

Usability and Functionality: A Comparison of Project Managers' and Potential Users' Evaluations

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Abstract - Users tend to use functional and usable products more frequently. It is also possible that a functional software is not usable or vice versa. Only functionality-focused designs fail to meet usability needs [1]. Therefore, both usability and functionality, which in software design are interrelated, should be taken into account in the design processes [2]. In addition, meeting users' requirements is one of predictors of project success. Therefore, there should be a match between the expectations of the users and the perception of the project managers with respect to usability and functionality. The aim of this study is to make a comparison of the project managers' and potential users' evaluations of the relative importance of usability and functionality factors in a software design project. Analytical Network Process (ANP) was used to analyze the relative importance of the factors.

Keywords – Functionality, software design, usability

I. INTRODUCTION

Functionality and usability are the sub-features of usefulness, which is a critical factor for acceptability of a system [3]. Usability assesses the extent a software facilitates users utilize the offered functions easily and appropriately. Functionality estimates the extent the software operates in the way it is structured and is expected to perform as users desire [4, 5].

Users tend to use functional and usable products more frequently. Porter et al. [6] state that the majority of the users prefer products that are “simple and easy to use” and it is adequate if they merely function, as they are expected to or slightly better. Nielsen [5] states that usability and functionality are quality characteristics that evaluate an interface design.

It is also possible that a functional software is not usable or vice versa [3, 5, 7]. The functionality of a software package becomes obvious to users through its interface and users interact with the system via this interface. Although it would appear that the usability feature is related only to the interface and not to the logic of available functions, Seffah et al. [8] assert attributes of a system can affect the usability of the whole system. Successful usage of a software package depends on the ability of users to understand the functionality of the system. Functionality can have positive impact on the usability of the system, such as a “back” function [9]. After all, evidence shows that the majority usually uses only a small part of the available functions of a system

[10]. At some point, the greater the functionality offered to the users the more skilled users must cope with the complex and time-consuming structure of the system [11]. Therefore, superfluous functionality can actually bring about a decrease in the usability of the software [10, 12]. To ensure users' needs are met, it is critical to balance functionality and usability in the design of the software. A user-centered design should consider both aspects — the interaction between user and the software as well as the operations performed by the system [1].

Since meeting users' requirements is one of the project success factors [13, 14, 15], understanding the user expectation of balance between functionality and usability is crucial for project team to implement a user-centered design. A mismatch between the expectations of the users and the perception of the project managers on what is required can be counted as one of the leading software project risks [16].

The aim of this study is to make a comparison of the project managers' and potential users' evaluations of the relative importance of usability and functionality factors in a software designed for a call center.

II. FUNCTIONALITY AND USABILITY FACTORS USED IN THIS RESEARCH

A literature review was performed to determine the usability and functionality factors that are important for the software we analyzed. Also, a series of interviews with the project managers was conducted. As a result of these interviews, a new functionality factor “autorun” was elicited although it was not mentioned in the literature we reviewed. The literature reviewed on usability and functionality included studies on web sites and software packages designed for organizations such as libraries other than call centers. The list of usability and functionality factors is presented in Table I.

The usability factors are navigation, interaction, learnability, ease of use, response time, memorability, efficiency, and satisfaction.

Navigation: It refers to finding one's way to the desired information through menus, graphical components, links and page sequence, and layout [17] as well as, even while doing this, knowing where one is at the instant [18].

Interaction: Responses to the user's actions are produced by the system [17]. Along with navigability,

interaction with system helps users to find easily the desired information [19].

TABLE I
USABILITY AND FUNCTIONALITY FACTORS USED IN THE EVALUATIONS

Usability Factors	Functionality Factors
A1.Navigation	B1.Security
A2.Interaction	B2.Search Options
A3.Learnability	B3.Information Provision
A4.Ease of Use	B4.Services/Facilities
A5.Response Time	B5.User Guidance or Support
A6.Memorability	B6.Customizability
A7.Efficiency	B7.Autorun
A8.Satisfaction	

Learnability: It is associated with the skill levels of a user and thereby the level of effort needed to learn how to operate the system [20]. For success of a system, the time a user needs to learn how to operate the system should be very small [21].

Ease of use: It refers to being able to operate a web site without experiencing any difficulty and trouble. According to Pearson et al. [22], ease of use is one of the most important components along with navigation for usability and plays a significant role in the adoption of a system by users.

Response time: It is the time needed by the system to respond to the activity of a user [17].

Memorability: It is the ease of recall of the main functions and their presentation on the web site when a user revisits the page [5]. Seffah et al. [8] point out that an inconsistent interface structure raises the memory load on users.

Efficiency: It is the ability of the web site to allow users to work quickly [5, 23] to attain their desired goal with the minimum number of clicks.

Satisfaction: It is the general pleasure a user feels making use of a web site. Satisfaction is primarily affected by the perceived efficiency and effectiveness, and emotions and thoughts arising from the usage [24].

Functionality factors are security, search options, information provision, services/facilities, user guidance or support, customizability, and autorun.

Security: The security features provided by the system protect users' privacy. Calero et al. [20], Stefani et al. [25], and Seffah et al. [8] include security as a functionality factor.

Search Options: Systems offer both simple- and advanced search strategies and enable additional eliminations in retrieved results [4, 26]. That the search function helps users quickly and precisely find what they are looking for.

Information Provision: It supplies users with adequate information about company, products and services [27].

Services/Facilities: They are purposive services/facilities offered to the user to assist in achieving the related goal of the system. Kapoor and Goyal [26] mention this functionality factor in their research on online public access catalogues, e.g. renewal and reservation services.

User Guidance or Support: Web sites offer customers uncustomizable (such as FAQ) or/and customizable help (such as online help) [27], and describe the necessary information about these steps which users can follow when they have a request or when they encounter a problem. According to Roy et al. [18], an adequate user guidance and support feature would reduce their cognitive load and pave the way for them to learn how to operate the web site.

Customizability: It is the flexibility to change system navigation to a level that meets users' needs or preferences. Liang et al. [28] suggest that customization increases user satisfaction by limiting information overload on users with respect to their preferences [22]. Palmer [17] points out that customization is an extension of the interaction provided by the web site.

Autorun: It enables the system to run some operations automatically.

As seen above, not only functionality and usability of a system, but also some of their other factors are related to each other. Hence, these interactions go to create a complex model composed of dependence and feedback among the factors. In evaluating a software, such a model can be treated with the Analytic Network Process (ANP) proposed by Saaty [29] in order to determine the relative importance of both usability and functionality factors.

III. ANP

When the factors in a complex structure of a decision making process are interrelated to each other, which means there are dependence and feedback among the factors, then this setting can be patterned only as a network. Analytical Network Process (ANP) enables decision makers as individuals or groups to cope with the factors interconnected with each other in the decision making problem [29, 30].

ANP can deal with the complexities of real-world problems of making societal-, governmental-, and corporate decisions because it takes complex interrelationships among factors into account [31, 32, 33, 34].

ANP has three stages: structuring (design), assessment (comparison), and synthesis (computation).

At the structuring stage, pertinent factors and alternatives, if necessary, are determined. Next, associations between pairs of factors are identified by experts. As a result, a network model, which consists of factors and relations among them, is constructed.

At the assessment stage, a nine-point scale suggested by Saaty [29] is used by the decision makers to make pairwise comparisons of the factors in the network.

	USABILITY								FUNCTIONALITY						
	A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7
A1		*	*	*		*	*	*		*	*	*	*		*
A2	*		*	*				*	*	*	*		*		*
A3				*		*	*	*	*	*				*	
A4			*			*	*	*		*				*	
A5	*		*				*	*	*						
A6	*		*	*			*	*					*	*	
A7						*		*							
A8									*						
B1	*	*			*		*	*				*			
B2	*	*	*	*	*	*	*	*			*			*	
B3	*	*	*	*		*	*	*					*		
B4	*	*	*	*		*	*	*							*
B5	*	*	*	*		*	*	*							
B6	*		*	*		*	*	*					*		
B7	*	*		*	*		*	*				*	*		

(A1 navigation; A2 interaction; A3 learnability; A4 ease of use; A5 response time; A6 memorability; A7 efficiency; A8 satisfaction; B1 security; B2 search options; B3 information provision; B4 services/facilities; B5 user guidance or support; B6 customizability; B7 autorun)

Fig. 1. Aggregated pairwise relationship matrix

Saaty's scale asks, "of the dependent factors, which one influences the common factor more and how much more?" According to this scale, a value of 1 shows that both factors compared have equal influence levels on the affected factor, while a value of 9 shows that one factor has extremely more influence than that of the other on the affected factor. To obtain the aggregated group judgment, the geometric means of all individual paired-comparison judgments for each question are calculated. Using these aggregated group judgments, pairwise-comparison matrices are generated.

At the synthesis stage the relative importance of the factors is computed. Importance is viewed as the influence of the factors on a common goal. To synthesize aggregated judgments to compute the relative importance of the factors, the computation of the eigenvector for each pairwise-comparison matrix, the generation of a supermatrix and a weighted supermatrix (if necessary), and the computation of the convergence of the supermatrix (limit matrix) are requisite. The relative weights (desired priorities) of the factors in the decision network are the values of the limit matrix.

IV. EVALUATION OF THE SOFTWARE

First, the structuring stage was performed; the usability and functionality factors were determined as described in Section 2. After the determination of usability and functionality factors, the group of experts whose working areas are usability engineering filled in a pairwise relationship matrix separately. To aggregate these matrices into a groups matrix majority rule was used (Fig. 1). The asterisk (*) entered in this matrix indicated that there is a direct relationship of factor i to factor j : If factor i affects factor j , the cell a_{ij} was filled with an asterisk (*). Where there was no relationship, the cell was not filled. Then the ANP model

representing the associations between factors are generated using the Super Decisions software.

In the judgment assessment stage, the second stage of the process, 5 project managers and 43 users filled a pairwise comparison questionnaire. An example question from the questionnaire can be seen in Fig. 2.

Of the factors given below which one influences "navigation" more and how much more?															
1=Equally 3=Moderately more 5=Strongly more 7=Very strongly more 9=Extremely more															
Interaction	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7
Response Time	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7
Memorability	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7

Fig. 2. A part of pairwise comparison questionnaire

The respondents judged the relative importance of the affecting factors on the affected factor for all possible pairs. Then, the geometric means of all paired comparison judgments for each question were computed for each group (project managers and potential users) in order to arrive at the aggregated group judgments. Utilizing the Super Decisions software, these responses were formed into pairwise comparison matrices.

In the synthesis stage of the process, the relative importance of the factors was computed using the Super Decisions software for both groups, which performed all the algebraic computations of the matrix. As pointed out before, the output of the limit matrix can be converted to the descending priority order: the relative importance of the factors (Table II and III) for both groups.

V. CONCLUSION

As it can be seen in Table 2 and 3, the most important factor in terms of usability and functionality for both groups is "navigation" with a relative importance of 20%. This shows that finding the relevant information with the least effort through menus, graphical components, sequences, and layout was considered as the important factor by potential users and

projects managers. In addition, both groups assign a higher priority to the usability factors in general.

TABLE II
THE IMPORTANCE OF THE FACTORS FOR PROJECT MANAGERS

Sub-Factors	Priorities
A1.Navigation	0.20082
A2.Interaction	0.10584
B5.User Guidance or Support	0.09898
B2.Search Options	0.09156
A4.Ease of Use	0.09041
A6.Memorability	0.08127
B7.Autorun	0.06995
B3.Information Provision	0.06503
A3.Learnability	0.04637
A5.Response Time	0.03691
B1.Security	0.03454
B6.Customizability	0.03415
B4.Services/Facilities	0.02867
A8.Satisfaction	0.00807
A7.Efficiency	0.00743

TABLE III
THE IMPORTANCE OF THE FACTORS FOR POTENTIAL USERS

Sub-Factors	Priorities
A1.Navigation	0.20381
A2.Interaction	0.12715
B2.Search Options	0.09703
B5.User Guidance or Support	0.06914
A6.Memorability	0.06594
B3.Information Provision	0.06236
B7.Autorun	0.06195
A5.Response Time	0.05665
A3.Learnability	0.05569
B1.Security	0.05257
A4.Ease of Use	0.04451
B4.Services/Facilities	0.04023
B6.Customizability	0.03907
A8.Satisfaction	0.01401
A7.Efficiency	0.00989

The second most important factor for both evaluation groups is “interaction”. It seems that “interaction” has a slightly more relative importance for potential users than for project managers.

For both evaluation groups, the most important functionality factors are “user guidance and support” and “search options”. While “user guidance and support” is the most important functionality factor for managers, it is second to “search options” and has a slightly lower relative importance for the potential users.

The remaining factors, excluding “ease of use”, have more or less similar relative importance ratings. “Ease of use” was considered as much more important

by the project manager group and had the 5th place with a relative importance level of 9%, while it had only the 11th place with an importance level of 4.45% for potential users.

Having similar orders and scores of usability and functionality factors for both groups shows that the project managers have captured the expectations and requirements of potential users accurately. This may have a positive impact on the project’s success. The findings of this study are important from the point of view that carrying out this study in the early stages of software design process can expose a mismatch between the expectations of users and the perception of the managers, a late discovery of which can otherwise cause irreversible results in the project.

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