

An Alternative Method for Facilitating Cheque Clearance Using Smart Phones Application

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ABSTRACT

Everyday banks receive a large number of cheques; these cheques are checked and submitted to their corresponding clearing banks for clearance. After verification the clearing banks send signed instructions back to the bank stating whether the cheque is cleared or rejected. Then the money is transferred from the payee a/c to the receiver's a/c. This whole process takes up to 3 working days just for inter-bank national cheques. Therefore there is a need to come up with an alternative method to shorten the lengthy process of depositing physical copy of the cheques in banks and its clearance making the entire cheque clearing process much simpler and speedier. This application allows users to deposit cheques without any need of depositing the physical cheques to banks.

Keywords: Automated Cheque Processing System (ACPS), Magnetic Ink Character Recognition (MICR), OCR (Optical Character Recognition), and Photo Cheque Deposit (PCD).

1. INTRODUCTION

One of the important means of efficient fund transfer is through cheque clearance. Let us consider a scenario where a customer (payer) of bank 'A' issues a cheque to a customer (payee) of another bank 'B'. The payee on receipt of cheque from the payer has to go to the bank holding his/her account (or cheque collection center such as an ATM outlet) to deposit the physical cheque so that the amount specified in the cheque is credited in his/her account. It takes about 2-3 days' of time for a cheque to get cleared and money to be transferred. During this process the bank B communicates with the Bank A to which the cheque belongs and it is only after the acceptance of the cheque by the Bank A that the money specified on the cheque is credited in the account of the Payee. Again, this entire process currently takes up to 8-15 days for transactions involving banks located in foreign countries. To facilitate speedier clearance of cheques, AUTOMATED CHEQUE PROCESSING SYSTEM (ACPS) using Magnetic Ink Character Recognition (MICR) is an ideal solution. It must be noted that Photo Cheque Deposit (PCD) is not just a scanned version of front and back page of the paper cheque. PCD verifies a set of values (e.g. cheque number, payer's account number, date of cheque, cheque amount, payee's name and account number, payer's signature along with authentication that the cheque itself is not a counterfeit etc.). This system will ensure that like paper cheques, photo cheques can't be counterfeited or altered. However it can bounce due to insufficient funds following with bank policies.

On requisition for paper cheques by an account holder, a set of physical cheques components consisting of unique cheque number, account number of payer, CTS code and logo of the Bank are issued. These parameters help to identify the cheque. However any system can generate these details using false or incorrect values which ACPS will help to catch and reject the cheque outright. Cheques may also originate from fraud sources doing serious damages to individuals, companies and financial institution if mistakenly cleared. There are three principal sources of cheque fraud: fake cheques documents; fake signature over an authentic cheque; and forged data over an originally authentic cheque (like modifying the amount or the beneficiary). Therefore cheques additionally require digital signature of the issuing bank. Using this signature the account holder will be able to verify that the given cheque is indeed sent by his bank. Therefore, we can consider that there are valid information and signature on the cheque. The processing time of cheque deposit using smartphone is less when compared to physical cheques as the verification of e-cheque details and the signature are done electronically, there is no physical transfer of cheque from place to place and then to bank.

2. THE PROPOSED SYSTEM

Banking transactions using smartphones is proposed in this paper. The proposed system is initiated by proper login of the consumer, the system will validate and authorize the consumer. The consumer then deposits its cheque for clearance indicating the account number to which the money is to be deposited and amount of the cheque. The system

will notify the status of cheque using a unique reference number provided after the successful process of cheque deposit. The following steps of the system are as follow:

1. The physical cheque book is issued by the bank with the blank spaces to fill the data.
2. Fill payee's name, amount, account number, date, and accurate signature in physical cheque and then give cheque to the payee.
3. Payee will use his personal username and password to enter in the system. Validating process initiates.
4. Electronic image of the front side and the back side of the cheque, and enter the account number and amount in the application.
5. When the data is successfully saved in the bank's database, it will send a reference for future use.
6. Bank verifies the data and send the electronic image of cheque to the paying bank.
7. Paying bank checks the signed signature, balance and provided data and then sends the success of failure message to bank.
8. The amount is then transferred to the payee account.

3. THE MOBILE REVOLUTION

The impact mobile phones have led our lives is revolutionary. First, we gravitated toward mobile phones just for the convenience of connecting with others anywhere anytime. Today, we do not leave our houses or offices without them.

Driving this dramatic change in how we live are not just mobile phones in general, but more specifically, the rapid adoption of smartphones across all age segments. Smartphones have become the all-in-one devices that allow us to snap a photo, pay a bill, arrange a social event, purchase coffee, find a restaurant, search for a lower priced item, receive a coupon as we are walking past a store, engage with friend at a social networking site and make a phone call [7].

One of the biggest areas of our lives that mobile has started to revolutionize is how we manage our money. Without question, the ability to use our mobile devices to review account balances, receive alerts to avoid overdraft fees, transfer funds, search for the lowest price on an item has significantly changed how we control our finances, save and spend. Not surprisingly, consumer adoption of mobile is also having a significant impact on how we interact and "do business" with our banks; traditional channels such as branches, online via a PC, ATMs, mail and call centers are being challenged by consumer preference for smartphones and tablets [7]. This phenomenon is not only changing how consumers bank, but also what they expect from their banks, and ultimately with whom they choose to bank.

Looking to the future, Photo Cheque Deposit (PCD) is likely to be a disruptive technology and driving force in consumer's adoption of mobile financial services.

4. HISTORY OF MOBILE RDC

To provide context for the Mobile (Remote Deposit Capture) RDC opportunity, it is worth briefly reviewing the history of the technology and its current position in the marketplace. The cheque 21 Act, passed by Congress in 2003, allowed for a digital image of a paper cheque to replace it, therefore eliminating the need to physically deposit the cheque at a bank, and ultimately fostering the growth of Mobile RDC [7]. On the technology front, Mitek Systems was an early pioneer in image capture software and played a key role in the development of remote deposit in capture.

Initially, RDC was offered to customers or business owner via use of a home or office scanner. In 2006, USAA became the first bank to offer RDC to its customers use at home via a desktop scanner powered by Mitek Systems. The same year, USAA began offering Mobile RDC to their customers using iPhones. From that point forward, a small group of pioneering banks and credit unions began offering this technology to their customers.

Today, USAA, Chase, US Bank, and PNC are among the top banks offering Mobile RDC. In addition, PayPal, several regional banks including Rockland Trust; and several credit unions including Digital FCU also now offer Mobile RDC [7]. In the spring of 2011, two leading brokerage firms, Fidelity and Schwab, also launched the service.

The view among many leading banks is that the technology has become a "must have" capability that will enhance communication and engagement with their customers. Mobile RDC also represent an opportunity to attract new customers and potentially reduce operating costs as banks shift consumers from high-cost branch channels to the mobile banking channel.

5. OUR MODEL

We consider a scenario where a payer issues a cheque to a payee who is a customer of another bank. There are four role model namely payer, payee, cheque submitting bank (A) and cheque clearing bank (B) (see Figure 1). Here the payer issues a cheque to a payee. The payee submits that cheque using his smartphone in his servicing bank 'A', who submits that cheque for clearance to payer's servicing bank, B. If the cheque is cleared, funds are transferred from payer's account to payee's account.

The cheque clearance model has a protocol consisting of the following five steps:

1. Request for cheque book – A cheque book is given by the bank when a customer opens an account. Cheque is a set of values in a document. Whenever a cheque book is issued, the bank authenticates the payer.
2. Payer fills down the cheque details like pay to, amount, date and account number, then payer can issue cheque to a payee.
3. The payee can deposit a cheque in a bank as follows:
 - a) Payee enters the cheque details in the smartphone application which include cheque number and payee’s account number.
 - b) Attach the front and back picture of the cheque for further processing.
4. Verification of cheque – ACPS checks whether
 - a) The payee is an account holder in its Bank
 - b) Signature on the cheque is just above the “please sign above” quote
 - c) Date on the cheque is less than or equal to the current date.
 - d) Changes or corrections has been done on cheque.

The captured images and the data is authenticated and the encrypted data is sent to the clearing department and thereafter forwarded to bank B. Instead of a physical cheque, an electronic image of the cheque will be sent to the bank.

5. Clearance of cheque – The deposited cheque is submitted by Bank A to Bank B and Bank B clears the cheque and sends notification. Bank A sends a notification to the Payee. Following is the protocol:
 - a) Bank B verifies the cheque received.
 - b) Bank B checks is the received cheque is not duplicate one.
 - c) Bank B checks if the cheque amount on the cheque is lesser than balance amount in payer’s account.

If the above checks pass, Bank B deducts the cheque amount from payer’s account and send the updated balance statement to payer. Bank B sends a notification to Bank A stating success of cheque processing directing to credit cheque amount to payee’s account. In case of failure of any of the above checks, Bank B sends a signed failure message to Bank A.

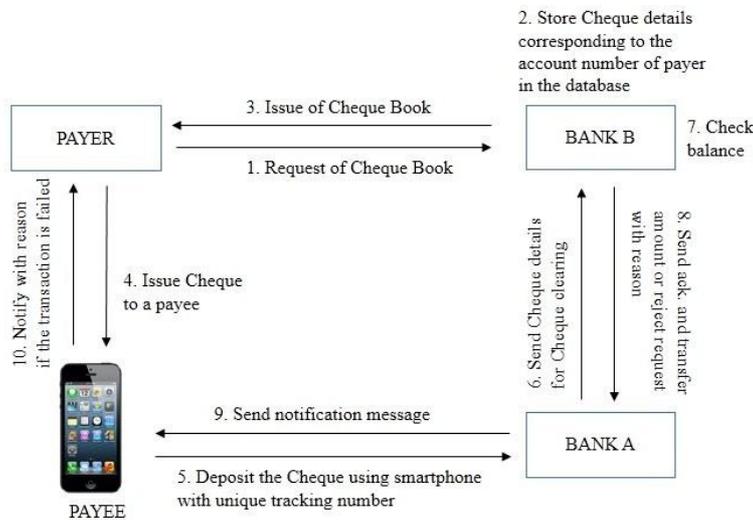


Figure 1: Model for cheque clearance system

6. EARLY DAYS OF MOBILE BANKING

To understand the mobile imperative for banks and other financial institutions, it is important to review where banks have come from in their mobile offerings and what they must strive toward in the future.

Mobile banking generally refers to the ability of an individual to use a mobile device to access their bank account to check balances, transfer money, and pay bills. In the late 1990’s, mobile banking was initially offered via Short Message Service (SMS). Banks moved to this format because consumers were quite familiar with, and had readily embraced, texting and instant messaging. In this early version of mobile banking, consumers could perform only limited banking activities. Today, many banks continue to also offer SMS-based mobile banking. Some of these applications include the ability to send an alert to a customer when they are approaching their overdraft limit [7]. SMS application can also enable banks to instantly alert customers to potential fraudulent activity.

As smartphones were developed that could support Wireless Application Protocols (WAP), banks began to offer their customers mobile banking via the mobile web. The development of the iPhone and Android operating systems has transformed mobile banking through the increased use of special programs for mobile banking, namely specific bank applications (apps) that have transformed mobile banking. As banks have come to recognize the importance of offering mobile banking as a key part of the customer relationship, they continue to offer their services via the dominant device protocols – Android, Blackberry and iPhone [7].

Consumers are becoming increasingly more sophisticated in their use of mobile banking services. At first, consumers used mobile devices to search for nearby ATMs and to check account balances. Today they are transferring money between accounts, making purchases. This increasing use of more sophisticated features reflects growing comfort with the technology and the desire for greater convenience.

7. STANDARDISATION OF CHEQUE FORMS

To facilitate MICR based Cheque Processing, instrument (smartphone) passing through clearing are required to be issued in standard format are defined size of 8" X 3 2/3" [6]. The instrument should be printed on MICR grade quality paper with a "read band" of 5/8" in width reserved at the bottom on which essential particulars occur in special MICR ink with the E-13B Font [6]. Cheques are printed by approved security printers forming part of a panel which is maintained by the Indian Bank's Association.

8. MICR CODE LINE STRUCTURE

The code line occurring in the Read Band is divided into five fields with distinct delimiters separating each field, the details of which are as under [6]:

1. Cheque serial number of six numeric digits preceded and followed by a delimiter. The alpha-numeric prefix to the serial number normally used by banks should be printed outside the code line in close proximity.
2. Sort field or the city/bank/branch code number consisting of nine digits followed by a delimiter. The first three digits represent the city, the next three indicate the bank and the last three digits signify the branch. The nine digit sort code is unique for any branch in the country.
3. Account number field consisting of six digits followed by a delimiter is an optional field. In the case of Government Cheques issued by RBI alone, the account number is of seven digits. The Government Account number is 10 digits in length-7 digits occurring in the Account number field and three in the transaction code field.
4. Transaction code field comprising of two digits in all instruments except Government cheques drawn on RBI which have a 3 digit transaction code. Control documents – batch and block tickets have a three digit representation in the transaction code field.
5. The amount field consists of 13 digits bounded on both side by a delimiter. The amount is encoded in paisa without the decimal point.

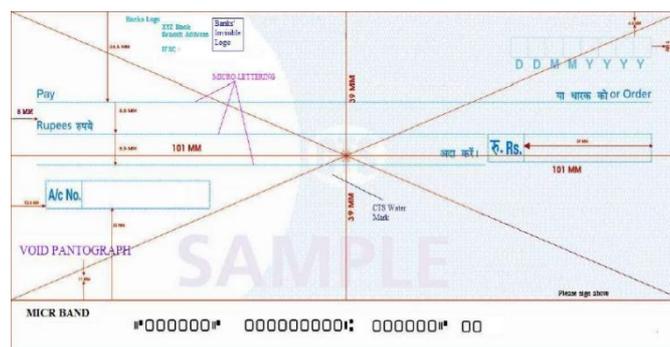


Figure 2 Sample Cheque

9. MICR CHEQUE PROCESSING EQUIPMENTS

The following are the MICR cheque processing equipment's [6]:

- *MICR Document Encoder* – The encoder is a table top machine which can print the code particulars of cheques and other payment instruments in magnetic ink on the 5/8" read bank at specified position.
- *Reader Sorter* – A reader/sorter is a device that reads the MICR encoded documents and sorts them to one of the many pockets as per the pre-determined sort pattern/programmer. Most reader/sorter can operate on off-line mode as well as on-line with a host computer.

- *Image Capture* – Image capture and image processing technology is a recent development processing by which the image of a payment instrument is captured simultaneously when it is processed on reader/sorter by adding an image capture module. The images so captured are stored on magnetic media for retrieval and processing.

10. IMAGE PROCESSING AND MICR EXTRACTION

The processing of cheque images requires a carefully designed workflow in order to capture an accurate MICR line and produce compliant TIFF images for both the front and read views of the cheque image.

Capture cheque images from mobile phone are captured as color or grayscale and compressed using JPEG compression. Back-end software functions process the input, if color, convert to grayscale using standard color for grayscale transforms [3]. They can iterative process will threshold the image, locate the cheque image, crop it from the background, and correct the skew and compensate for any trapezoidal image shape. The grayscale image may undergo this processing time until a good MICR read is obtained.

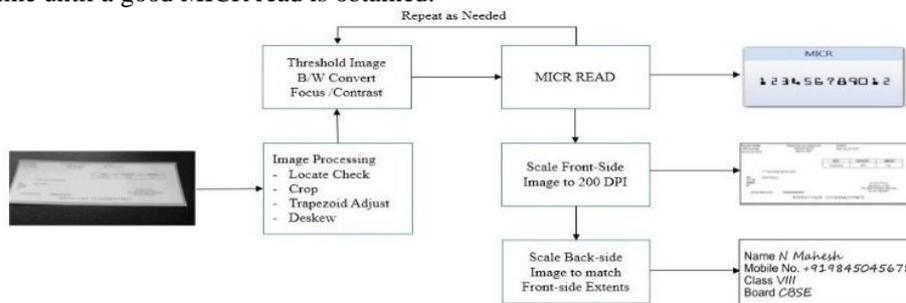


Figure 3: Image processing workflow

The conversion to black and white uses an algorithm that analyses the image content to determine the optimal threshold curve to produce a high quality black and white image. The threshold algorithm automatically compensates for poor focus and low contrast conditions in the image.

Once the OCR (optical character recognition) technology is used to read the MICR information from the image, the final step is to scale the image to a 200 DPI resolution [1], adjusting for any non-symmetrical resolution detected.

The rear images are processed in the same except that a resolution scaling is determined from the results of processing the front image, as there is no MICR information to process on the back. The result is an image exchange compliant TIFF image.

11. RISK-MANAGEMENT CHALLENGES TO BANK

Photo cheque deposit presents risks to a bank by extending payments processing outside its direct control, stepping out the “trusted zone” of bank-to-bank payments processing, where there are established policies, procedures, and internal controls [14].

Duplication Cheque Detection - When cheque are submitted to a bank teller, a paper check is easily removed from circulation. However, a cheque scanned by a smartphone device might not be taken out of circulation after conversion to a cheque image. The same paper cheque can be accidentally or intentionally submitted for deposit multiple times. Therefore, a robust duplicate detection mechanism for cheques deposited through all customer channels are needed for fraud prevention and cost containment.

Fraud Risk – Certain aspects of fraud can be elevated in photo cheque deposit environment for both consumer and corporate customers. One such fraud risk is the presentment of a counterfeit or altered item, which can be more difficult to detect as a scanned image [9]. Many of the cheque security features, such as watermarking and micro-printing in the signature line, can be eluded when the cheque is clicked.

12. RESULTS



Figure 4: ACPS scanning cheque

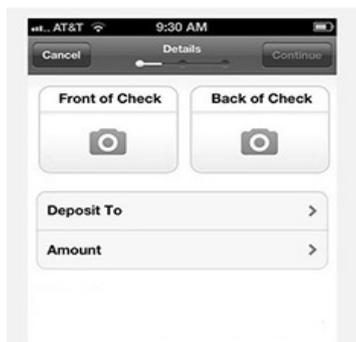


Figure 5. Cheque deposit account selection

13. CONCLUSION

Today's mobile-oriented consumers seek convenience in all aspects of their lives, and the management of their money is no exception. Reflecting this consumer priority, deploying mobile capabilities has become a critical competitive imperative for financial services providers. As financial services providers plan and develop their mobile banking programs to meet the demands of today's consumer, having the most relevant apps is critical.

In today's marketplace, where basic mobile banking functionality is quickly becoming table stakes, ACPS represents an opportunity for banks to increase relevancy with their customers, enhance engagement and communication, and stay at the leading edge of the mobile app. ACPS delivers that unique combination of real consumer utility and marketplace sizzle.

ACPS within an overall mobile banking offering provides banks with many attractive benefits. It:

- Attracts customers giving effortless transactions.
- Provides compelling economics to reduce operating costs.
- Reduces manual time consuming process and takes away any unwarranted human errors.
- Automated process eliminates any fraudulent risks.

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