BI-LINGUAL FRAMEWORK FOR E-BANKING APPLICATIONS: A CASE STUDY OF SEMI-LITERATE USERS

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ABSTRACT: In developing countries like Pakistan, the literacy rate is low. Therefore, there is a need to critically evaluate the adoption of e-banking applications according to the usability attributes. In order to address the said issue, a usability framework was proposed by constructing bi-lingual web interfaces with and without speech facility for semi-literate users. To conduct an experiment, data was collected from twenty four (24) participants. For statistical analysis, one way ANOVA test was employed on responses collected from the targeted audience. The results depicted that usability attributes i.e. learnability $f(3, 92) = 21.557$, $p < .000$, memorability $f(3, 92) = 11.527$, $p < .000$, effectiveness $f(3, 92) = 17.826$, $p < .000$ and efficiency $f(3, 92) = 21.930$, $p < .000$ were highly significant for the proposed framework. It was concluded that use of local language i.e. Urdu with speech facility could improve adoption of e-banking applications by semi-literate users.

Keywords: E-banking, Adoption, Usability framework, Bi-lingual web interfaces, Semi-literate users and Pakistan.

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INTRODUCTION

E-banking is described as the automated delivery of new and traditional banking products and services directly to customers through electronic, and interactive communication channels (Salehi and Alipour, 2010). One of the benefits of using e-banking is the 24/7 availability of the services to the customers (Perkins and Annan, 2013). Despite all the benefits associated with e-banking, there are certain factors that limit adoption (Shaikh and Karjaluoto, 2014; Perkins and Annan, 2013; Raza and Hanif, 2012; Lee, 2009; Weir *et al*., 2007). These factors include but not limited to trust (Yousafzai *et al*., 2003), perceived risk (Raza and Hanif, 2012), security, usability (Perkins and Annan, 2013), innovativeness, familiarity and awareness (Dixit and Datta, 2010).

The low literacy rate makes it difficult to adopt e-solutions (Medhi *et al.,* 2009b). The people who got education up to sixth or eighth grade (Medhi *et al., 2009a*; Medhi and Toyama, 2008) and are not be able to read English with fluency (Rao and Niguel, 2010) are considered as semi-literate user. According to the report of Pakistan Bureau of Statistics (2014-2015), 47.59% of the population is literate out of which 13.81% of the literate population lies under semi-literate users. Mostly, these e-banking applications are designed in such a way that can only be used by literate users. Therefore, to address the said issue it is important that proposed solution must be simple, affordable, and easily accessible to fulfil user needs (Mahmood *et. al.,* 2014). The aim of the present research is to propose a solution for adoption of e-banking applications by semi-literate users in Pakistan.

Usability is used to identify the designing and functional weaknesses in the early stages of a system development (Bai and Blackwell, 2012). User Interface (UI) is measured in multidimensional aspects of usability i.e. learnability, memorability, effectiveness and efficiency. To improve the usability of e-banking applications, UI designing is one of the most imperative tasks (Weir *et al.,* 2007). The task of UI designing specifically for the semi-literate people is more crucial (Medhi and Toyama, 2008). Moreover, designing different UI for different regions can be helpful for the adoption of application because it can be beneficial for better user experience, convenience, and usability (Emmanuel and Muyingi, 2014). For this purpose, different techniques used are speech UI (Emmanuel and Muyingi, 2014; Sherwani and Ali, 2004; Oviatt *et al.*, 2000), text free interfaces using visual aids (Medhi and Toyama, 2008; Medhi and Kuriyan, 2007; Deo *et al.*,2004), and sensor based human-machine interface (LeBlanc *et al.,* 2006; Oviatt *et al.,* 2000). In case of E-banking adoption, an important factor is the lack of user friendly interfaces (Perkins and Annan, 2013) which triggers to the problem addressed in this research study.

MATERIALS AND METHODS

First, a need analysis survey was conducted to identify concerns and barriers faced by semi-literate users in using e-banking websites. The data collected from initial survey was used to construct proposed framework

and develop prototypes. To evaluate proposed framework, experiment was conducted with semi-literate users. Four separate prototypes were designed to evaluate English content based prototype, Urdu content with Urdu speech UI based prototype, Urdu content based prototype and English content with English speech UI based prototype. The prototypes were designed by introducing features which were considered to facilitate semi-literate users. These features included were language option such as English and Urdu along with speech UI technologies to help users in performing various tasks. A speaker symbol was provided with each input field to play audio to guide user about different options.

Table 1. Prototype details and their features.

Prototype	Visual aid	Speech UI	Feature
1	English	None	The website contents were made available in English language.
2	Urdu	Urdu	The website contents were made available in Urdu language along with the Urdu translated speech UI.
3	Urdu	None	The website contents were made available in Urdu language.
4	English	English	The website contents were made available in Urdu language along with the Urdu translated speech UI for each control.

In order to conduct experiment, 15 participants including males (n=16) and females (n=8) were selected. The participants had middle or under middle school education and held bank accounts that made them qualified to take part in the experiment. The participants were aware of the procedure of bank transaction such as fund transfer service. The self-explanatory research procedure is presented in Figure-1.

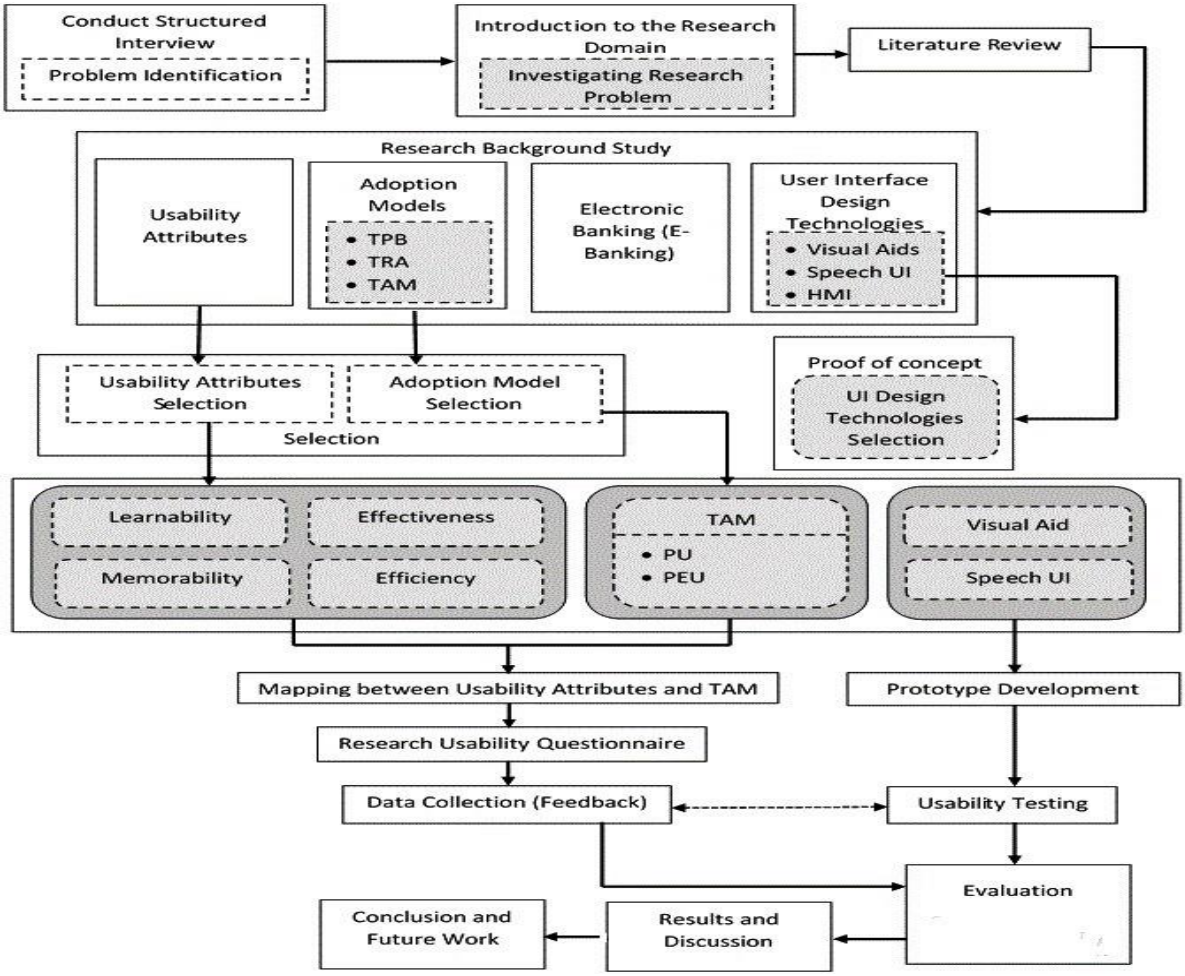

Figure 1: Research Methodology

Measures of construct: The constructs for this research were taken from the past studies. The participating domains in the research study were the constructs of adoption model and usability attributes. The mapping was performed at two levels. Firstly, the constructs of adoption model i.e. perceived usefulness (PU) and perceived ease of use (PEOU) were mapped onto the usability attributes which were effectiveness, efficiency, learnability and memorability. Secondly, survey instrument items were prepared for every usability attribute. The mapping is reflected graphically in Figure-2. The next step was to interact with all of the designed prototypes in order to perform evaluation. Finally, the last step was to collect answers of questions from the targeted audience through the designed questionnaire.

The mapping performed between the TAM constructs and usability attributes served as a benchmark to evaluate the differences in the perception of target audience.

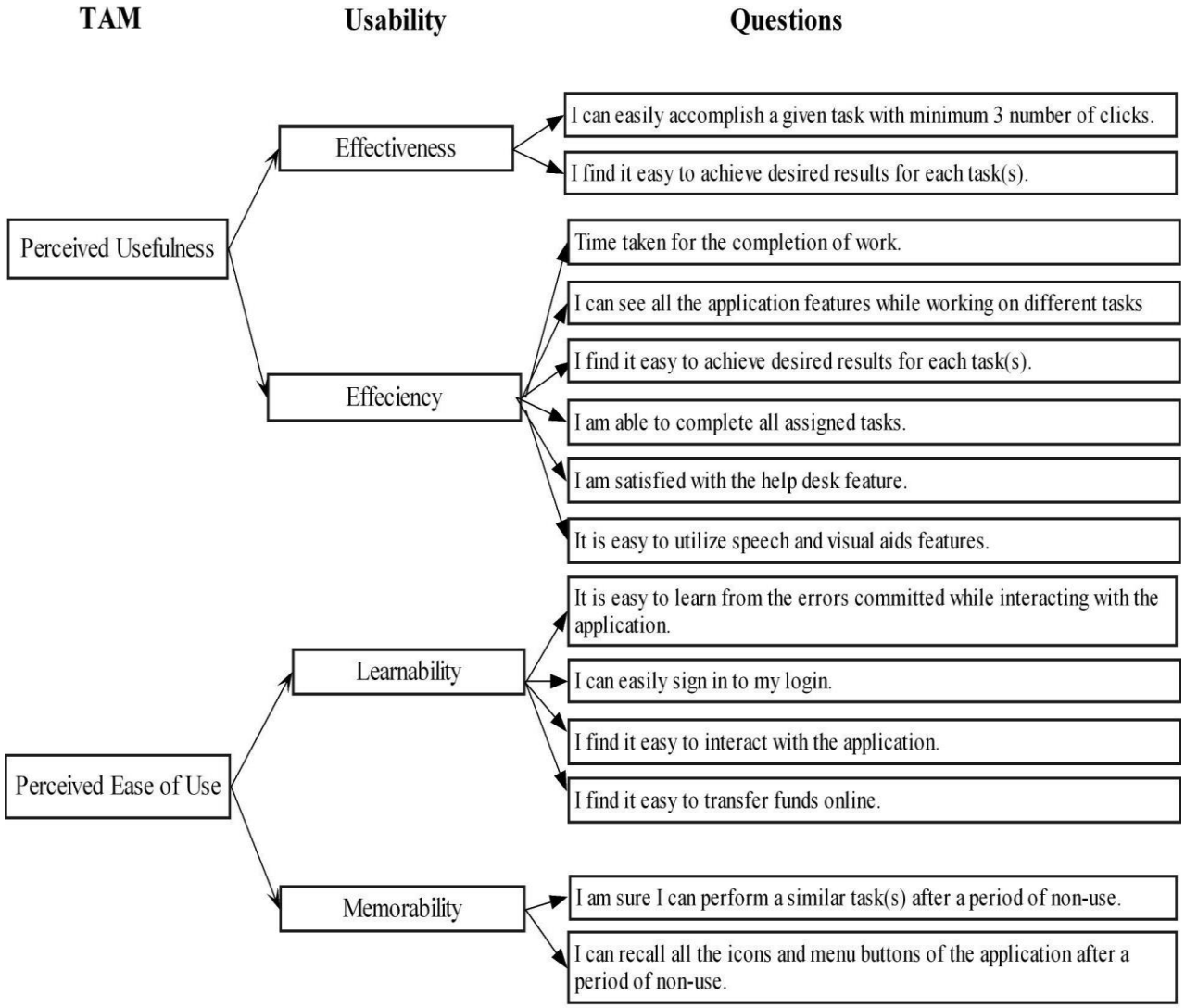

Figure 2: Mapping of TAM constructs and usability attributes

RESULTS

A one-way ANOVA test was applied to compare the English content based prototype, Urdu content with Urdu speech UI based prototype, Urdu content based prototype and English content with English speech UI based prototypes were compared. There was a significant difference in the scores for learnability statistical means [English content based prototype (M $\pm$ S.D = 2.52 $\pm$ 1.41), Urdu content with Urdu speech UI based prototype (M $\pm$ S.D = 4.7$\pm$ .35), Urdu content based prototype (M $\pm$ S.D = 3.04 $\pm$ 1.48), English content with English speech UI based prototype (M $\pm$ S.D =2.13 $\pm$ 1.18); f (3, 92)= 21.557, p < .000], memorability

[English content based prototype (M ± S.D =2.37 ± 1.48), Urdu content with Urdu speech UI based prototype (M ± S.D =4.18 ± 1.01), Urdu content based prototype (M ± S.D = 3.06 ± 1.56) and English content with English speech UI based prototype (M ± S.D = 2.08 ± 1.25); f (3, 92)= 11.527, p < .000], effectiveness [English content based prototype (M ± S.D = 1.22 ± 0.74) and Urdu content with Urdu speech UI based prototype (M ± S.D = 2.21 ± .35), Urdu content based prototype (M ± S.D = 1.6 ± 0.78) and English content with English speech UI based prototype (M ± S.D = 0.94 ± 0.58); f(3, 92)= 17.826, p < .000], and efficiency [English content based prototype (M ± S.D = 2.34 ± 1.26) and Urdu content with Urdu speech UI based prototype (M ± S.D = 4.54 ± .53), Urdu content based prototype (M ± S.D = 3.11 ± 1.56) and English content with English speech UI based prototype (M ± S.D = 1.96 ± 1.15); f(3, 92)= 21.930, p < .000]. For all the usability attributes, the mean value was greater for Urdu content with Urdu speech UI based prototype in comparison with all other prototypes. An analysis of variance (ANOVA) yielded significant variances among groups. A post hoc Tukey test showed that the English Content was found to be significant (p<.000) with Urdu Content with Speech UI but not with other groups; Urdu Content with Speech UI was found to be statistically significant (p<.000) with all groups; Urdu Content was found to be statistically significant (p<.000) with Urdu Content with Speech UI and English Content with Speech UI but not with English Content; English Content with Speech UI was found to be statistically significant (p<.000) with Urdu Content with Speech UI and Urdu Content but not with English Content while considering usability factors which are learnability, memorability, efficiency and effectiveness.

DISCUSSION

In this study, a rigorous research methodology had been employed by incorporating UI design technologies such as speech UI and visual aids to enhance effectiveness of e-banking applications for the semi-literate users. The results gathered from the experiment conducted in this research showed that participants appreciated use of local language i.e. Urdu in speech UI with facility of content translation features. These features helped them to understand, learn and memorize application to perform e-banking tasks. Further, these features directly influenced efficiency and effectiveness of the said application.

The tasks assigned to participants were also time constrained and recorded during the experiment which was used to evaluate average time to complete the tasks. The average time taken in order to make use of fund transfer service by the English content based prototype and English content with speech UI technologies was 14 and 12 minutes respectively. However, the average time taken by Urdu content based prototype and Urdu content with speech UI technologies was 9 and 6 minutes respectively. The result showed that Urdu content with speech UI technologies took less time in order to perform the task of fund transfer service.

The usability attributes i.e. learnability, memorability, effectiveness and efficiency used in this research were explored and justified through previously published studies by (Lin, 2013 and Nielsen and Kaufmann, 1993). The significant values of usability attributes of this research were found to be consistent with the related literature by (Lalji and Good, 2008; Green and Pearson, 2011).

Conclusion: In designing e-banking applications, an important consideration that had been largely ignored is involvement of semi-literate users and use of native language. This research contributed by proposing an integrated framework that had employed usability attributes in e-banking application along with user experience. The research had made use of visual aids (translated content) and speech UI in e-banking application that showed positive results towards the adoption of such applications by semi-literate users. The proposed framework could be adopted to enhance the usability of e-banking applications.

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