

## **Mobile Banking Based a New E-commerce Architecture: Developing Countries Perspective**

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### **Abstract**

*Telecommunication technology introduces people with a new modern, virtual and portable digital life. Mobile banking is one of the newest applications of telecommunication technology. In this technology mediated world, ecommerce is one of the important sectors to globalize trade. In ecommerce world, existing security technologies are already proved to online fund transfer and products delivery. All of the existing technology is based on online banking. But in developing countries like Bangladesh where technologies are not so fast and lots of people have the lack of trust on online banking. There is a simple, reliable and convenient ecommerce should be introduced to include all level of people. In this paper, an overview of the current fund transfer technology and its security has been elucidated. Based on the telecommunication technology, a new complete architecture for ecommerce trade, fund transfer and confirmation about products receiving has been proposed. In the proposal, fund transfer has been done through mobile banking. As the mobile banking doesn't need any internet connection, it has a great advantage over rural customers of the developing countries. Moreover, the proposed architecture will work together with online banking and the secured third party for the better convenience.*

**Keywords:** *Ecommerce, Mobile Banking, Ecommerce situation in Bangladesh, Portable Banking, Ecommerce architecture*

### **1. Introduction**

Information Technology (IT) has a great impact on modern society's life style. Online marketing facilitates added another new steps for modernization. Day by day people are going to be more dependable on technology. E-commerce which is now one of the most important business technologies in developed countries and semi developed countries like USA, China respectively. As a result, online business refers to the ecommerce which is also creating a big influence in developing countries like Bangladesh (BD). This paper describes the present challenges of E-commerce (ecommerce) in developing countries and probable reliable solutions. Moreover it has been proposed a new architecture of ecommerce that will ensure authorized and confirm transactions for e-marketer and e-businessman. In this paper it has been also discussed present situation of ecommerce in BD. Here, developing countries mean the countries which have already an impact of mobile banking [1] like Cameroon, Democratic Republic of Congo, Gabon, Kenya, Madagascar, Tanzania, Uganda, Zambia and Zimbabwe, Bolivia, Brazil, Egypt, Ethiopia, Guyana, Jamaica, Tajikistan, Togo and Vietnam. This paper represents Bangladesh as an example of these developing countries.

### **2. What is Ecommerce**

Ecommerce (electronic commerce) is a term of trade where commercial transactions and all others bussiness process is done through online. when this term is used in broader

sense is called ebusiness. Basically ecommerce is three types. These are Business to Business (B2B), Business to Consumer (B2C), Consumer to Consumer (C2C). when consumer shopping on the web is called B2C. Transaction conducted between two business on the web is called B2B. In C2C, participants in an online market place can buy and sell each others.

### **2.1. Ecommerce Scenario in BD**

Despite being under developed country some sectors of Bangladeshi business community has embraced technology with reasonable success. Personal computers and internet are emerging as day to day business tools. In recent years, large numbers of IT skilled person are entering into job market. Every year from 34 public universities [2], 77 private universities [3], 49 government [4] & 350+ private polytechnic institutes nearly 4% IT skilled and semi-skilled manpower are adding to job market. Within this skilled manpower at least 10% are being self-employed through online outsourcing (like programming, customer support, call center, SEO *etc.*). This skilled & semi-skilled manpower also can play a strong role for developing some emerging sectors. These positive indicators are favoring the prospects of ecommerce in BD. Some emerging sectors of BD have been shown in the following.

1. RMG (Ready Made Garments) sector
2. Online Banking (Already started in some private bank)
3. Online shopping
4. Bill pay (Now Bill pay is running through mobile operator)
5. Online education *etc.*,

### **2.2 Implementation stage of ecommerce**

In 2008, BD government declared vision-2021 and also declared to build digital Bangladesh. For implementing this vision ministry of commerce, ministry of ICT & planning commission jointly implement ecommerce in BD. Recently ecommerce committee has been formed headed by commerce secretary. Also ICT ministry is working for enacting a law regarding "Ecommerce Transaction Act". Government and private sector are going to implement this very fast and cordially in BD. Some Government sector which already taking action to implement ecommerce:

- a) From union level (first level of government, located rural area), government has run online birth registration, electric bill payment (through mobile operator), online Porcha (a land ownership documents) distribution.
- b) E-tendering
- c) Online job application
- d) Online Banking (implementing most of the private bank and Govt. bank also going to implement very soon)
- e) Mobile application has been started for (person to person) P2P money transfer.

Now some government offices are fully online based or paperless office management. www.roc.gov.bd (Registrar of joint stock companies and firms) is one of the digital offices [5] in BD. Very immediate Govt. is going to implement land registration process

through online. Already district administration communicates with public through online [6] (like any complain, application, appointment *etc.*).

### 2.3. Some Ecommerce Services in BD

Basis on Alexa ranking [7]

| SL | Ecommerce site     | Global Rank | BD Rank | Ecom. Type | Currency Transfer. | Target people |
|----|--------------------|-------------|---------|------------|--------------------|---------------|
| 1  | www.bikroy.com     | 4891        | 14      | C2C        | Hand to Hand       | Only BD       |
| 2  | www.clickbd.com    | 18590       | 109     | C2C,B2C    | Hand to Hand       | Only BD       |
| 3  | www.cellbazaar.com | 14554       | 5412    | C2C        | Hand to Hand       | Only BD       |
| 4  | www.rokomari.com   | 45144       | 180     | B2C        | through curier     | Only BD       |
| 5  | www.upoharbd.com   | 562304      | 6744    | B2C        | online Banking     | International |
| 6  | www.Hutbazar.com   | 2008122     | 14993   | B2C        | online Banking     | International |

The existing ecommerce sites service and its limitation have been given in the following table as sequence of sl.

|   | Services Description                      | Limitations   |
|---|---|---|
| 1 | Only advertisement                        | No online transaction, B2C,B2B, responsibility up to consumers  |
| 2 | advertisement, some booking               | No online transaction, B2B,responsibility up to buyers.   |
| 3 | advertisement of mostly 2nd hand products | no transaction, B2B,B2C, All responsibility up to buyers, wrong products also possible to post.                 |
| 4 | Only books, CD, DVD etc.                  | B2B is absent, no online transaction, On cash delivery via curier, items display is not standard.               |
| 5 | Diffirent gift items                      | No B2B, C2C. no link with Bank, Paypal is for money transfer method, No automation (brokers-Bank-courier)       |
| 6 | varieties                                 | No B2B, C2C.Paypal & credit card used for transaction. No automation (brokers-Bank-courier) Only support Paypal |

Table-1

### 2.4 Most Challenges Ecommerce in BD

In BD still there is no successful ecommerce frame work. Even then internet consumer is increasing very fast but still their activities are limited in between internet browsing, Facebook chatting, newspaper reading etc. To enlarge the ecommerce market place the most challenge is customer's trust on secured transaction. According to critical success factors for E-Commerce companies which identified by Sung [8], there are customer relationship, privacy of information, low cost operation, ease of use, ecommerce strategy, technical ecommerce expertise, stability of systems, security of systems, plenty of information, variety of goods/services, speed of systems, payment process, services, delivery of goods/services, low price of goods/services and evaluation of ecommerce operations.

In perspective of BD, the main challenge is to build trust on currency transfer and brokers liability on end level customers. It is also important to ensure accountability and sincerity of companies. Because companies sincerity and honesty are directly related to customers trust on broker. And the most challenges for brokers are---

- a) Ensure customer's information security like credit cards and others credentials.
- b) Customer's testimonials & trust.
- c) Secured money transfer to customer-brokers-companies.

- d) Ensure right products are delivery
- e) Time manner or deadline of transaction
- f) Actively handle alternative channel between consumers / customers and the vendors / companies
- g) Clearly stated polices and vender information
- h) Honestly & sincerely maintain the vendors ranking on broker's website.

#### **Technical Challenges:**

- a) To ensure customer & companies secured financial transaction.
- b) Professional website design
- c) Consistent (professional) graphic design
- d) Ensure website & server dedicated bandwidth.
- e) Ensure skilled manpower.
- f) Interconnection between mobile Bank server (MS)-Broker's server (BS)-Company's server (CS) and Courier server (CuS).

#### **Social Challenges**

- a) Traditional purchase habit, quality-price balance maintenance.
- b) Customer relationship maintenance and retention.
- c) Panic about phishing and pharming attracts (Due to unawareness)
- d) In developing countries most of the customers like to negotiate price. Build on trust on fixed price.
- e) Distrust due to problem of electronic negotiation.
- f) Security beaches.

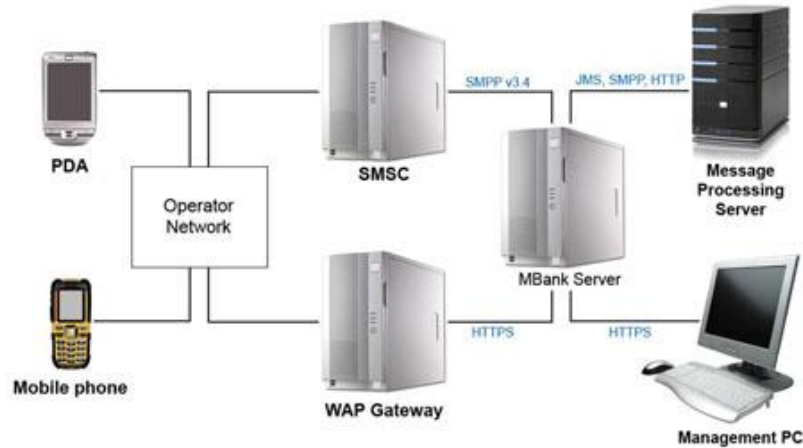
### **3. Constraints for Ecommerce Implementing in BD**

In Bangladesh, there is a great deal of interest in e-business; however, due to various economic, infrastructural and legal reasons it has not spread. Most important companies, associations, chambers and government offices have set up websites. These sites mainly provide information about the organization and its products and services. Main reasons for low e-commerce transactions are absence of legal framework for completing an electronic business, financial payment system and overall lack of consumer's confidence on reliability of e-commerce transactions. Load shedding is another big constraint in BD. Uninterruptable electricity is mandatory for ecommerce strong basement.

### **4. Potentiality of Ecommerce in BD:**

Bangladesh is world 88<sup>th</sup> large country by area in the world but 8th populous country [9]. 28.4% of total population lives in urban area [10] and rest in rural area. 57.7% of total population are educated [10] (over age 15 and can read and write) and 10% of educated have computer literacy but 2% has online transaction idea.

Since 2012 some private Banks (Dutch bangla bank, Prime, Islamic Bank, Brack Bank) has been started their mobile banking activities. There is no private bank in most of the semi urban. There are some government banks which are not up to date. So, a huge number of populations are unable to join with this banking. 80% of total population are using mobile and 60% of mobile consumer know how to use mobile properly. 10% of



**Figure 1. Mobile Banking Architecture**

mobile consumers have experience of mobile banking. Through mobile banking rural people have already started to believe virtual banking or money transaction. In this paper it has been proposed a secured electronic transaction trough mobile banking. Because, it's the most important to build up rural people's belief on ecommerce and it's secure currency transaction. Already people have strong trust on courier services like Sundarban, SA paribahan, Continental. In BD postal services network is also well established. For Big consumer or large transaction (B2B) we prefer online banking transaction like www.taobao.com (China's biggest online market). Mobile banking are prepared for (B2C) and (C2C) because, this is more trustable and the easiest communication channel to lower level educated people. By using mobile banking technology ecommerce market can be expanded till to rural area. It also can lose pressure on capital city.

## 5. Related Works

In paper [11], they have proposed an encryption based and fuzzy logic based ecommerce architecture. Also they have discussed some incremental results about their proposed model which will help to show the validity of their model. They have emphasized more about companies rating after successful transaction. But in ecommerce more sophisticated and risky is secured money transfer consumer to company via Brokers. In their paper there is no clear indication how money will be transferred also there is no any instruction about acknowledgement after successful transaction.

In Paper [12], a settlement bank (third commercial bank) has been proposed which will communicate with consumer's bank and merchant's (company) bank. These three banks must have interrelation. So, ultimately for different consumer's transaction it will require to establish a commercial relation with settlement bank. In their proposal, all transaction will be via third bank so it will be costly. In their proposal it's not clear if customer have tried to transfer money but somehow it's not transferred so how acknowledgement will be transferred to company, broker's even to customer. Their proposed architecture is not fully automated with the lack of acknowledgement in every step.

## 6. Mobile Banking

Mobile banking is a system that allows customers of a financial institution to conduct a number of financial transactions through a mobile device such as a mobile phone or tablet. By this banking network consumer can transfer money to broker or any others by using mobile network, no need any internet connection. Mobile Banking is performed by mobile banking architecture [13].

### 6.1. Mobile Banking Situation in BD

In 2011, Bangladesh Bank (central Bank) regulated those mobile financial services be bank led. Within the Bangladesh Bank regulations, banks are allowed to use mobile financial services for: payments in / out, transferring inward remittances, person to person payments, person to business payments, business to person payments, person to government payments, government to person payments, other payments (microfinance, insurance premiums). Here it is mentioned that in Bangladesh, all of these transaction are done through P2P (Person to Person), P2G (Person to Government) and some utility bill payment like telephone, gas, electricity bill etc. In this paper, ecommerce architecture has been proposed of which payment will be paid through this mobile banking account. In developing country like Bangladesh, it's the most challenges to be trusted to people specially for financial transactions. From the table 2, it has been observed that how mobile banking account holders are increasing very rapidly. These consumers are already habituated to transaction through mobile banking. Our goal is to capture these consumers. This will be more helpful to expand ecommerce market in BD. It is also believed that when consumers trust will be built up on brokers then they also be willing to transact through ebanking.

### 6.2. Mobile Banking Related Current Data

**Table 2. Total Mobile Banking Situation in BD [14]**

| Description                                | Amount (in April, 2014) | Amount (in May,2014) | % Change ( April to May, 2014) |
|--|-------------------------|----------------------|--------------------------------|
| Approved Bank                              | 28                      | 28                   | -                              |
| Banks started to convey the service agents | 20                      | 20                   | -                              |
| registered consumers                       | 3,25,756                | 3,78,018             | 16.04%                         |
| total transaction                          | 15.342 mm               | 16.148 mm            | 5.25%                          |
| Total transaction in taka                  | 3,57,74,770             | 3,76,78,005          | 5.32%                          |
| No of Daily average Transaction            | 8,095.72 Crore BDT      | 8,205.99 Corre BDT   | 1.36%                          |
| Average daily transaction in taka          | 11,92,492               | 12,55,934            | 5.32%                          |
|  | 26.986 billion BDT      | 27.353 billion BDT   | 1.36%                          |

## Mobile Overview

| Mobile Profile     |  |
|--------------------|--|
| Operators          | Airtel, Banglalink, Citycell, Grameenphone, Robi, Teletalk |
| Coverage           | 99.16% (Grameenphone)                                      |
| Unique subscribers | 59,909,729   |
| Active SIMS        | 107,516,698  |
| subscriber ARPU    | \$3.41   |

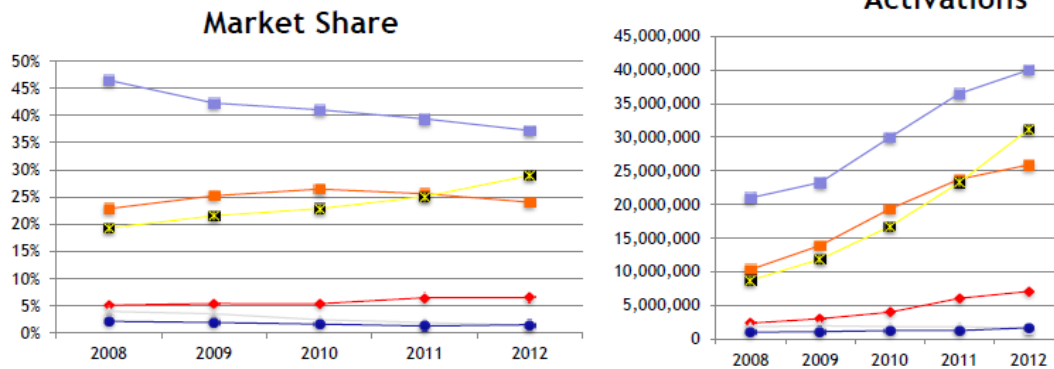
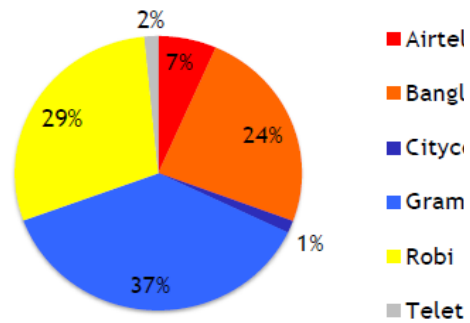


Figure 2. Mobile Users statistics[15]

### 6.3. Why mobile Banking

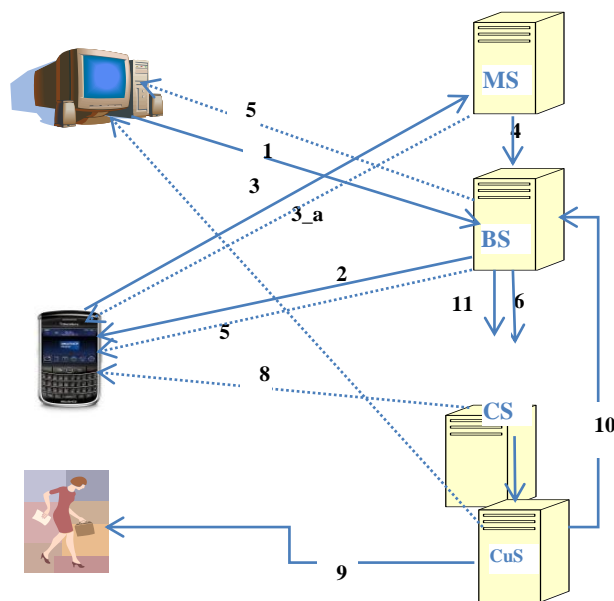
In 2008 Bill Gates announced that banking is essential, banks are not. This quotation means that the traditional bank branch is going to vanish in order to be surrogated by electronic banking which continues to attract new consumers. But electronic banking is also more complex and still untreatable to developing country's rural people. So mobile banking is the best way to reach to a remote customer.

There are few drawbacks of e-banking sector in e-commerce such as, distribution coverage, banking account opening, time consuming and cost. The distribution coverage of online connected commercial banks is not very large in BD. Opening an account is also a complicated process. This also includes transport cost. Online Banking services are providing by private bank. Also they have annual charges. So, usually rural people, students, low income people don't want to go private bank. But in BD, these category people are large in amount. On the other hand, a consumer can open a mobile bank account by only 5BDT and no need to go bank. Almost every rural market has mobile banking agent. Agent can solve all baking problems. According to the Table-2 presently 16.148 million people have mobile banking account and every month 5.25% new users are adding to this network. In fig-2 illustrates those 107.52 million (mm) [2012] active mobile users in BD. So telecom can play a vital role in e-commerce to eliminate existing constraints of e-banking. In this case telecom acts as a solution maker or payment gateway. For this reason author are going to propose a new architecture that will ensure all ecommerce requirements through mobile banking and mobile [16].

## 7. Proposed Architecture

### 7.1. Prerequisites

1. Every consumer and broker must have mobile banking account and a mobile.
2. Broker server (BS) must be connected with Mobile Banking Server (MS), Companies Server (CS) and Courier Server (CuS) through internet or VPN.
3. Company and courier's server must have some information exchange capabilities.
4. Every consumer must have unique account to BS. Broker has to confirm that consumer has a mobile number, email address, valid postal address and unique mobile banking account.
5. Broker also has to confirm product has unique ID. [e.g., we propose format of id will be like 120-12-1-121. Here 120- companies id, 12-product type (e.g. cloths), 1-sex and 121-individual item. Ecommerce software smartly parses this id and helps to show consumers same categories different items.]



**Figure 3. Proposed Ecommerce Architecture**

### 7.2. Architecture:

1. Consumer search and select the product from broker's website (stored in BS). The consumer adds this product to his/her cart.
2. A symmetric encrypted pin and Broker's mobile banking account no. will be sent to the consumer's mobile through SMS. (This pin is unique and creates temporarily and related with the product ID)

Here, MS-Mobile banking server, BS- Broker's server , CS-Company's server , CuS-Courier Server

[According to the Figure 3, the lines (1 to 11) and its explanation has been given below]

3. Consumer sends money (price) through his mobile bank account (by mobile) to Broker's mobile bank account via MS. Before sending this message consumer encrypt with symmetric key. [format of message sending previously concerned to consumer e.g. 120-12-1-121(product ID), 12A123(pin), 30\$(Amount) →01717864022 (Broker's mobile account)]



- a. MS will send an acknowledgement to consumer's mobile. [e.g. your 30\$ has been received ]
4. MS will message to BS concerning about the received money. Format will be like this [01925835286(consumer mobile Bank account),120-12-1-121 (product ID), 500\$ ]
5. BS will store order details in its DB and verify with consumers order (that is previously stored). If Product ID, amount is ok. Then acknowledge to consumer through email and mobile.[e.g. Mr. X your money has been received]
6. BS will send order details with consumer's postal address and mobile no. to CS.
7. CS will send the product to courier and will collect the courier no.
8. CS ensures email /message to consumer with courier information like courier no. & company.
9. CuS update their data at every station and deliver the product.
10. CuS send a message to BS with confirmation of deliver.
11. BS server will wait for a fixed time for consumer complains. If no complain from consumer within due time the money will be transferred to Company and update the company's ranking.

### 7.3. Security Mechanism

1. RSA algorithm will be used for secured communication between client-BS, BS-CS and CuS-BS.
2. All SMS communication between consumer-MS, BS-consumer and company - consumer will be done using symmetric key encryption and decryption.

## 8. Future Work

In this architecture, existing encryption algorithm is used in information transfer between MS, BS, CS and CuS. For the better security, more robust security mechanism or algorithm between these servers can be proposed. Moreover, secured encryption SMS transfer system can also be explored for the best security.

## 9. Conclusion

In this paper, proposed ecommerce architecture is secured and trustworthy architecture. Every e-business currency transfer and product delivery is the most challenges. In this proposal, no need of any internet connection between consumer and mobile banking server. Also it is very important that mobile banking cash transfer liabilities belongs to bank authority. For, information security consumer to broker, broker to company and company to carrier all information transfer will be done using a secured encryption algorithm like AES, so the system become reliable. It is also important that as long as courier will not confirm to BS about goods delivery, broker will not send money to company. It'll increase consumer's currency security higher.

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