USABILITY CHALLENGES IN EMERGING MARKETS

Maryam Aziz, Chris Riley and Graham Johnson
Advanced Technology and Research,Financial Solutions Group Ltd., NCR, U.K.

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Abstract: Understanding emerging cultures and adapting new services accordingly is one of the biggest challenges faced by modern businesses today. Several user-centred approaches are employed during the life-cycle of service adoption. These approaches mainly involve design and evaluation of a service based on specific requirements of the target market. This paper describes an on-going multi-method case study which involves the evaluation of a self-service ATM system with a fingerprint sensor used for identification purposes as based in the financial sector of Pakistan. The paper is positioned to assess the validity of traditional usability evaluation methods in the context of emerging markets. These methods include one-on-one observations, in-depth interviews and sensor performance data analysis. The methods ensure both objective and subjective assessment of sensor use throughout. However, several difficulties faced with sensor evaluation such as participant recruitment, lack of participants' response and the impact on the local culture's user attitude towards sensor use are discussed. The paper also presents the preliminary findings and draws implications for both researchers and practitioners based on our experience.

1 INTRODUCTION

Emerging markets present a wealth of investment opportunities to global industries. Despite the efforts, global industries face several challenges to fully exploit these opportunities. For example, it is quite challenging to understand how traditional western business models and strategies can be applied successfully in emerging markets such as China, Pakistan and India. It becomes particularly difficult when a business strategy involves introduction of a new product or a service in the user domain. The success of a product or a service is generally determined in terms of the products usability assessed by target users. A great deal of research on various methods and approaches to evaluate product usability in western countries has been carried out. These methods and approaches have largely been applied in emerging markets with the mindset of obtaining useful insights into product use. However, this research questions the appropriateness and reliability of these methods when desired outcomes are not achieved. For instance, Geldof (2007) reports on methodological challenges faced during a usability study of Information and Communication Technologies (ICTs) by low-literate youths in Ethiopia. Such examples of usability studies emphasise the need of – first, understanding the requirements of the context in which the study is being conducted and second, adapting the research methodologies to fulfill those predetermined requirements.

This paper presents an experience-based in-progress case study which highlights several challenges with usability evaluation methods employed. The study was conducted in collaboration with BankIslami, Karachi in Pakistan which had recently introduced fingerprint enabled automatic teller machines (ATMs). The purpose of introducing fingerprint technology was to enhance security measures and promote self-service use in the financial sector of Pakistan. The study was conducted in the banks branches with real customers. Here we focus on the first phase of the in-progress study, which assesses user perceptions of and practical issues with fingerprint sensor usage.

The paper is structured as follow. Section 2 provides a brief background of various usability methods and their role in product evaluation in emerging markets. Section 3 discusses the usability methods employed in the context of fingerprint sensor use in the financial sector of Pakistan. The methodological challenges faced in the study are also discussed in this section. A brief overview of the preliminary findings along with insights into the

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underlying cultural factors which impacted usability methods is presented in section 4. The paper then derives lessons learned and implications derived from the study for both researchers and practitioners alike in section 5.

2 USABILITY EVALUATION

The usability of a product is seen as a key factor in determining the product adoption. Two main streams of research can be observed that discuss concerns regarding the usability of products. The first stream argues that the objective usability of a product is as significant as the subjective usability Monk et al. (1993). The second streams emphasises the validity and appropriateness of methodologies employed to evaluate the usability of products in emerging markets Thomas and Macredie (2002).

The first stream of research highlights the importance of adopting an approach which incorporates both objective and subjective aspects of usability evaluation of a product. The majority of research in Human Computer Interaction (HCI) tends to opt for either a subjective or an objective approach to evaluation Barkhuus and Rode (2007), De-Angeli et al. (2006) for example. These approaches are often seen as mutually exclusive Monk et al. (1993) and there seems to be a lack of research that combines the two Barkhuus and Rode (2007). The ISO (ISO 9241-11:1998) guidance on usability for instance, gives three quantifiable measures of usability which are efficiency, effectiveness and user satisfaction. These measures focus on the technological reliability of a product. In order to evaluate subjective usability of a product, user perceptions and expectations are taken into account. Several methods such as interviews, surveys, “think aloud”, one-on-one observations and focus groups are but a several examples of commonly used methods designed to assist with the understanding of user perceptions of product usability.

Anderson (1994) argues that research methods are inherently biased to cultures in which they originate. Hence these methods have been proven to be effective in western cultures. However, the appropriateness of such methods and the validity of data acquired through them needs to be questioned when they are employed in unfamiliar contexts. For example, the verbal protocol method has proven to be effective in assessing the usability of products in North America. But the validity of this approach remains unclear in cultures such as India where voicing a negative opinion may not be the norm Chavan. (2005).

Another study reports on the usability evaluation of a website in North America Evers (2002). Several methods such as verbal protocol, questionnaires and one-on-one observations were used. It was reported that Japanese participants were particularly uncomfortable with the one-on-one observation method. Similarly, a study to introduce ICTs to youths in Ethiopia was conducted by Geldof (2007). Several methodological difficulties with the recruitment of participants and the impact of the local culture on the participants answering behaviour emerged during the study. These studies therefore highlight the critical importance of understanding the requirements of specific context before employing a research method. This issue becomes of particular importance when the subjective assessment of product usability is in question. It is therefore argued that subjective usability measures are not just validation tools but they also provide an understanding of requirements of a specific context and user appropriation for the product Barkhuus and Rode (2007).

We report our experiences with the methodology we adopted to evaluate the fingerprint sensor usage in Pakistan. The strengths and weaknesses of the methodology along with an understanding of the Pakistani culture are briefly discussed.

3 RESEARCH METHODOLOGY

BankIslami is an early adopter of fingerprint technology and Pakistan is one of the first countries that have seen fingerprint technology be implemented in the self-service environment. Currently, fingerprint technology is being used in 16 branches and will be launched in another 11 branches within the year. The fingerprint enabled ATMs are installed within lobbies adjacent to the bank’s branches. An example of such an installation can be seen in image 1 where the fingerprint sensor mechanism is shown.

Figure 1: fingerprint sensor.

It is argued that with the emergence of mass consumer markets, laboratory-based usability evaluation of services becomes meaningless (Thomas and Macredie 2002). Therefore, the investigation was carried out at three branches in Karachi, including the Bank's headquarters. A multi-method approach was adopted to conduct the usability evaluation of the fingerprint system both in subjective and objective terms. These methods included field observation, semi-structured in-depth interviews and analysis of sensor performance data. The interviews, 34 in total, were conducted in the native language "Urdu". Each interview lasted from 45 minutes to an hour. All interviewees (31 males and 3 females) were regular users of fingerprint sensor technology in BankIslami. Their age range was between 18 and 54. Most of the people were contacted by phone to come to the bank branch to participate in the study. The reason for this arrangement was that most of the individuals were not actual bank customers. This issue is explained in detail in section 3.1.

The main purpose of the first two methods (field observation and interviews) was to acquire a subjective understanding of fingerprint sensor usability. The subjective usability was aimed to provide an understanding of user perceptions of usefulness, ease of use and concerns of and practical issues with the sensor. The sensor performance data acquired from the bank presented the logs of actual usage of the sensor at 10 bank branches from across the country. The data was analysed to assess the objective usability of the sensor in terms of false acceptance rate, false rejection rate and number of user attempts to verify their identity at an ATMs. Since the aim of the paper is to discuss the methodological difficulties faced during the study, the focus in this section will be kept on the execution of the first two methods.

3.1 Participant Recruitment

At the time of conducting the study, fingerprint technology had been in use for over 11 months in BankIslami branches across the country. It was therefore decided to carry out the usability evaluation of fingerprint sensors in a real world context. Three main branches of the bank within Karachi (including corporate headquarters) were chosen. With the collaboration of bank staff, arrangements were made to recruit bank customers as participants within these branches.

A real challenge of participant recruitment occurred when individuals arriving at branches turned out not to be customers of the bank in question. It was discovered that in Pakistani culture, day-to-day financial transactions tended to be carried out by a customers' subordinates or employees. People performing financial transactions on behalf of other employers were not the customers of the bank. These people deposited cheques, withdrew money and paid utility bills for which they were provided with necessary personal financial information.

During the entire duration of the study, only male subordinates or employees had performed transactions on behalf of their employers. It was interesting to discover that a very low percentage of women who were actual bank customers managed their own financial accounts. Therefore, going to the bank's branches to perform financial transactions was not seen to be common in the female community. This placed a real challenge on recruiting not only male but also female customers to participate in the study. However, upon requests to participate in the study, customers made time and arrived in branches on time.

3.2 User Responses

A semi-structured interview with a focus on assessing user perceptions of fingerprint sensor ease of use, efficiency, security and usefulness was designed. The main purpose of conducting the interviews in "Urdu" was to help participants express their perceptions and concerns of fingerprint technology freely. Despite these efforts, participants did not seem to fully express their perceptions and concerns regarding technology use. It is argued that in certain cultures such as India, individuals do not feel comfortable with voicing negative opinions

about technology use Chavan (2005). However, in our study, users did not state their opinions positive or negative fully. The technology was generally perceived to be easy to use and effective. Surprisingly, no participants were concerned about using such technology in the sensitive financial self-service environment. Overall, participants showed a positive attitude towards the technology.

However, participants' lack of responses had a significant impact on obtaining a clearer understanding of sensor subjective usability in user opinions.

3.3 One-on-One Observation

In order to investigate the practical difficulties with fingerprint sensor use, participants were observed using the sensor during the enrolment and verification processes. The design of this phase of the study was based on experience from a similar study involving the use of biometric sensors in the UK in a controlled lab environment. Participants in the UK not only commented on the problems with the use of sensors, but also verbalised their expectations about the technology design. However, in the Pakistan study, a lack of user responses limited the effectiveness of assessing the actual use of sensors.

For example, during the registration phase, participants were prompted to indicate any difficulties with fingerprint sensor use. Several design aspects of the sensor such as, housing, sensor contact area, pressure, correct finger placement, hand position and angle were assessed in this phase. Participants were observed to face several difficulties with sensor use. However, upon inquiring, participants did not report any problems. When participants failed to use the sensor correctly they took full responsibility. Also, during the verification process, similar user behaviour patterns were observed. While facing difficulties with the sensor, they believed they were not using it correctly and tried to work around it.

3.4 Cultural Setting

During the study, it was discovered that unlike the general trend of registering the index finger in the west, bank customers had enrolled their thumbs. The bank was promoting the use of biometrix technology for registering thumb impressions. Due to the different angle position of thumb and index fingers, several difficulties were faced with the sensor use. For example, users could not place the thumb properly on the sensor. They were seen to hold the sensor in the hand in order to place the thumb on the sensor. They were also found to have problems with understanding how much pressure was required for their thumb impression to be read by the sensor.

It was discovered that in Pakistan, fingerprints in the form of thumb impressions for identity verification had been in use for decades. It was reported by bank customers that due to poor literacy rates in rural regions, thumb impressions had been used to sign legal documents, perform financial transactions and in acquiring national identification documentation. Also, with the modernisation of technology, many Pakistanis' had used various electronic fingerprint sensors during the course of these transactions. For example, at the age of 18, every person in Pakistan applied for the national identity card, for which a thumb impression needed to be provided. The national identity card was mandatory when opening an account with any bank.. We believe that the strong positive attitude toward the use of fingerprint technology found in our study was an artifact of the extensive use of thumb impressions in Pakistani society.

4 PRELIMINARY FINDINGS

Despite all the practical difficulties with the fingerprint sensor, participants of the study perceived it to be easy to use. They also expressed a preference for fingerprint usage over personal identification numbers (PINs). The main reason given for this preference being that they had difficulties remembering all of their PINs. Users reported that they were encouraged to keep unique PINs for all their bank accounts and most of them had more than two bank accounts with different banks. A few users reported that they also had kept records of their PINs and carried them along while going to an ATM. Users reported that on a number of occasions, they had forgotten their PINs at an ATM which had caused them inconvenience.

Although participants were aware of the potential for fraud with the fingerprint system, no particular concern regarding the use of fingerprint enabled ATMs was reported. In addition, a demand for the widespread introduction of the technology in the financial sector was expressed by users. Users also showed an interest in the use of fingerprint technology in other technological devices such as laptops, mobile phones, define (PDAs), lockers, credit card payments and for over-the-counter services.

Also, due to a high level of familiarity with the technology, individuals had become complacent with usage. Participants tended to reference their own behaviour when describing problems with the fingerprint sensor. Also, despite the practical difficulties with the sensor, users could not suggest how the devices could be enhanced.

It was interesting to see that individuals' shared their accounts with family members and friends. Employees were also trusted with confidential information in order to perform financial transactions. In both cases, registering a fingerprint would restrict the sharing of identity details with trusted family, friends and employees who provided assistance with performing financial transactions.

Mixed responses emerged from the elderly users toward using the fingerprint sensor at ATMs. These responses could be divided into two groups based on their preferences of banking services. The first group expressed a strong desire to use fingerprint technology as they struggled to remember all their PINs. However, several elderly users could not register their fingerprint for their poor quality thumb impressions. Their fingertip skin was wrinkled and the sensor could not take a clear impression of the fingertips. In the second group, elderly users showed reluctance toward using the technology because of their familiarity with using the traditional methods. They also believed that the use of a fingerprint would restrict their children in managing their accounts.

5 CONCLUSIONS

Fingerprint technology was launched at BankIslami in May 2006. The study was carried out 11 months later to understand user acceptance of the technology in order to further predict technology adoption. The findings help us obtain an insight into the perceptions of real customers and observe the actual use of the sensor. Despite several methodological difficulties with data collection, a positive user attitude toward the use of fingerprint technology emerged. The study however did highlight the need of assessing the strength of the approach employed.

The results gained form the interviews gave rich contextual information but were not sufficient to identify some of the real usability problems that were present. Interviews revealed that Pakistani society is a trusting society where individuals share their financial information with family, friends and employees. This finding highlights the need of improving the facilitation of services in the financial sector. In this regards, the specific requirements of individuals who open bank accounts need to be analysed together with the requirements of individuals who operate them and/or provide partial/full assistance with account management.

The observation data helped the researcher's understand issues with fingerprint sensors generally. However, study participants did not verbalise any issues they had with the sensor usage. We argue that the limited user response regarding the use of the sensor was maybe due to their lack of reference to compare the efficiency and effectiveness of the sensor. Also, a number of assumptions about a user's familiarity and experience with fingerprint technology were made. We also argue that by providing users more information about the workings of fingerprint technology and experience with various fingerprint sensors will help them think and verbalise their opinions. Based on these findings, it is therefore important to investigate the understanding of fingerprint technology for identity verification in detail in a culture where the concept has been ingrained for decades.

The main challenge is to then investigate how existing methods can be shaped and new methods introduced to evaluate usability of products in emerging markets. For example, Chavan (2005) suggests a usability approach 'use the collective' for the Indian market, which is argued to be a collectivist society Hofstede (2001). By using this method, the usability of a product is evaluated in the midst of its potential users. The effectiveness of this method can be seen in acquiring individual opinions of users regarding a product use in a group. The appropriateness of this method in sensitive or private contexts such as the financial sector still needs to be determined. We propose a method similar to 'use the collective' to gauge user opinions of a product use. The method should involve a semi-structured discussion session with participants who are trusted friends and/or family members. The method is different from the traditional focus group session in two ways. Firstly, the session will be semi-structured to ensure all aspects of a product evaluation are covered. Secondly, the participants of the session will be selected form a group on the basis of trust or inter-relations. The group will also represent the current or potential users of the product.

On the basis of our findings, we conclude with the opinion that usability evaluation in (HCI) research as a whole would benefit from practitioners adopting diverse methods of evaluation and embracing both sides of the subjective verses objective debate.

Usability evaluation is an on-going process which needs to be carried out as user perceptions and experience evolve with a product. In future research, we will employ a multitude of methods to overcome the methodological difficulties, which we faced in this study.

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