that users follow an optimal navigation path or the number of times they need to back track. You can collect usability metrics for both novice users and experienced users. Few websites have truly expert users, since people rarely spend enough time on any given site to find out it in great detail. Given this, most websites benefit most from studying novice users. Exceptions are sites like Yahoo and Amazon, which have highly committed and constant users and may enjoy studying expert users. Intranets, extranets, and weblications are almost like traditional software design and can hopefully have skilled users; studying experienced users is thus more important than working with the novice users who typically dominate public websites. With qualitative user testing, it is enough to test 3–5 users. After the fifth user tests, you've got all the insight you're likely to urge and your best bet is to travel back to the drafting board and improve the design so that you can test it again. Testing quite five users wastes resources, reducing the amount of design iterations and compromising the ultimate design quality. Unfortunately, when you're collecting usability metrics, you want to test with quite five users. In order to urge a fairly tight confidence interval on the results, I usually recommend testing 20 users for every design. Thus, conducting quantitative usability studies is approximately fourfold as expensive as conducting qualitative ones. Considering that you simply can learn more from the simpler studies, I usually recommend against metrics unless the project is extremely well funded. success rate or the completion rate because it's gives a general idea about the performance of the system.

IV. FIGURES AND TABLES

Comparing Two Designs

To illustrate quantitative results, we can look at those recently posted by Macromedia from its usability study of a Flash site, aimed at showing that Flash is not necessarily bad. Basically, Macromedia took a design, redesigned it according to a set of usability guidelines, and tested both versions with a group of users. Here are the results:

Table no:1

	Original Design	Redesign
Task 1	12 sec.	6 sec.
Task 2	75 sec.	15 sec.
Task 3	9 sec.	8 sec.
Task 4	140 sec.	40 sec.
Satisfaction score*	44.75	74.50

*Measured on a scale ranging from 12 (unsatisfactory on all counts) to 84 (excellent on all counts).

Table no :2

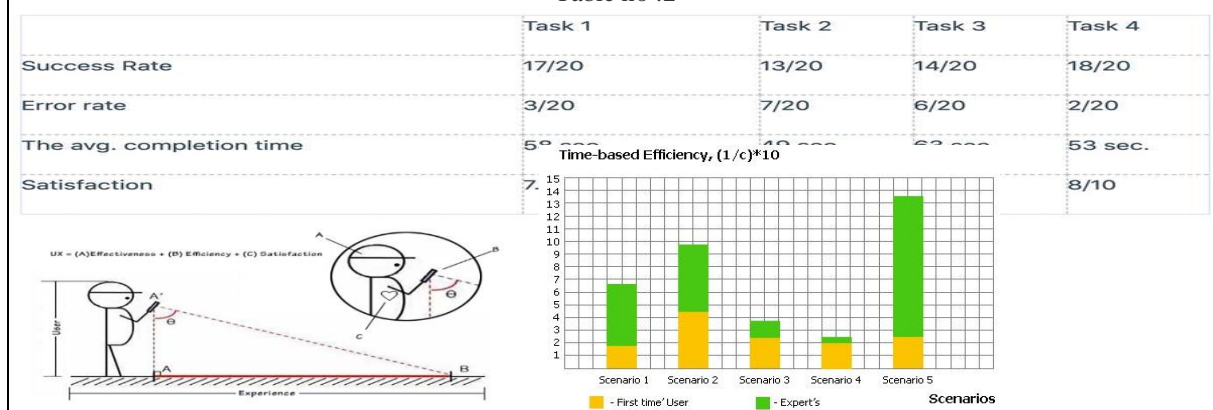


Fig-1

Measuring Usability in UX



fig-2

Fig-3

V. CONCLUSION

usability metrics, it's possible to watch and quantify the usability of any system irrespective if it's software, hardware, web-based or a mobile application. This is because the metrics presented here are supported extensive research and testing by various academics and experts and have withstood the test of your time .

Moreover, they cover all of the three core elements that constitute the definition of usability: effectiveness, efficiency and satisfaction, thus ensuring an all-round quantification of the usability of the system being tested. usability gets side-tracked and becomes something which will be addressed afterward . Tracking the usability of your product with metrics allows you to possess a transparent understanding of the experience you're providing to your users, and improve it over time. usability metrics are measured and aggregated into actionable results, which allows you to act instantly on the info you record. That makes it painless to stay track of how your design's usability progresses, detect issues, and improve your users' experience

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