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A hybrid approach to measure design improvement factor of website

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Abstract*: Software Engineering is the major activity of Information Technology. We can engineer the various types of end user applications such as games, spread sheets, websites with the help of Software Development Life Cycle. Different types of principles to asses such as Usability, efficiency, reliability, cost, risk, economic value are applied to above mentioned applications.*

Usability is the quality measure of a user's interaction with a product. When this product is website its termed as web usability. It is the quality attribute that assesses how easy user interfaces. It contributes to improve the design process. Web usability is an approach to make website easy to use for an end-user, without the requirement that any specialized training be undertaken. Website design is the key issue, because how the end user experiences the design is the key to acceptance.

There are several usability principles mentioned in the literature but all these principles depend upon the application domain. We propose a two-step hybrid approach. In the first step according to performance of clusters output web usability principles are selected and in the second step Function Point matrix is applied to optimal web usability principles selected in the first step. It grades optimal usability principles and suggest improvement factor for each principle.

Keywords*: web usability, Function Point matrix, improvement factor*

I. INTRODUCTION

With advances in Internet technology, website design had become critical issue .The main objective of website is to achieve goals set by domain. User can be frustrated and may give up if more efforts are spent by him/her to accomplish a particular task.[14] Confusing website might affect the productivity. Though Usability principles are application specific [9], software engineering suggests many domain independent quantification techniques. Function point metrics is one of them and the most accurate and effective metrics it is also used for studying software productivity, usability, quality, costs, risks, and economic value software applications[10].We have studied 50 websites using a questionnaire. It consists of web usability questions according to the standard guidelines given in a literature. Usability count is calculated and top 50 websites with respect to its usability count are considered for further study[1]. Clustering based technique for different combination of various web usability principles is used according to expert's knowledge. Cluster evaluation techniques are used to select optimal web usability principles [7]. Now we apply a well-known Function point matrix to optimal web usability principles. It will result into grading of each principle and in turn it will suggest the measurement for modification of website design. Data flow Diagram [11] is the first step to calculate measuring parameters. These Measuring parameters are used to calculate Function Point .We calculated measuring parameters [11] for entire application based on Data flow Diagram [10]. We applied all 14 rating scale questions to each web usability principle [11]. Thus each principle is scaled. Then we converted above retrieved measure into the scale of 0 and 1. It represents the improvement factor of each principle. . A value near to zero represents poor interface design and needs improvement by a specific scale. This approach selects optimal principles with their scale. It saves a lot of time, cost, and efforts for updating website design.

II. Background

Usability process involves design with its evaluation and follows basic steps as requirement analysis, conceptual design, prototype, production, launch and maintenance [2]. Home page should be created in such a way that it will create positive first impression of a website. The important issues while designing websites are navigation, graphics, screen based control, page layout, etc.[3]. Benefits of planning usability into the website are Higher satisfaction leads to productivity, Completion with success to acquire brand loyalty, A higher rate of repeat users to progress in competition . The challenging task lies in extracting useful information from a large collection of data either from a data warehouse or from a database [3,8]. Generally collected data contains irrelevant or redundant attributes. Classification and clustering do not give accurate result if there are interdependent attributes. Correct feature selection is a fundamental data preprocessing step in data mining. Feature Mine algorithm contains sequence mining and classification algorithms which efficiently handles very large data sets with thousands of items and millions of records[4]. Edie Rasmussen states Cluster analysis is a

technique which assigns items to groups based on a calculation of the degree of association between items and groups. Cluster analysis can be used for hierarchical algorithm. Nested data set is produced in which pairs of items or clusters are connected successively. However, the hierarchical methods are better information retrieval. The commonly used hierarchical methods, such as single link, complete link, group average link, and Ward's method, have high space and time requirements. In order to cluster the large data sets with high dimensionality there is need to have a better algorithm Examples are the minimal spanning tree algorithms for the single link method, the Voorhees algorithm for group average link, and the reciprocal nearest neighbor algorithm for Ward's method. Edie listed steps of clustering including Selecting of the attributes on which items are to be clustered , selecting appropriate clustering method, Creating the clusters or cluster hierarchies ,interpreting clusters and validating the results etc.[5]. They have focused on feature selection algorithms for classification (knowing class label) and clustering (unsupervised feature selection) where data is unlabeled. Feature selection algorithms designed with different evaluation criteria broadly fall into three categories: the filter model, the wrapper model and the hybrid model. The filter model relies on general characteristics of the data to evaluate and select feature subsets without involving any mining algorithm [6]. This paper states that Function point metrics are the most accurate and effective metrics it is also used for studying software productivity, usability, quality, costs, risks, and economic value and in near future function point metrics can easily become a universal metric used for all software applications [11]. A. Felfernig, A. Salbrechter states that Function point matrix is very versatile it is not only used for checking usability but it is also used to measure other attributes such as errors per FP, defect per FP, $ per FP, page of documentation per FP and FP per person month [12]. The paper stated that function points is an important tool to measure the probable errors at the all the development stages. However, errors found may be more if development process is not matured, thus it an indication to improve the process[13].

III. Process

Usability count is the measure that quantifies web usability. It is calculated based of questionnaire. It includes questions depending on standard guidelines of usability. To select optimal web usability principles, the first step is to study the websites which follows standard rules. So we have 50 websites having topmost usability count [14] [1]. Clustering approach is for selection of web usability principles. Cluster evaluation parameters with expert's knowledge are used for selecting different website principles [7]. To grade these optimal principles and to suggest improvement factor, we propose a hybrid approach, using function point matrix. It includes measuring parameters such as no. of user inputs, no. of user outputs, no. of user inquiries, no. of external interfaces and no. of database files. For getting measurement parameters, Data Flow Diagram is drawn for the complete application. Count Total is calculated using weighting factor table that is table 1 [13]. The Fi is complexity adjustment factor and the value Fi varies for optimal web usability principles. After rating all fourteen questions [10]we get the value of Fi. The Function point FP represents quantitative value for each principle. It is converted within the scale of 0 and 1. Zero represents the poor design. The value near to zero represents the degree to which website should be modified for that particular principle.

Measuring Parameter	Count	simple	average	complex		
Number of user inputs	5	3	4	6	=	15
Number of user outputs	6	4	5	7	=	30
Number of user inquiries	2	3	4	6	=	6
Number of files	3	7	10	15	=	45
Number of external interfaces	1	5	7	10	=	5
COUNT TOTAL						101

Table 1. Weighting Factor

The formula for computing FP is as follows:

FP=count total*[0.65+0.01*∑Fi (i= 1 to 14)]

FP=101*[0.65+0.01*14]

FP=79.79

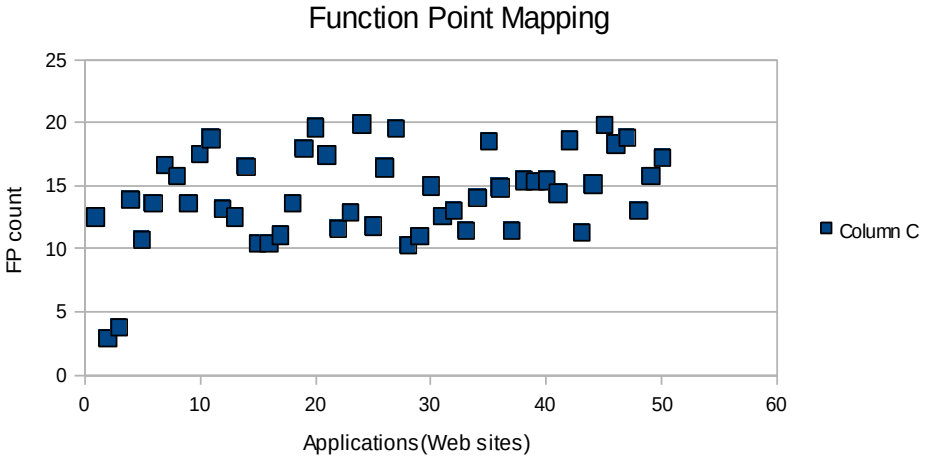
FP=80

FP=0.8 (range between 0 to 1)

Principle Applications	P1	P2	P3	P4	P5	P6	P7
W1	0.6	0.7	0.2	0.8	0.4	0.2	0.1
W2	0.8	0.5	0.4	0.3	0.9	0.6	0.6
W3	0.1	0.5	0.6	0.1	0.6	0.8	0.5
W4	0.9	0.3	0.6	0.8	0.9	0.2	0.1
W5	0.3	0.3	0.9	0.8	0.2	0.3	0.5
W6	0.6	0.7	0.5	0.9	0.2	0.1	0.7
W7	0.2	0.5	0.9	0.6	0.4	0.2	0.7
W8	0.4	0.8	0.4	0.1	0.7	0.4	0.9
W9	0.9	0.2	0.9	0.7	0.6	0.4	0.7
W10	0.1	0.1	0.3	0.4	0.6	0.5	0.4

Table 2 Function Point mapping between Applications and various Principles

Table 2 shows the representative 10 applications and 07 principles amongst 50 and 35 respectively. Above mentioned matrix indicates mapping between Applications and various Principles. Pi: Principles (i=1 to 7) and Wj: Applications (Websites) (j=1 to 10) The data indicates the converted value of FP within the range of 0 and 1 for specific website and principle correspondingly.



Graph 1

Graph1: Function Point Mapping represents total FP count for 50 websites

IV. Conclusion

The overall quality of a website is actually sum of many quality attributes, important one of which is usability. Focusing usability as a quality goal, there are serval usability principles explored in literature. Though These principles are domain dependent, above hybrid approach grades each principle using Function point matrix and suggests the factor of improvement .As optimal principles are being measured it saves time, cost, efforts for updating website design.

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