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Icon and User Interface Design for Mobile Banking Applications

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***Abstract*—Mobile banking has entered the industry as a novel remote method for related activities. Usable and reliable user interfaces for mobile banking application should be designed by implementing user-centered design methodologies. Visual components such as icons would reduce the possible interaction problems. The aim of this study is designing icons and user interfaces for mobile banking applications with the actual users' participation. The process consists of task analysis, an icon design survey, final icon design, and evaluation, and the installation of the mobile banking application with the icons. Financial experts attended to the task analysis while the icons were designed with the potential users. Another group of participants tested the understandability of the final icons. Three screen layouts were designed with the implementation of icons, and the user interface was completed. It is crucial to encourage clients for the use of mobile banking services by improving the usability of the systems.**

***Keywords*—mobile banking, participatory design, icon, user interface design**

I. Introduction

Business world is continuously growing more dependent on developments at an ever-expanding rate with the great improvements in the communication technologies. Banks and financial institutions need to design new strategies to keep their organizational strength in the competitive market. Rapid adoption of new generation mobile devices has generated opportunities for innovative services.

Banking industry is consistently changing the way of delivering financial services to improve the quality by reducing the time and cost. Mobile banking applications has proved its strength in banking market as a novel remote method for tracking financial operations. Such applications should be capable of providing faster and easier accessibility. Therefore, it is important to design and develop a user-friendly interface which conveys usefulness.

Mobile banking applications aim to provide customers with a unique experience of financial transactions instead of old fashioned and face to face interaction. This new system allows users to manage their assets, check balances and transaction history, pay bills, transfer money, trade stocks, and purchase/sale foreign currency and so on.

The number of people who handle their assets with a mobile device is continuously rising with increasing concern on financial management in an alignment with time management. It was predicted that the subscribers of mobile banking will be over 30 million in 2016 [1]. The statistics of Bank Association of Turkey shows the total number of registered customers in 2013 that logged in at least once was 2.7 million. The amount is doubled in comparison to 2012 [2].

Mobile banking with fewer functions and clearer interface would support the users while performing operations easier [3]. Lin (2011) suggested creating an easy-to-navigate user interface increase the accessibility [4]. Zhou (2012) believes that the limitation in mobile context, like small screen and inconvenient input increase the necessity of a well-designed interfaces. A poor interface design may reduce the trust to service providers from customers' perspective [5]. Gu et al. (2009) highlights the importance of developing user-friendly interfaces for mobile banking application to enhance the self-efficacy and perceived ease of use [6].

Iconic interfaces, which defined as sets of images to convey meaning nonverbally, are used in wide scale of applications. These pictorial icons act as a physical metaphor to make better software [7]. Huang et al. (2002) believe that computer icons as individual consumer products have become a culture more than just an information sign [8]. This type of user-driven products has more focus on product functionality and the interfaces [9]. Using icons in mobile environment represents the desirable functionality with users in need of performing their tasks.

A symbol should display a strong association with the referred meaning in both designers and users mind [10]. A qualified and well-designed icon reduces the need of additional instructions for users and increase identification rate of icons [10]. Decreasing the complexity of system and the number of errors, as well as increasing in usability and user satisfaction are found as advantages of understandable icons [11]. Huang and Lai (2008) also indicated the usability of icons is significantly influenced by reliability and practical function [12]. Therefore, selecting an icon without ambiguity can guarantee correct functioning of mobile applications [10].

In this study, clear icons and usable interfaces were designed for mobile banking applications. Our approach started with the determination of functions by experts' survey. In the icon selection process, identified tasks were given to

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each subject by a questionnaire, asked them to sketch figures representing the corresponding terms and the most frequently drawn ones were selected to be used for the initial design. Necessary modifications were done based on the feedback provided by the design expert reviews and existing design guidelines. Finally, the user interfaces were designed with the implementation of our new icon set.

II. Research Procedure

Icons have the ability of creating a comprehensive language by going over linguistic cognition. It is definitely hard to design and select suitable set of icons that convey the message to the client. Since the available banking icons are not completely recognizable, this study tries to improve accuracy and validity of icons to make more distinguishable shapes for better meaning delivery. Figure 1 shows the research procedure.

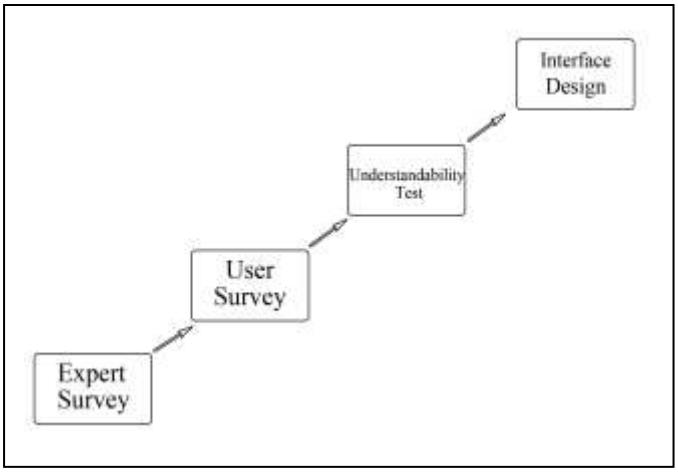


Figure 1. Research Procedure

This research included the following steps: (1) conducting experts survey with twenty-four financial experts to identify the tasks, (2) a questionnaire about proper icon design, completed by sixty-nine mobile banking users, (3) selection of initial icon designs based on results of a survey, expert suggestions, and existing design guidelines, (4) the understandability evaluation of designed icons with twenty users, and (5) mobile user interface design with the implementation of new icon set.

The same approach was used by another research of one of the authors in designing icons and interfaces for medical information systems. The effectiveness of this method was proven recently. It was found the participatory design useful because users had more interest in the results and enjoyed the process [11].

III. Experts Survey

Expert survey was conducted with twenty-four experts (11 females, 13 males), working at financial institutions, having experience between 4 to 18 years. Participants were recruited from one of the biggest banks in Turkey, and ranged in age from 27 to 43 (M = 33.04, STD = 5.16). We tried to simplify the system features by including only the tasks with highest priority. In addition to the identification of common functions used in the existing systems, an online survey was distributed to determine the tasks. Semi structured interviews with the participants were completed to check the validity of the findings. Table 1 shows the tasks which are included to our model.

TABLE I. LIST OF TASKS FOR MOBILE BANKING APPLICATION

Primary Options	Sub-Tasks
1. Transactions	1.1 Card Information 1.2 Account Information 1.3 Money Transfer 1.4 Account Transactions 1.5 Bill Payments 1.6 Card Loan Payments
2. Applications	2.1 Special Offers 2.2 Domestic Market 2.3 Applying for Card 2.4 Applying for Credit
3. Assets	3.1 Investments 3.2 Private Pension
4. Connection	4.1 Nearest ATM 4.2 Contact Us
5. Profile	5.1 Update Profile 5.2 Change Password
6. Exit	-

Sixteen sub-tasks were found and categorized under six main options based on their similarities and expert reviews. The primary options planned to be appeared on the home screen were identified as “Transactions”, “Applications”, “Assets”, “Connection“, “Profile” and “Exit”.

IV. Users Survey

The purpose of the users’ survey was introducing the research to the potential users, confirming the findings of task analysis, and asks them to suggest icons for the mobile banking application. A brief project introduction was given to the subjects, with the explanations of each task in order to remove the effect of misunderstanding. After the meetings, totally twenty-two tasks were identified; the subjects were then requested to sketch icons for these tasks. The most frequently drawn figures for each task were selected for the initial icon design.

Sixty-nine financial consumers (42 females and 27 males) participated to the users’ survey. 84% of them declared their familiarity with the mobile devices and computer icons. The average age of the subjects is 24.7. 47 subjects are undergraduate students, 9 are professors at university, and 13

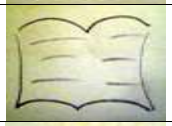
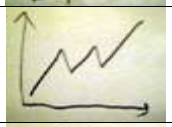
of them are working in different industries such as construction, finance, information technology, and medicine.

A discussion session was organized with the participants in order to collect their feelings and impressions about using this technique in the icon design process. They indicated their expectation for easier to use interfaces with their involvement, and enjoyment of suggesting new design ideas.

V. Designed Icons

All icons were designed by using only black and white [13]. Also they were all drawn by considering three basic rules; consistency, attractiveness, and fitness [14]. Text was not presented on the icons to avoid confusing except for "Nearest ATM" [15].

TABLE II. ICON DESIGN FROM THE USERS SKETCHES

Function Name	Mostly Sketched Images	Final Design	% of similarity
1.1 Card Information			78
1.2 Account Information			62
1.3 Money Transfer			96
1.4 Account Transactions			64
2.1 Special Offers			53
2.2 Domestic Market			65
3.1 Investments			70
4.1 Nearest ATM			88
4.2 Contact Us			69
5. Profile			87

Huang et al. (2002) recognized that among five factors having impact on designing qualified icons, meaningfulness and locatability are in a higher importance than styling quality, message quality, and metaphor [8]. Lin (1992) proposed that the visual icons should be meaningful, concise, identifiable, associable, eye-catching, and symbolic [16]. Commonly used icons in most software environment are generally unclear and hard to understand because of careless design and lack of research [7].

Table 2 presents the functions, the most frequently sketched figures, final design, and the percentage of the similarity for corresponding icons. A high agreement was observed on sketches representing "Profile", "Nearest ATM", "Money Transfer", "Card Information", "Investments", and "Contact Us". The frequency of drawing the same or similar figures for a specific task was over 60%. The necessary modifications were done on the initial icons with design experts, and the existing guidelines [17, 18].

VI. Understandability Test

A second questionnaire that the actual users attended was undertaken to explore the degree of understandability of the proposed icons. Twenty consumers (8 females and 12 males), who did not attend the previously conducted users study, were selected to test the designed icons. The subjects were recruited from Istanbul Bahcesehir University undergraduate students whose major is Software Engineering. Their age ranged from 19 to 23 years. They are all familiar with the communication technologies, the use of visual components on mobile applications, and next generation mobile devices.

Brief information on the design procedure was given to each subject before starting the survey. Simple explanations of each task were provided. A Flash application was developed which presents the tasks to the participants in alphabetic order, on separate screens. Participants were asked to match the icons to the corrected tasks. If the participants cannot match the icon with the label accurately, the application skips it and move through the next question automatically.

Except for "Contact Us" ( ), and "Connection" ( ), most icons were clearly understood by the participants. Those two icons are similar with each other in appearance. Therefore, it caused ambiguity and influenced the degree of understanding. The icons for "Card Information" ( ), "Money Transfer" ( ), "Account Information" ( ), "Account Transactions" ( ), "Special Offers" ( ), "Nearest ATM" ( ), "Exit" ( ), "Profile" ( ), and "Investments" ( ) were recognized by all participants. The remaining icons were recognized with at least 80% of success. Although two icons cause confusion, we decided to continue with the same icons set for mobile user interface design sessions.

VII. User Interface Design

Many significant reasons of widely use of virtual components in various applications were listed [8]. Weidenbeck (1999) declared that icons are recognized and remembered easily [19]. They also provide better cognitive affordance [20]. End-users prefer to interact with visual icons instead of textual representations [21]. Icon-based interfaces are believed to reduce system complexity and the mental load when they are designed properly [17].

A workshop was organized with the same participants who attended the previous experiment. Three different design layouts for mobile user interfaces were proposed by paper prototyping. Figure 2 shows the screen layouts that finally presented for our mobile banking application.

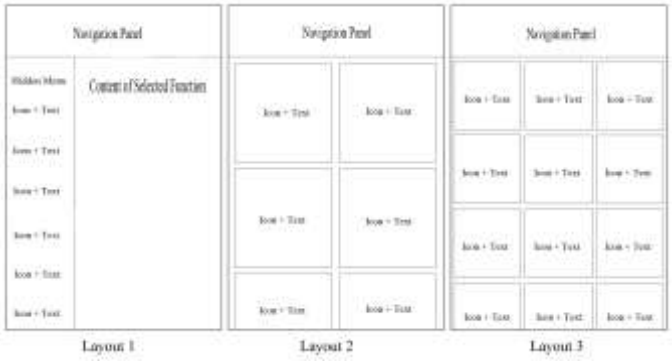


Figure 2. Screen Layouts

Thirteen participants preferred Layout 1. Graphical User Interface (GUI) provides information to the users by the support of visual components rather than textual descriptions. Direct manipulation of the graphical elements is available to perform actions. The screen shot of the final GUI is displayed in Figure 3.

Figure 3. Iconic Interface

Although an extra space is required on screen, the combined presentation of icons and textual titles were used in order to reduce the cognition and improve the learnability. Subtasks are displayed when the main option is clicked. A hidden menu was placed on left hand side of the mobile screen and the content is updated when an option is selected. The users are allowed to customize the tasks in which they selected most frequently. It is crucial to let users perform on an application with freedom while preventing them to make errors [21]. In Figure 3, you may find a customized hidden menu.

VIII. Conclusion

Mobile banking is still a developing system which can be adopted by financial organizations to improve the market share and the customer satisfaction. Especially in developing countries, there is a great opportunity to benefit from technological innovations on the marketing strategies. The consumers might be attracted and encouraged to adopt mobile banking services with more user friendly interfaces [22]. Ease of use and usefulness play critical role on mobile banking environment. Therefore, a mobile application with reduced but high priority features was designed and developed with the use of icons. The icons and user interfaces were designed with the actual users' participations. Although ambiguous icons would raise various interaction problems, properly designed icons improve the performance of the end-users. It was found that the customized method that we implemented is useful due to the high interest shown by the users in the results, and their enjoyment during the process.

As a further study, the usability of the application can be evaluated with generating new icons and user interface design methodologies for the mobile context.

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