

계층분석과정을 이용한 모바일 뱅킹 플랫폼 선정에 관한 연구: 우즈벡 은행을 중심으로

Selection of Technology Platform for Mobile Banking Using the Analytical Hierarchy Process

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ABSTRACT

The purpose of this paper is to analyze what are the key determinants in selection of mobile banking technology platform, main challenges in a given developments of technology as well as rate the importance of factors in regards to various criterions. In addition, this paper proposes comprehensive approach for solving mobile banking technology platform selection problem. To serve the purpose, this paper uses the Analytic Hierarchy Process (AHP) to select best mobile banking technology platform for not only in functionality aspect, but also in organizational aspect. We expect that the results of this study will be useful for banks who have intention to select mobile banking technology platform in the future.

Keywords : Mobile Banking, Mobile Banking Technology Platform, Analytic Hierarchy Process (AHP)

1. Introduction

21st century brought various ways of doing business which are mainly related with the development of Information Technologies (IT) and the Internet. Mobile business environment forces individuals to more mobile and flexible life styles. In terms of communication means,

a mobile and smart technology is empowering users with variety of benefits such as a range of tools and applications. In particular, recent trends indicate that the popularity of mobile banking has been increasing rapidly than ever before. Hence, the phenomenon attracting many companies providing banking services in order to provide better service to its recent customer as well as gain new market niches.

Selection of mobile banking technology

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platform is an important contemporary process. As mobile banking adoption increases, financial institutions must decide which options will best serve their markets. Especially, in Central Asia the banking sector is developing rapidly and there is a huge opportunity for the expansion. Therefore, this study will deal with brief literature review regarding mobile banking technology platform selection problems. For many banking service providers, these issues remain a complex process and requires diligent problem solving approach. This process needs evaluation of multiple criteria and various constraints associated with them.

The purpose of this paper is to analyze what are the key determinants in selection of mobile banking technology platform, main challenges in a given developments of technology as well as rate the importance of factors in regards to various criterions. In addition, this paper proposes comprehensive approach for solving mobile banking technology platform selection problem. To serve the purpose, this paper uses the Analytic Hierarchy Process (AHP) to select best mobile banking technology platform for not only in functionality aspect, but also in organizational aspect. We expect that the results of this study will be useful for banks who have intention to select mobile banking technology platform in the future.

II. Literature review

According Harland(2008), there were an estimated 3.1 million mobile banking

customers in the United States in 2008 - which is nearly an eight-fold increase over 2007 - and that number is expected to more than double to 7 million by the end of 2009. The reason for this rapid growth can be caused with the development of mobile phones and mobile technologies which creates enjoyment and ease of use.

There are various approaches to Mobile Banking based on different technologies. Each method offers a different range of functionality, consumer reach and user experience as we shall discuss later in this study. Every mobile banking technology platform has advantages and disadvantages. There are three main technologies in this sector: SMS text messaging, Web based and client based downloadable application platforms.

Simple success story of mobile banking in South Korea is LG Telecom and Kookmin bank joint project (Infogile, 2007). Under this project, mobile users were able to use smart chips embedded in cell phones for accessing all of the transaction and inquiry based services. The chip-based service automated the authentication of users when they accessed their bank's financial services to make the whole process much faster and convenient (ibid).

Our scenario is that Uzbekistan National Bank would like to expand its businesses to mobile banking and should select appropriate technology to implement. However, the dilemma is that the National Bank is cost driven and the overall strategy to implement is in long term. The bank would like to

introduce new services now in order to attain current customers and attract new young energetic potential customers

When choosing a Mobile Banking solution banks' needs to think about technology that provides the right mixture of customer experience and customer reach/functionality in order to meet the needs of their multi-channel strategy (Krugel, 2007). So, the National Bank of Uzbekistan needs some consultancy regarding their platform selection problem.

To note, extensive previous study research has been carried out but initial results indicated that there are no studies covering mobile banking technology selection issue. Therefore, it was decided to present pioneer study of its kind on selection of mobile banking technologies.

The foundation of the Analytic Hierarchy Process (AHP) is a set of axioms that carefully delimits the scope of the problem environment (Saaty 1986). It is based on the well-defined mathematical structure of consistent matrices and their associated eigenvector's ability to generate true or approximate weights Saaty (2001). The AHP methodology compares criteria, or alternatives with respect to a criterion, in a natural, pair wise mode. To do so, the AHP uses a fundamental scale of absolute numbers that has been proven in practice and validated by physical and decision problem experiments. Recently, it is one of the popular approaches which is flexible and powerful tool to handle both qualitative and quantitative multi-criteria problems. It converts individual preferences into ratio scale weights that can be combined

into a linear additive weight for each alternative (Kumar et al., 2009). The resultant can be used to compare and rank the alternatives and, hence, assist the decision maker in making a choice. The approach has been applied in many fields starting from simple car purchasing issues to country level complex and multi criteria problem solving issues.

III. Research model

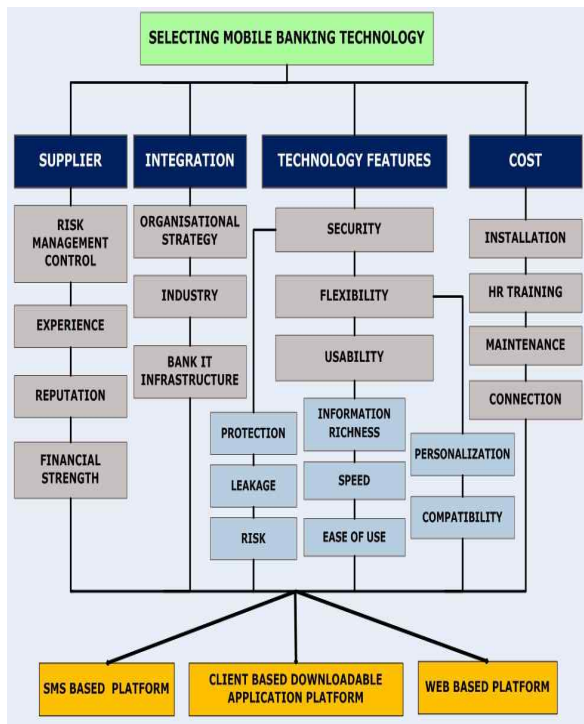
1. Methodology

In our study, selection problem has been dealt with by using questionnaire based study. A structured questionnaire was constructed and completed by practitioners and experts of banking fields. Our study basically consisted of several steps to complete as shown in the Figure 1 below. Accordingly, previous literature regarding the mobile banking technology platforms and selection using the AHP approach was carefully revised.

Based on the previous knowledge, questionnaire was built and rated by the experts. In the second step, after completing the survey we have designed hierarchy and synthesized the priority weights of each criteria and measured consistency using Expert Choice 2000 software tool. Finally, having the results of the analysis, we have decided which mobile banking platform is appropriate for the Uzbek banking sector to start with.

2. AHP model

Based on the previous studies and survey, we have built the following AHP model for analysis shown in the Figure 1. As it can be seen from the figure, our main goal is to select mobile banking technology platform. Our level 1 criterion's are identified as Supplier, Integration, Technology Features and Cost. In Level 2, 14 sub-criteria's were detected and only "Security", "Flexibility" and "Usability" sub-criteria's generated child nodes, meaning secondary sub-criterion, highlighted with blue color bars.



(Figure 1) The AHP Model for Selecting Mobile Banking Technology

Final alternatives such as "SMS Based platform", "Client Based Downloadable Application Platform" and "Web Based

Platform" are highlighted with light brown color bars.

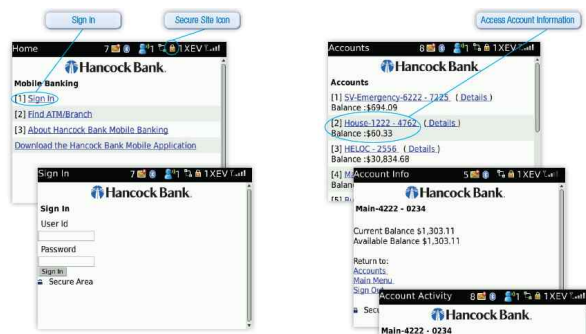
From this point forward, operational definitions for the criteria's will be explained based on literature review and self introduction. [Table 1] provides operational definitions for each criterion used in our proposed AHP model.

2.1 Alternative A: Web-based Mobile Banking (PDA Banking)

Although there are some evidences that banks have deployed mobile internet and WAP websites since the late 1990s, consumers started using and adopting significantly in recent years caused by faster mobile broadband networks, cheaper or flat rate data network tariffs and more advanced mobile handsets, e.g. iPhone smart phones (Juniper Research, 2008). Web based mobile banking in other words browser-based banking "refractors" the online banking experience to the smaller mobile phone screen (NCR, 2008). To do this refactoring effectively, the information on the Internet banking site has to be adapted (typically based on HTML) to get the optimum user experience on the mobile devices (ibid). Web-based Mobile Banking is offered, for instance, by the Emirates Bank of United Arab Emirates and Zurich-based Habib Bank AG (Tiwari and Buse, 2007).

Most mobile internet banking website users will have access to mini statements and balance enquiries at the base level and more advanced services including payment instructions and bill payments (Juniper

Research, 2008). With the mobile banking, the mobile bank users can execute many of the same transactions available on Internet banking (see [Figure 2]), e.g. checking balances and history, transferring funds between accounts, viewing account alerts and more (Harland FS, 2010). Scholars highlight that the similar look and feel of online banking and browser, mobile banking guarantees that online users are comfortable with the look and feel of experience.



(Figure 2) Web Based Mobile Banking GUI Example

(Source: Hancock Bank, 2010)

The disadvantages of web-based mobile banking are as follows (Tiwari and Buse, 2007):

- Accessible only via a certain type of mobile devices, i.e. PDA
- User has to prepare and carry out the transaction in the online mode, increasing the utilization costs.

Also, there are advantages of the (Juniper Research, 2008; Harland FS, 2010):

- Security - no information is left on the phone, and from the viewpoint of rapid rollout.

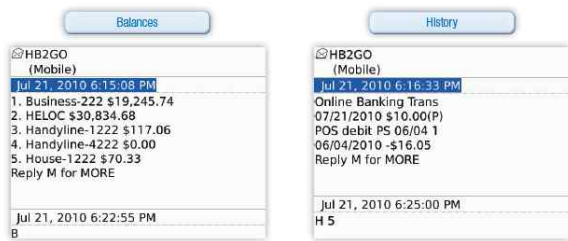
- Browser is the universal application on smart phones and no special download is required.
- Does not require permission from Mobile Network Operators such as Verizon or AT&T, thereby eliminating their demands to share revenue.
- Ease-of-use and low-maintenance makes this solution a great choice that requires minimal support by the financial institution.
- Offers a rich interface and flow of information.

2.2 Alternative B: SMS-based Mobile Banking

SMS (Short Messaging Service) allows users to send and receive text messages on a mobile phone using the numbered keypad on the handset to input characters where each message is limited and sent to and from users of different operator networks (Krugel, 2007). Although, SMS mobile banking platform is the simplest of all approaches and compatible with virtually all mobiles, the interface provides limited features and functionality, because it is limited to 160 characters, so only a small amount of bank information can be received (NCR, 2008).

Basically, in messaging-based mobile banking, the communication between the bank and the customer is carried out via text messages. These processes are well explained by Dilg et al., (2004) research studies. He states that the messages may be initiated automatically by the bank whenever certain predefined events occur, for instance

whenever a transaction is performed on the account. He continues that alternatively, the messages may be sent by the bank as a response/confirmation to customer requests where a customer message may contain either an instruction, e.g. to carry out a transaction, or an information request, e.g. for the account status.



(Figure 3) SMS Based Mobile Banking Example

(Source: Hancock Bank, 2010)

The server of the banks receives the SMS, decodes the commands and executes the instructions, if the request is found to be authorized (Tiwari and Buse, 2007). The authentication is processed with the help of a special Mobile Banking Personal Identification Number (MPIN) and the requests are only accepted from a mobile phone number that has been especially registered as authorized number for operating that particular bank account.

The main advantage of SMS mobile banking applications is that the platform is compatible with almost all mobile phones (Juniper Research, 2008). But, it also has many disadvantages as follows (Juniper Research, 2008; Harland FS, 2010):

- SMS based transaction considered to be

less secure.

- Each financial institution must have and pay for their own short code for security reasons.
- Users may incur charges from their carrier as standard text messaging rates do apply.

2.3 Alternative C: Client Based Downloadable Applications

Downloadable application is a new development of mobile banking technology platforms. It offers bank customers a selection of banking services through a single application delivered by the bank to the consumer's mobile phone (Juniper Research, 2008). Downloadable application enables customers to conduct transactions using menus where the application is pre-loaded on the mobile phone with the co-operation of the carriers before it is sold or the consumer has to download it (NCR, 2008). Transactions can be prepared offline (e.g. entry of necessary details) and when a connection to the server is established and the data can be transmitted (Tiwari and Buse, 2007). Before the data is transmitted a security check takes place. This type of mobile banking platform reduces the psychological pressure, particularly tension of being fast during data-entry in order to save costs as well as decreases the likelihood of typing errors getting processed (ibid). It is believed that this results in winning greater acceptability from users. Services that are available through a typical downloadable application include balance account statements,

bill payment, funds transfer and an ATM locator (please see the Figure 3).



(Figure 4) Client Based Downloadable Application Based Mobile Banking Example (Source: Hancock Bank, 2010)

Juniper Research (2008) stated that the application is mainly Java or Brew-based, but can also be based on an STK (SIM toolkit) which is used by MNOs to provide added value data applications and the application can be easily customized depending on the user interface complexity supported by the mobile. To meet the requirements of this application, clients should fulfill two primary pre-requisites (Tiwari and Buse, 2007):

- The mobile device must have sufficient disk space, memory and processing power to run the necessary software;
- The software must be especially designed to cope with small-sized display, low processing power, low memory and low disk space.

Smart phones such as iPhone or Samsung Galaxy S have sufficient hardware capabilities to run such a client and ideally may be suitable for client based mobile banking. The main advantages of client based mobile banking application are as follows (Dilg et al, 2004; Tiwari and Buse, 2007; Harland FS,

2010):

- A significant part of banking process is conducted offline reducing online connection time and costs
- Since the device goes online only for a short period, there is little threat of some waiting hacker to attempt to break into the connection, hence, increased security
- The big pro to this solution is that the user can get a rich and highly customized look and feel;

There are also disadvantages of the platform which can be stated as follows (NCR, 2008; Harland FC, 2010; Juniper Research, 2008)

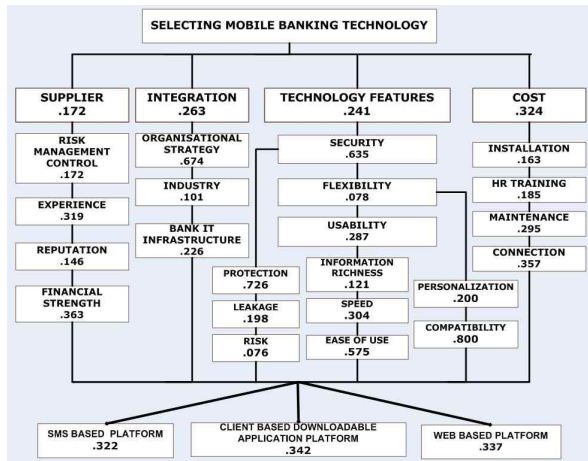
- Not all mobile devices support the download of applications.
- The settings for their mobile handset, otherwise the features will not appear consistently from handset to handset (given current technology).
- End users must be somewhat savvy is a major drawback at this time.
- Mobile Operators also require that each device be certified.

IV. ANALYSIS AND FINDINGS

After the data collection, Expert Choice 2000 software tool was used to calculate weights of alternatives respectively. The following Figure 2 demonstrates the relative weights of main and sub criteria's. It is very important to highlight several features of our AHP model for the selection of mobile banking platforms.

Firstly, it can be seen from the Figure 5 that first level "Cost" criterion received the

highest relative weight (.324) and “Integration” and “Technology Features” showed .263 and .241 weights respectively, whereas “Supplier” criterion was the last. Since our concern is focused on Uzbek banking sector, the results indicate that banks are mainly cost driven.



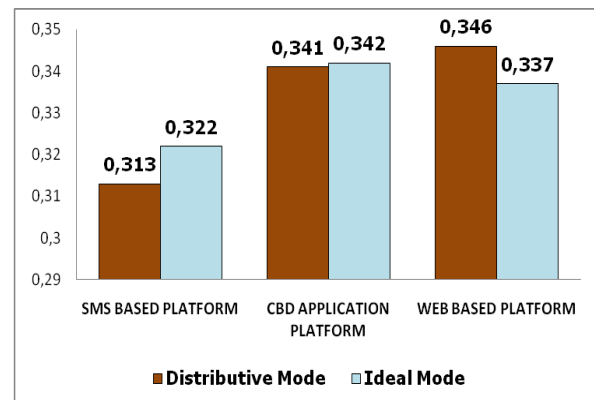
(Figure 5) Analysis results

According to the weights of four sub criteria under the “Supplier” main criteria, the criterions “Financial Strength” and “Experience” are the most important criterions with the values .363 and .319 respectively. Regarding the “Integration”, integration with “Organizational Strategy” (.674) is the most important.

In regards to “Technology Features” main criteria, “Security” sub criterion is the most important with the value .635. We can refer this importance to the fact that perceived security is one of the most important factors for adopting the service by users. So, banking sectors should consider security issues as number one issue while considering technology features. As it has secondary sub criterion, we can see from the [Figure 5],

“Protection” (.726) is very important criterion. As for “Usability” sub criteria which showed .287 value, “Ease of Use” (.575) and “Speed” (.575) indicated the highest importance correspondingly. Flexibility showed the lowest relative weight (.078) and its secondary sub criterion “Compatibility” (.800) demonstrated higher importance than “Personalization” (.200) criterion.

Final fourth main criteria, regarded as “Cost” demonstrated the most important value of .324. It is interesting to note that “experts” rated “Connection” (.357) sub criterions as the highest whereas “Maintenance” (.295) showed only the second highest importance. The final results indicate that (see [Figure 6]) client based downloadable application platforms (.342) and web based platform (.337) mobile banking technologies are the best alternative for the Uzbek banks to start with. The consistency indicators ranged from 0.08 to .059 which considered as satisfactory with maximum of four criterions.



(Figure 6) Distributive and Ideal Mode Method Comparison

Based on the findings, now we can easily

state that while selecting mobile banking technology, financial institutions tend to consider vendors with more experience and financial strength. The selected technology should be secure in terms of data protection, easy to use and compatible with other technologies and costing the organization with less maintenance expenses as well as cause less cost for customers to connect with the services. Since two alternatives showed quite close importance in both distributive and ideal modes, we can suppose that these two alternatives fit the Uzbek banks more in comparison to SMS based platforms. Finally, we can state that in a given amount of facts and findings, we summarize that Uzbek banks should select client based downloadable platforms in order to align with their future strategies and market requirements. Although it will result in more costs and resources, it should benefit in the long run with fewer system alterations and expenses in the future.

V. CONCLUSION

Within the study, we have proposed criteria for the AHP model for mobile banking technology selection problem. Further, we have obtained the “experts’” rating of these criteria through the use of questionnaire. Specialized software helped us to calculate the relative weights of the alternatives. The results indicated that client based downloadable application and web based platform are the best options to start with taking into consideration long term goals. We believe that the study contributed

to the development of both theoretical and practical implications.

We believe that our contribution to the theoretical framework is simple and straightforward. The study proposed the AHP model based on previous studies and recent findings. Since the application of AHP in the field is one of its kinds, the research developed and introduced new model for further considerations and studies. Researchers are able to modify the model in their similar studies by using less time and resources, and come up with more reliable and applicable outcomes. In turn, it will increase the effectiveness of the model and provide more accurate understanding of the issue.

As for practical implications, it is worth noting that selecting mobile banking technology platform for financial institutions (e.g. Uzbek banks) is quite a complex problem involving qualitative and quantitative concerns. Moreover, when banks confront such problems to solve, disagreement may exist among different levels of management and interested parties. But, application of the AHP approach to our selection problem can improve the process. As Saaty (2001) mentioned, AHP accommodates group decisions where managers can collaborate in setting priorities and hence achieve consensus. It is also important to mention that the AHP is one of the few approaches capable of handling multi criteria problem solving. From these perspectives, we can state that our study helps managers of Uzbek banks and many other financial institutions of the world not only in selecting the best mobile banking

platform but also managing many other complex problems. The model proposes several factors to consider while choosing mobile banking technology and also it can be easily applied in their decisions with some revisions.

Certainly, there are limitations of this research study. Firstly, we believe that there is a lack of experience in conducting such studies with AHP application. It is possible that we could not fully apply the benefits and advantages of AHP approach in solving the selection problem. Understanding the full process of AHP approach and even small details in application methodology would enhance the quality of our study. Secondly, the “experts” survey response may be biased due to the lack of experience in the field of banking sector as well as understanding the issues mentioned in the study in depth.

Hence, there is a need for further study of the field. Due to the fact that this is one of the pioneer studies in the field of mobile banking technology selection problem, we recommend future studies to consider previous studies in depth and run initial qualitative study with bank managers. By doing so, leveraging more important criterions will be possible and more precise. Consequently, the overall study quality of the AHP application in banking sector would be stronger.

Since the mobile markets and technologies keep growing and improving, we believe that the future of banking lies on mobile technologies, simply on mobile banking. Thus, our study will assist financial institutions to

solve their future selection problems with precision today.

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[Table 1] Operational definition

CRITERION		DEFINITION
Supplier		Vendor who is providing the mobile banking services, e.g. hardware and software applications.
	Risk Management Control	Vendors' risk management processes should be designed to identify, measure, monitor, and control these operational risks
	Experience	Experience of the vendor in the given market based on the years of operation and products developed.
	Reputation	Overall reputation of the vendor in the given market, brand name and share values.
	Financial Strength	Financial strength of the vendor in case of failing to comply with the contract and obligations.
Integration		The extent the mobile banking technology integrates with banks, industry or bank IT infrastructure strategies, whether it is suitable with the organizational goals and vision.
	Organizational Strategy	Since the purpose of the Uzbekistan bank is to expand its market with the introduction of mobile banking services in the long term, how suitable the mobile banking technology with the overall organizational strategy of development.
	Industry	How suitable the mobile banking technology with the overall industry strategy of development in a given Uzbek banking sector environment.
	Bank IT Infrastructure	How integrative the mobile banking technology with banks IT resources dedicated towards new platform implementation and operations.
Technology Features		Considered to be one of the main factors while selecting any technology, in our case, covers the features of mobile banking technology platform including functionality, security, usability and flexibility.
	Security	Security issues such as data input and output mechanisms and personal performance mistakes, loss of connection risk. Includes the establishment of a secure channel to provide data confidentiality and integrity between the client and the bank service, and also the authentication of the client.
	Protection	Means of activities directed towards protecting the mobile banking data via various techniques.
	Leakage	The probability of mobile banking users' private information lost and leakage through the 3rd parties involved as intermediaries.
	Risk	The level of risk losing personal data of clients during the service delivery or within the mobile banking system.
	Flexibility	Refers to mobile banking technology flexibility to a given environments, whether it is adaptable, personalizable and compatible with functionalities and other devices and need of company.
	Personalization	To what extent personalization of the mobile banking service can be executed by the target clients.
	Compatibility	Whether mobile banking platform is compatible with existing systems of the company and mobile devices of target customers or not. Is it possible to integrate new systems If in a given period, there are some new technological innovations.
	Usability	The ability of the platform meeting banks requirements through its functionality
	Information Richness	The number of information provided within a session regarding the major banking operations and services.
	Speed	The speed of banking services provided including the connection speed to the server.
	Ease of Use	The extent to which a bank or its clients believes that using a given mobile banking platform would be free from effort, easy to adopt and use.
Cost		It refers to total cost that firms have to invest to adopt mobile banking platform.
	Installation	Initial hardware and software installation expenses.
	HR Training	Training and education costs confronted if the new system is installed. These costs will cover retraining and other related costs directed towards inner employee skills development or outsourced employee
	Maintenance	Includes all relevant costs incurred for the maintenance of the platform in case of system damages.
	Connection	This cost includes the cost of connecting to the service by the end users, e.g. the cost of internet connection in Web based mobile banking

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