

Security Challenge and Issue of Mobile Banking in Republic of Uzbekistan: A State of Art Survey

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Abstract— A mobile phone is a device that widespread technology that turns into a part of every person in the information era. Mobile banking is a framework that permits clients of a monetary organization to direct various budgetary exchanges through a cell phone, for example, a cell phone or personal digital assistant. For today, online banking is one of the modern tools, which allow banks to increase their profitability and increase their profitability client base. Recently, In Uzbekistan, a mobile banking service represents on a large scale and has become one of the latest services approached by commercial banks in Uzbekistan. Nowadays, Mobile banking is a subset of Mobile-services in Uzbekistan where all or almost of banks provide Internet banking service uses SSL encryption of data transmitted from the user's computer to the bank system and vice versa. Security measure allows users to exclude a previously common type of fraud. The main objective of this work is to classify and analyze the Security issues and challenges in Mobile banking in Uzbekistan.

Keywords—*Mobile Banking, Internet banking, Mobile Banking in Uzbekistan, Challenges.*

I. INTRODUCTION

For today, online banking is one of the modern tools, which allow banks to increase their profitability and increase their profitability client base. This article examines the worldwide issues and challenges online banking as well as an overview of the current state of online banking in Uzbekistan.

A mobile phone is a device that widespread technology that turns into a part of every person in the information era. Mobile banking is a framework that permits clients of a monetary organization to direct various budgetary exchanges through a cell phone, for example, a cell phone or personal digital assistant. Mobile Banking indicates to arrangement and benefits of saving money and monetary administrations with the assistance of mobile telecommunication devices. Banking is one of the big financial foundations explores the opportunity of technology where this technology allowed the services to have the best customer experience and comfort. The technologies perform a significant role in the banking sector.

The developing of mobile devices nowadays, mobile banking is one of the important strategies in the banking industry. Mobile banking is an application of mobile computing which supports customers with mobile banking service. Whenever and what they want, the users be able to mobile bank such as a short message. Mobile banking [1] has emerged as a popular mode of banking in many developed and developing countries. Access to mobile data services can be a distinct part depending on technology or performance type. The current population of Uzbekistan is 32,520,015 as of Tuesday, November 6, 2018, based on the latest United Nations estimates.

According to the International Telecommunication Union, the number of mobile users in 2017 [2] more than exceeds 7 billion. In 2000, their number was estimated to be 1 billion. In turn; the number of Internet users reached 4.2 billion. The number of mobile subscribers in Uzbekistan has increased by 1.4 million in 2017 compared to 2016 and amounted to 22.8 million people in January 2018.

In [21], this paper was published in 2010 and after that not so much work has been done specially in mobile banking.

Nowadays, internet banking helps users and customers. Customers can money transfer, check out their account details, get their bank account statements and pay money sitting in the comfort of their offices and at home. On the other hand, the biggest limitation of internet banking needs to a personal computer and the internet connection. And this is a little problem in developing countries if we consider most developing countries, especially in Uzbekistan. Despite various initiatives, the level of internet connection in Uzbekistan is still relatively low. Mobile banking can solve this problem as it reduces the user's requirement to just their mobile phones.

Payments for all mobile services in Uzbekistan (Ucell, UzMobile CDMA, UzMobile GSM, UMS, Beeline, Perfectum); Natural gas and electricity payments; Internet access charges (Sarkor Telecom, Uzonline , EVO, TPS); Payments for fixed telephony; Payments for IPTV; Payments for cable television (UzDigital TV, Stars TV); [3] Payments

within the system, Customers can transfer funds from plastic card through the special account opened to them by transferring funds from other plastic cards to the mobile bank's special number, i.e. non-cash Payments; Individuals Monthly payments for loans received from Bank branches; One - time payments for goods and services purchases.

II. MOBILE PAYMENT CHARACTERISTICS

In developing countries for example in Uzbekistan, mobile banking service providers depend on agents for customer acquisition and for managing liquidity. They access customer-sensitive information such as the username, mobile number and other credentials that are used for identification and authentication purpose. These agents are not well equipped to preserve customer sensitive information and can easily lead to information leakage. Any loss of control over protected or sensitive information by service providers is a serious threat to business operations as well as, potentially, customer security.

There are some conditions for the mobile payment service to be acceptable as a market payment service:

- **Universality:** where the mobile banking should give transactions services among Business to Businesses (B2B), Customer to Customer (C2C), and Businesses to Customer (B2C)
- **Interoperability:** combining technologies as one system based on standards
- **Security, Privacy and Trust:** customers go to the bank and give their personal information and also depositing their money. However, there should be a trust between the customer and the bank so the customer can trust the mobile banking payment service and make sure that his personal information not is misused.
- **Simplicity and Usability:** the mobile banking payment services should able to fit the customer's convenience.
- **Cross-border payments:** mobile banking should be widely accepted in the world-wide
- **Cost and Speed:** where speed it's very important in the mobile payment that convenience merchants and customers

III. MOBILE BANKING IN UZBEKISTAN

Mobile banking in Uzbekistan, primarily by Hamkorbank and its international financial corporation and the Asian Development Bank, was developed by a hamkormobile platform in May 2009 [4]. It was an independent platform allowing operators to transfer, receive, save and withdraw money, as well as buy goods and services.

Remote service for individuals - this is a system that allows you to control your bank account from anywhere using a mobile phone or the Internet browser [5].

IV. SYSTEM OPPORTUNITIES

Payments for cellular operators and fixed telephony, Internet

providers and digital television services, Utility payments, Single-time payments for Consumer Goods and Services, and other payments, payments for consumer and mortgage loans, seeing and replenishing of account status, obtaining information on deposit balances and interest accrued, online Smart Visa balances and its get information about turnover [6]. Payments to the budget, transfer of bonus cards from card to card, online conversion, connecting Visa and Union Pay cards and checking account status and more.

We can see from table 1[20], three banks controlled 59.9% of the total assets banking in 2018 compared to 86.9% in 2001. the National Bank of Uzbekistan controlled 76% of the banking sector in 2001 where 30.9% in January 2018. The national bank of Uzbekistan controlling 19.5% and 18.5% of the deposit and market loan shares in 2018. The foreign ownership controlled 7.7% of the sector in 2018. However, there is 0.8% of the share of the bank with no state ownership is increased it in 2001 to 13% in 2018.

TABLE 1: UZBEKISTAN'S BANKING SYSTEM OWNERSHIP AND CONCENTRATION

Market Share (Percentage of Banking Assets)				
	2001	2014	2016	2018
Market share of the top three banks	86.6	50.6	49.7	59.9
Market share of top five banks	91.3	63.7	62.9	71.8
State-owned banks	82.2	41.2	41.4	48.8
Shareholding banks with indirect state ownership	6.1	35.5	33.7	33.2
Banks with foreign ownership	0.9	8.7	9.9	7.7

The main provider mobile platform in Uzbekistan CLICK was founded in November 2011. The activity of the company is the development of software products for commercial banks, organizations, individuals, their adaptation to various hardware and software complexes and further improvement. Software products are protected by the current legislation of the Republic of Uzbekistan [7]. "CLICK" system is a mobile banking system that allows mobile operators to pay for services of cellular operators, Internet providers, and other companies; traditional and internet-shop purchases, card-to-card transfers, and more. Key features of the CLICK system:

- transfer from card to card
- "CLICK Terminal" service
- Manage the accounts you have sent to you
- Auto payment service
- View payment history
- An online check of account balances
- Repayment of received loans
- SMS notifications

The advantages of the click system are as follows;
Hammerliness. Usage of a USSD-request on a negative balance and without the use of the Internet, even if the user's number is blocked, can pay at any time from his bank account. In order to use the system, you do not need to install any software on the phone: USSD-request can be sent from any mobile phone [8].

Proximity. Opportunity to replenish the balance and manage your bank account, without having to go to the bank branches and paying for the recent payment receipt or payment acceptance and payment system locations opportunity to pay without leaving home. The entire payment system is in the pocket of each subscriber.

In order to connect to the system, it is not required to open special accounts in the bank and deposit funds to another deposit. Our system allows you to "bind" your number to an existing account of an individual.

V. SECURITY ISSUES AND CHALLENGES IN MOBILE BANKING

Mobile banking has become a big challenge for banks because of the fast development of mobile technologies such as 1G, 2G, 3G, 4G, and 5G. In Uzbekistan, most of the people use the ATM machine as well as online banking services. However, they are afraid of mobile banking due to the theft mobile handset and misuse.

A) Mobile banking and Security issues with Wireless Application Protocol

New technology has made people access the internet much easier. Users connect the mobile devices to WAP and GPRS to have access to a wide range of banking services like transferring money from one account to another account, making payments for purchasing items. In Uzbekistan also Mobile devices have become both ubiquitous and indispensable for consumers and business people alike. Although these devices are relatively small and inexpensive, they are powerful with multiple functions. The mobile devices have specialized built-in hardware, such as cameras, accelerometers, Global Positioning System (GPS) receivers, and removable media readers. Furthermore, they are integrated with multiple wireless communication technologies such as Wireless Fidelity (Wi-Fi), Bluetooth, Near Field Communications (NFC), and a cellular interfaces (that can be reconfigured to choose between CDMA or GSM) that provide network connectivity across the globe. On the other hand security and convenience are the key factors for the growth of mobile banking and mobile commerce.

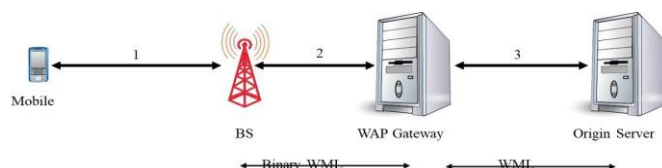


Figure 1. Security aspect in the WAP architecture

Wireless Application Protocol is used for communication among devices where the customer uses it to realize the functionality of internet banking. For secure and successful transmission between the customer and bank, encryption data process has been used but this is not good enough to secure the sensitive data among the customer and bank. The transmission needs to be more security methods with high memory storage capacity. We are unable to apply a complex cryptographic system due to the mobiles have a low computational capacity [9].

Because the technology development is increasing day by day, it is important to provide a very good end-to-end security (Figure 1). However, it is very difficult to provide security using WAP because at the gateway the data is not encrypted while switching the protocol process [10]

There are two technologies are using in South Africa for mobile banking namely Wireless Internet Gateway (WIG) (short message service) and Wireless Application Protocol (WAP). Security is very important before you provide the services [11]

TABLE 2: SECURITY THREADS FOR MOBILE BANKING

Danger Identification regarding Mobile banking	
Security threads for mobile banking	Mobile banking and Security issues with Wireless Application Protocol
	Transaction and message transmission Using Mobile Banking
	Third party identification password
	Identification of password

Recently in Uzbekistan that banks had a chance long enough to communicate with customer's mobile banking applications so and with their performers - the developers, so they are able to look at problems from different positions. Often there are organizational problems when in their technical assignments for customers. The problem of data storage, Mobile devices can be easily lost or just lose sight for a while. Meanwhile, they can say about their owners much more than their board "brothers". Therefore, the problem of data storage on mobile devices is one of the most important. When analyzing the security of mobile applications banking often observes critical information in open form, which is either simply stored in the application, or unconsciously "falls" in cache network requests, logs, crash dumps, screenshots. An attacker when getting physical access, the device can download these critical files. Another equally important issue is to work in the untrusted environment. Often users put themselves their devices are at risk getting root access on their Android device or installing jailbreak on an iOS device. However, they often do not understand that when you receive various free "bonuses" The OS's built-in security mechanisms are partially or completely disabled. This increases the probability infection of the device with malicious code and implements a successful attack by an attacker. Worth noting is the problem of application distribution. It concerns only mobile operating systems with many app stores, and first of all, the Android OS. For Android, there is a huge number of stores (Google Play, Samsung Apps, Yandex market, Amazon mobile app distribution, Slide Me, etc.). Some of them are installed by default. As a result, one store may contain a

legitimate application, and in another - its modified version with malicious functionality.

There are also unofficial applications for banks that often represent "Wrappers" over Internet sites. We recommend using only official apps, but banks need to monitor stores applications to detect fakes.

Code deobfuscation occurs in Android applications. In iOS, it is absolutely missing. The situation is similar with anti-debug technicians as for channel security data transfer. This is a problem for mobile banking. But mobile devices are good that provides freedom of movement and choosing a place to connect to the network on your own.

B) Authentication Risks and Issues

The people like to use the mobile phone any where they go so they use the mobile banking application while they are moving and in any situation. The Security mechanism can be done by identifying the customer's pin number, phone number etc.

Authentication Model: two kinds of services are provided to the customers one is the direct bank services to the customer and the second one is the bank will share the services to the third-party provider.

C) Bank provides the service directly to the customer Architecture

If a customer wants to transfer money using mobile banking he has to authenticate himself to the bank server using firewall then the server will verify the customer security password and pin number then the bank will be allowed him to complete the process for money transfer[12]. This method has security issues for instance system crash, server failure and malevolent intrusion [13]. However, banks they don't prefer using this method (Figure 2).

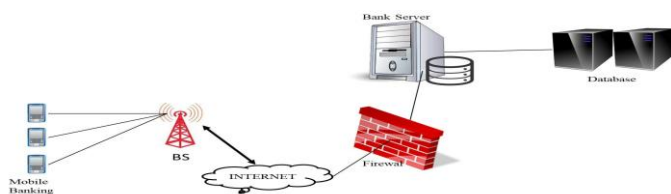


Figure.2. Service directly to customer Architecture

D) SMS Spoofing Attack

The spoofing attack is the most serious attack in SMS mobile banking where the attacker can send a message to the sender number so most of the organism doesn't use mobile banking using SMS [14]

E) Mobile banking virus attacks

There are many types of viruses, Trojan and malicious internet program [15]. For instance, Trojan can get the password from the web easily and from the operating system cached information. Zeus Trojan is used for stealing the password and the authentication number for the mobile banking transactions [16]

VI. SECURING MOBILE BANKING ON ANDROID WITH SSL CERTIFICATE PINNING

Let's say you want to exchange some sensitive data between your application and a server. SSL should do the trick, but in many cases, you'll have to send sensitive data between your application and server. Take mobile banking applications for example. The last thing you want is a malicious hacker to steal someone's bank account info – or worse, their money [18].

Security is crucial for a mobile banking solution, so you'll be using SSL to keep that data safe and secret. But there's a catch. To increase the security with pinned SSL certificates, the application is independent of the device's trust store. Compromising the hard-coded trust store in the app is not so easy - the application would need to be decompiled, changed and then recompiled again - and it can't be signed using the same Android key store that the original developer of the application used.

VII. MOBILE BANKING ANALYSIS

Central Bank of Uzbekistan Tashkent, [17] on 1 April 2013 the number of users of distance banking services in Uzbekistan made up over 149,000, the central bank noted that number of SMS-banking and mobile banking services made up 106,925 units and internet banking 42,098 units as of 1 April 2013.

Compared to 1 January 2013, a number of users of SMS banking and mobile banking service rose by 37,600 and internet banking – by 2,930 units (Figure 3).



Figure 3: Number of users of distance banking services

According to the central bank, National Bank of Uzbekistan (34,300 users), Ipoteka Bank (30,314 units) and Microcreditbank (15,477 units) are leading on a number of users of distance banking services as showing in Figure 4 and table 3.

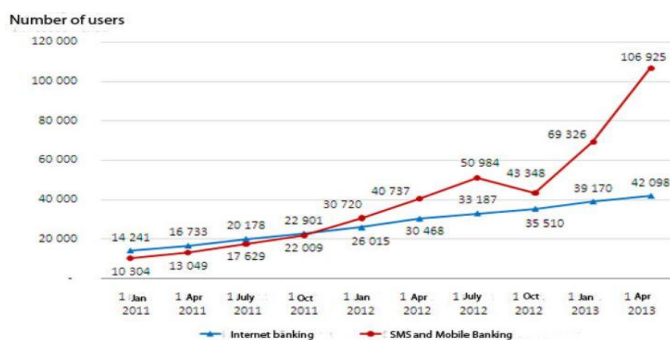


Figure 4: Number of users of distance banking services by type of system

TABLE 3. MOBILE BANKING SERVICES OFFERED BY SOME OF THE BANKS IN UZBEKISTAN

No	Name of the Bank	Internet banking Users	SMS-banking and mobile banking users	Total
1	National Bank of Uzbekistan	4227	30071	34298
2	Uzpromstroybank	2042	1348	3390
3	Agrobank	1765	749	2514
4	Ipoteka-Bank	3158	27255	30413
5	Microcreditbank	2385	13062	15447
6	People's Bank	1204	-	1204
7	Savdogarbank	459	-	459
8	Qishloq Qurilish Bank	1239	8692	9931
9	Turon Bank	981	613	1594
10	Hamkor Bank	4147	4767	8914
11	Asaka Bank	1503	8513	10106
12	Ipak Yoli Bank	3229	2042	5271
13	Uzbek-Turkish Bank	177	128	305
14	Trust Bank	1352	970	2322
15	Aloqabank	1226	1789	3015
16	KDB Bank Uzbekistan	217	498	715
17	Turkiston bank	227	25	252
18	Sederat Iran	11	12	236
19	Samarkand Bank	6302	429	6731
20	Universalbank	258	425	683
21	Kapitalbank	2803	3907	6710
22	Ravnaq Bank	64	33	97
23	Davr-Bank	704	-	704
24	Credit Standard Bank	34	215	249
25	Invest Finance Bank	1028	431	1459
26	Amirbank	52	38	90
27	Asia Alliance Bank	610	329	939
28	Hi-Tech Bank	298	82	380
29	Orien Finans Bank	396	502	898
TOTAL		42098	106925	149023

Figure 5 shows [19], the number of ATMs and information terminals for 100,000 adults have so fast grown, the development of non-cash bank payment system was not silky. However, year-to-year changes in the number of banks card were much faster in the early years relative to year-to-year growth in the number of ATM.

All in all, it seems that gradualist and precautionary approach that Uzbekistan has adopted did indeed serve its purpose. It helped to avoid twin crisis that most of the transition economies faced and thus helped to protect social stability and limited the negative impact of structural reforms on employment and economic growth. Changes like decreased state ownership, the introduction of credit bureaus and collateral registers, the rapid development of the non-cash payment methods suggest the banking sector is gradually converging to a market-based system.

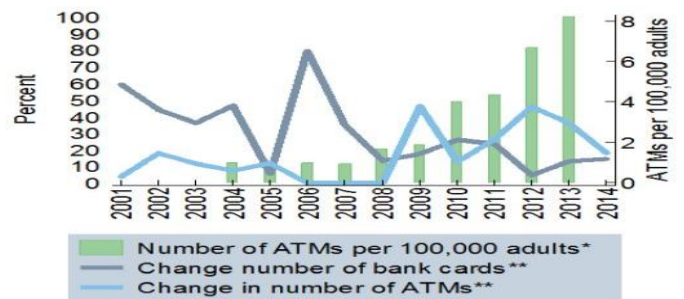


Figure 5. Bank Cards and ATMs

Table 4: Bank Card, Internet, and Mobile Banking Use in Uzbekistan

	2011	2015	2016	2017	Ratio of 2017/2011
Bank cards issued (,000)	7,909	15,215	16,316	19,523	2.5
Transaction volume through bank cards (in billion UZS)*	10,192.4	31,324	53,050	-	5.2
Payment terminals	85,741	169,581	183,060	208,536	2.4
Information points	491	2012	2,345	4,954	10.1
Number of depositors	1,159,890	143,284 9	1,515,004	1,638,67 3	1.4
Number of deposit accounts	3,926,356	503,070 4	5,364,838	5,809,17 2	1.59
Remote banking users Number	24,545	53,4800	1,061,022	2,042,11 1	83.2
Percentage of depositors	0.6	10.6	19.8	35.2	-
Internet banking and bank client network users Number	14,241	62,227	81,492	135,629	9.5
Percentage of depositors	0.4	1.2	1.5	2.3	-
Mobile and SMS banking users Number	10,304	47,2573	979,530	1,906,48 2	185.0
Percentage of depositors	0.3	9.4	18.3	32.8	-

Table 4 [20] shows the presents extra proof on the increase in account penetration, an appearance that the number of bank cards increased 2.5 times in 2017 approaching 2011. The number of users increased from 0.4% of depositors in 2011 to 2.3% in 2017. The use of mobile banking increased from 0.3% of depositors in 2011 to 32.8% in 2017. The CER (2015) notifies that the surge in electronic banking products was an outcome of the regulatory changes.

VIII. CONCLUSION

For today, online banking is one of the modern tools, which allow banks to increase their profitability and increase their profitability client base. This article examines the world-wide issues and challenges online banking as well as an overview of the current state of online banking in Uzbekistan.

This work is to classify and analyze the Security issues and challenges in Mobile banking in Uzbekistan. Majority of the customers in Uzbekistan are using online banking or ATM. However, around 40 % of customers are using the mobile banking where the remaining people 60% do not use this technology.

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