

Usability Evaluation of Live Auction Portal

Deepak Gupta* and Anil K. Ahlawat**

Abstract: Usability evaluation has become a more relevant field for researchers now-a-days. It is also used to enhancing the quality of software. However, there is a lack of a commonly used, standard dataset for usability evaluation. In this work, a new dataset for Live Auction has been created and made publicly available. The Ranking of players for live auction have been implemented using a mathematical multiple criterion based performance evaluation model consisting of SOWIA (subjective and objective weight integrated approach) and MOORA (multiple objective optimizations on the basis of ratio analysis) methods. In this paper, we have initially done the critical analysis of various usability evaluation methods, and then uses a questionnaire evaluation technique to create the live auction dataset. At last, the usability evaluation of live auction can be done using the three usability issues.

Keywords: usability evaluation, questionnaire, sowia-moora, live auction portal.

1. INTRODUCTION

The need of the quality software systems is increased exponentially during the last two decades. Software usability evaluation has been recognized as a key factor in improving the overall quality of a software product and research shows that the lack of usability can determine the success or failure of a software system. According to ISO 9241-11 [5], usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”.

Usable software systems are much more successful as they are more accurate, safe, efficient, and effective. Several studies have shown the advantages of incorporating usability evaluation in the process of software development. Therefore, usability evaluation has become a significant and relevant research area. However, there is a lack of commonly used, standard dataset of usability. A number of usability models have been proposed by various standards and researchers but none of them defined the usability dataset for usability evaluation. A number of usability evaluation methods have been given by various researchers. The evaluation methods can be classified as inspection, testing and inquiry methods. One or more of these methods may be chosen for usability evaluation on the basis of available abilities of evaluator, resources, types of users and environment. This paper presents analytical comparison of the usability evaluation methods and use questionnaire evaluation method to create the dataset, and further usability evaluation can be done using three usability issues.

2. USABILITY EVALUATION TECHNIQUES

A number of usability evaluation methods have been proposed by various researchers over the last two decades. These can be classified into three categories viz Inspection, Testing, and Inquiry. Here, we have discussed only the main evaluation methods from each category.

According to [20], a critical analysis of the usability evaluation methods is based on five criteria, viz can conduct remotely (Yes/No), Intrusive (Yes/No), Expensive (Yes/No), Applicable Stages and Usability

* Maharaja Agrasen Institute of Technology (MAIT), Delhi, India, Email: myself.deepakgupta@gmail.com

** Krishna Institute of Engineering and Technology (KIET) Ghaziabad, India, Email: a_anil2000@yahoo.com

Table 1
comparative analysis of usability evaluation techniques

<i>Criteria</i> <i>Usability evaluation</i> <i>technique</i>	<i>Can be</i> <i>conduct</i> <i>remotely</i>	<i>Intrusive</i>	<i>Expensive</i>	<i>Applicable</i> <i>Stages</i>	<i>Usability</i> <i>issues</i> <i>covered</i>
Heuristic Evaluation [12]	Yes	No	No	Design,Coding,Testing, Deployment	Effectiveness Efficiency
Cognitive Walkthrough [18]	No	No	No	Design,Coding,Testing, Deployment	Effectiveness
Remote Testing [22]	Yes	No	Yes	Design,Coding,Testing, Deployment	Effectiveness Efficiency Satisfaction
MUSiC Method [9]	No	Yes	Yes	Testing,Deployment	Effectiveness Efficiency Satisfaction
Thinking Aloud Protocol [13]	No	Yes	Yes	Design,Coding,Testing, Deployment	Effectiveness Satisfaction
Questionnaires [17]	Yes	Yes	No	Design,Coding,Testing, Deployment	Effectiveness Satisfaction
Field Observation [14]	No	Yes	Yes	Testing,Deployment	Effectiveness Satisfaction

issues covered (Effectiveness, Efficiency, Satisfaction). Table 1 shows the comparative analysis of the usability evaluation techniques.

3. 'LIVE AUCTION' PORTAL

Auction is a process that marks the presence of a number of interested parties engaging in a bidding war for an item, valuable or service. In the present age of computers, it would be unfair to ask an individual to leave the comfort of their respective premises and be available at a common location. It would also not be apt to ask individuals to involve in the process of auction by physical gestures when same can be achieved by click of a mouse. Thus, Live Auction takes this plight of bidding individuals into consideration and makes the process automated. This not only allows the individuals to easily get involved in the process of the auction, but also makes the process visually more attractive and informative. The server, controlled by auction administrator, displays all the information needed by the administrator for proper conduction of the process. The client, used by individuals engaging in bidding war, enables them to be well informed about the player that is up for the auction, including all the stats available on the player, and helps them make a much more

The Portal has been designed and created using java and NetBeans and the ranking of players have been implemented using sowia-moora approach. SOWIA-MOORA[7] is a mathematical multiple criterion based performance evaluation model consisting of SOWIA (subjective and objective weight integrated approach) and MOORA (multiple objective optimizations on the basis of ratio analysis) methods. The input of MOORA method is the output of the SOWIA method. SOWIA method has been chosen as it helps to determine the relative importance of criteria integrating the perception and understanding of different experts in the form of subjective weight and objective weight which depends on the performance of alternatives with respect to each criterion. For the purpose of ranking we use MOORA method because it gives the several advantages like very simple and stable, less computational time, minimum mathematical calculations involved.

The input of sowia-moora approach is the IPL_Records consisting of number of matches, runs, strike rate, average, fifties, hundreds and the output is rank of each player. The input and output snapshot can be seen in Figures 1 and 2 respectively.

SOWIA MOORA INPUT

#	ID	MATCHES	RUNS	STRIKE_RATE	AVERAGE	FIFTY
1	1	135	3300	128.65	26.48	1
2	2	100	3373	142.2	38.33	31
3	3	43	938	161.62	23.54	4
4	4	92	3426	153.36	43.37	20
5	5	61	1480	144.39	36.1	8
6	6	95	2675	126.93	35.2	21
7	7	22	942	127.3	47.1	5
8	8	147	4098	138.54	33.59	28
9	9	139	4110	130.43	38.06	26
10	10	94	2551	140.71	32.71	14
11	11	143	3272	139.0	39.42	16
12	12	142	3874	131.72	33.69	29
13	13	89	1819	118.42	25.99	1

Figure 1: Input of sowia-moora method

SOWIA_MOORA OUTPUT

#	ID	PLAYER_NAME	PLAYER_PHOTO	RANK	SOLD_STATUS
1		1 Robin Uthappa	=BLOB 262 KB=		6 Not_Sold
2		2 David Warner	=BLOB 262 KB=		13 Not_Sold
3		3 Glenn Maxwell	=BLOB 262 KB=		1 Not_Sold
4		4 Chris Gayle	=BLOB 262 KB=		9 Not_Sold
5		5 David Miller	=BLOB 262 KB=		4 SOLD
6		6 Ajinkya Rahane	=BLOB 262 KB=		7 SOLD
7		7 Lendl Simmons	=BLOB 262 KB=		3 Not_Sold
8		8 Suresh Raina	=BLOB 262 KB=		12 Not_Sold
9		9 Virat Kohli	=BLOB 262 KB=		10 Not_Sold
10		10 Shane Watson	=BLOB 262 KB=		5 Not_Sold
11		11 MS Dhoni	=BLOB 262 KB=		8 Not_Sold
12		12 Rohit Sharma	=BLOB 262 KB=		11 Not_Sold
13		13 Manish Pandey	=BLOB 262 KB=		2 Not_Sold

Figure 2: Output of sowia-moora method

The algorithm given in [7] has been implemented in Java and NetBeans and the algorithm generates the rank of each player. Thus, the live auction Portal have been successfully created and implemented using sowia-moora method. Now, a dataset will be cretaed for live auction portal using questionnaire and then evaluate the usability for the same using some usability issues. The snapshots of the live auction portal is shown in Figures 3-8.

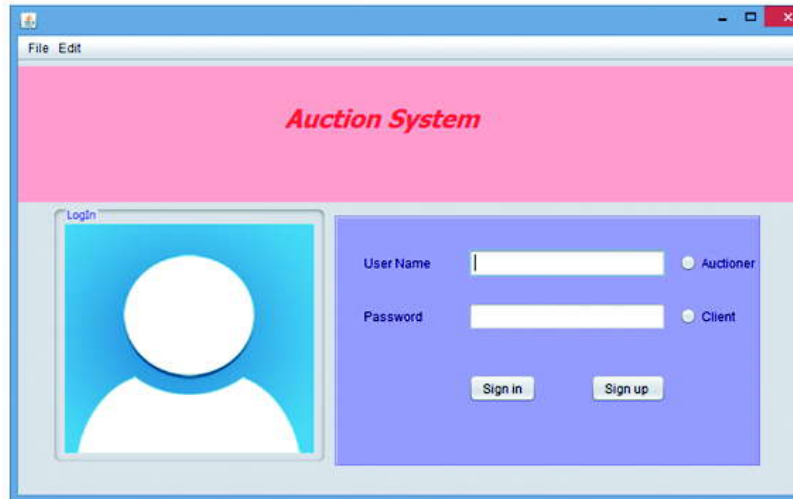


Figure 3: Login Window

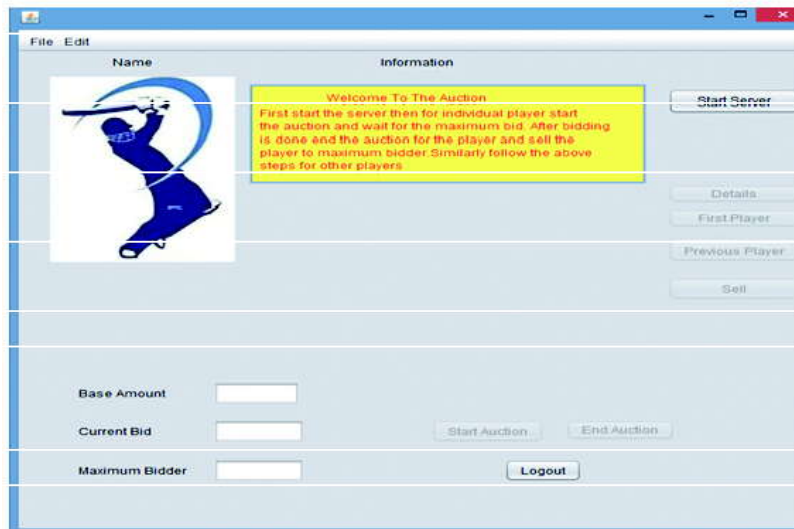


Figure 4: Auctioneer Window



Figure 5: Navigate between data of different players using 'next' and 'previous' buttons.



Figure 6: Players details window



Figure 7: Various changes in the state of buttons during auction.



Figure 8: Auctioneer starts the auction for the player.

4. LIVE AUCTION DATASET USING QUESTIONNAIRE

A data set is a collection of related, discrete items of related data that may be accessed individually or in combination or managed as a whole entity. The term data set is first originated with IBM, where it considers it as a file. In this session, we will discuss the methodology of the dataset creation on the basis of the three usability issues i.e. effectiveness, efficiency, satisfaction and their 12 attributes[21]. The attributes of these three factors are given in the Table 2.

Table 2
Attributes associated with the usability issues.

<i>Usability Issues</i>	<i>Attributes</i>
Efficiency	Resource, time, user effort, economic cost.
Effectiveness	Task accomplishment, operability, extensibility, reusability, scalability.
Satisfaction	Likeability, convenience, aesthetics.

Why Questionnaire is used?

Questionnaires are effective means of collecting huge amounts of information from enormous sample of people. When the questionnaires are completed then data can be gathered relatively quickly. This is helpful for huge populations and when the interviews would be impractical. There is an issue with questionnaire that is participants may lie due to any reasons. Generally, people want to reflect their positive image so they bend the reality to reflect good image. The significant distinction is between open and closed ended questions. Generally, questionnaire use both open and closed questions to gather data. And it is productive for collecting both quantitative and qualitative data. The answers of the closed questions can be put into categories which have been selected in advance by researchers. Such type of data is called as nominal data. Open questions enable people to exhibit what they generally think in their own words.

Aim & Objective

The aim of this research is to investigate the usability attributes in the valuation of the usability of a 'Live Auction' portal. The specific objectives for the research are:

- To ask usability experts and students and to give the answers of the questionnaire given to them for live auction portal.
- To use the answers given by usability experts and students, compute the values of usability attributes (weights).
- To use the weights of usability attributes and probability theory, compute the total weights of usability issues.
- Usability issues are used as an input to probability theory and computes the final values using the equation factor r_{value} .

Participants/Sample

The participants in this study were undergraduate students enrolled as engineering students (B.Tech.) related to two branches (Computer Science and Engineering, and Information Technology) at one of the universities in India. Three batches were selected from each branch. The total number of students was 396; the number of males was 249, while the number of females was 147 (Table). 287 provided usable responses. Demographic information concerning the students is shown in Table 3. The students in each batch carried out the procedure on live auction Portal. The Portal was evaluated by six classes (three batches from each branch).

Table 3
Demographic information of the research participants

		<i>Branches</i>		
		<i>CSE</i>	<i>IT</i>	<i>Total</i>
Sex	Male	105	73	178
	Female	53	56	109
ComputerExperience	< one year	3	8	13
	From one tothree years	144	104	248
	> three years	11	17	28
InternetExperience	< one year	16	12	28
	From one tothree years	75	62	137
	> three years	67	55	112
FrequentlyUse ofInternet	Daily	78	34	112
	Weekly	45	37	82
	Monthly	33	47	80
	By Semester	2	1	3
	Yearly	0	0	0

Procedure

All data collection sessions followed the same procedure. Data were gathered using one survey in a university in India where all students had access to the Internet. The session began with the researcher welcoming the students and explaining the objectives of the study; the web application that would be evaluated; the number of survey that needed to be filled in; and students' right to withdraw from the session at any time. The students were then asked to fill in the pretest questionnaire in order to obtain information regarding their background and experience. Then, the students were asked to provide their perceptions of the usability attributes (weights) using the survey.

On the basis of the survey using questionnaire conducted and the response collected by various experts and users, all the 12 attributes are assigns a value on the likert 7-point scale as seen in Table 4.

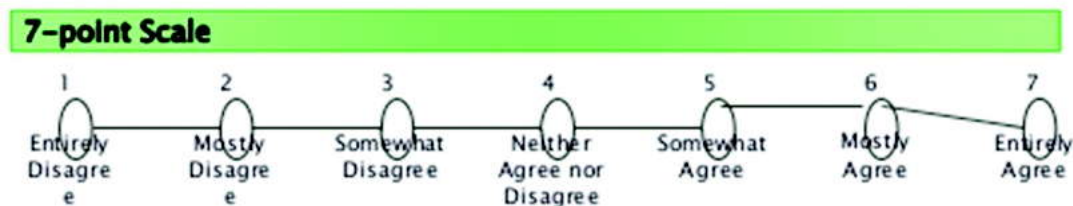


Figure 9: Likert 7-point scale.

Table 4
Values of each attribute for the live auction

<i>Factors</i>	<i>Attributes</i>	<i>Explanation</i>	<i>Live Auction</i>
Efficiency	Resource	It is a measure of following resource related attributes for successful completion of tasks by user.	6
	Time	it reflects capability of software product in term of time investment for activities includes in performing actions by users, response time by system, time spent on errors, and memory Load:	7
	Economic cost	it involves following expenses required for software	5

(contd...Table 4)

<i>Factors</i>	<i>Attributes</i>	<i>Explanation</i>	<i>Live Auction</i>
	User Effort	It reflects capability of software product for producing desired results with respect to physical and mental efforts that user invests.	6
Effectiveness	Task accomplishment	It is a measure of software product in which user can perform his task with successful accomplishment of his goals.	6
	Operability	It is a measure of software product which helps user to perform required functionalities in tasks with accuracy.	6
	Extensibility	It is a measure of adaptation of software product with respect to changing needs of user.	4
	Reusability	It is a measure with which software product can be reused in another application.	5
	Scalability	It is the ability of software product to continue to function well when it is changed in size or volume in order to meet a user need.	4
Satisfaction	Likeability	It is measure of software system to maintain the attention of all kinds of user.	5
	Convenience	It is a measure of software product that builds strong attitude of user towards its design.	5
	Aesthetics	It is a measure of software system to attract its user in sensorial terms (visual, olfactory).	5

5. USABILITY EVALUATION OF LIVE AUCTION PORTAL

The intuition of chance and probability develops at very early ages [19]. However, a formal, precise definition of the probability is elusive. The probability of an event tells that how likely the event will happen. Using the probability theory, the values of the three usability issues can be mapped on the scale of 0-9 as shown in Table 5. The $Factor_{value}$ can be computed by finding the probability using the following equation:

$$Factor_{value} = (\sum \text{attributes value in a factor} * Max_{value}) / (\text{total number of attributes} * Max_{value-of-likert-scale})$$

Where

$Factor_{value}$ is the value generated for each factor of a live auction.

$Max_{value-of-likert-scale}$ is the maximum value of the scale i.e. 7.

Max_{value} is the maximum value of the scale i.e. 9 as we are mapping it in scale of 0-9..

Table 5
Normalized mapped values of the usability issues for Live Auction on the scale of (0-9)

	<i>Effectiveness</i>	<i>Efficiency</i>	<i>Satisfaction</i>
Live Auction	6.42	5.82	6.42

6. CONCLUSION

In this paper, we have reviewed critical analysis of various usability evaluation methods. It has been found that each evaluation method has its own merits and demerits. One or more of these methods may be chosen for evaluating the usability of a software system depending on the type of resources available and users, abilities of the evaluators, if quantitative data can be obtained or not, if the response of the method is quick or not, if the method is expensive. We have created a live auction Portal and successfully apply sowia-moora method for determining the ranking of players. We have created questionnaire for live auction Portal

and collect the responses from the users. The live auction dataset has been created successfully. We have successfully done the usability evaluation of the live auction portal using three usability issues.

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