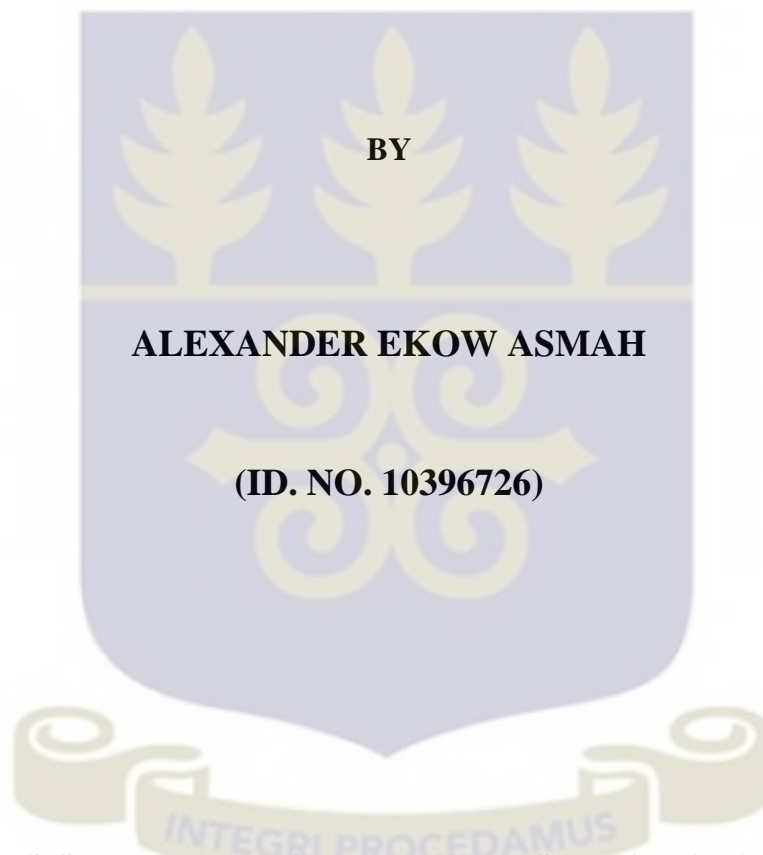


**UNIVERSITY OF GHANA**

**FACTORS THAT AFFECT BANKS' ACCEPTANCE OF ELECTRONIC  
CHEQUE CLEARING SYSTEM: EVIDENCE FROM GHANA**



**BY**

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**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN  
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MPhil  
MANAGEMENT INFORMATION SYSTEMS DEGREE**

**JUNE, 2015**

## DECLARATION

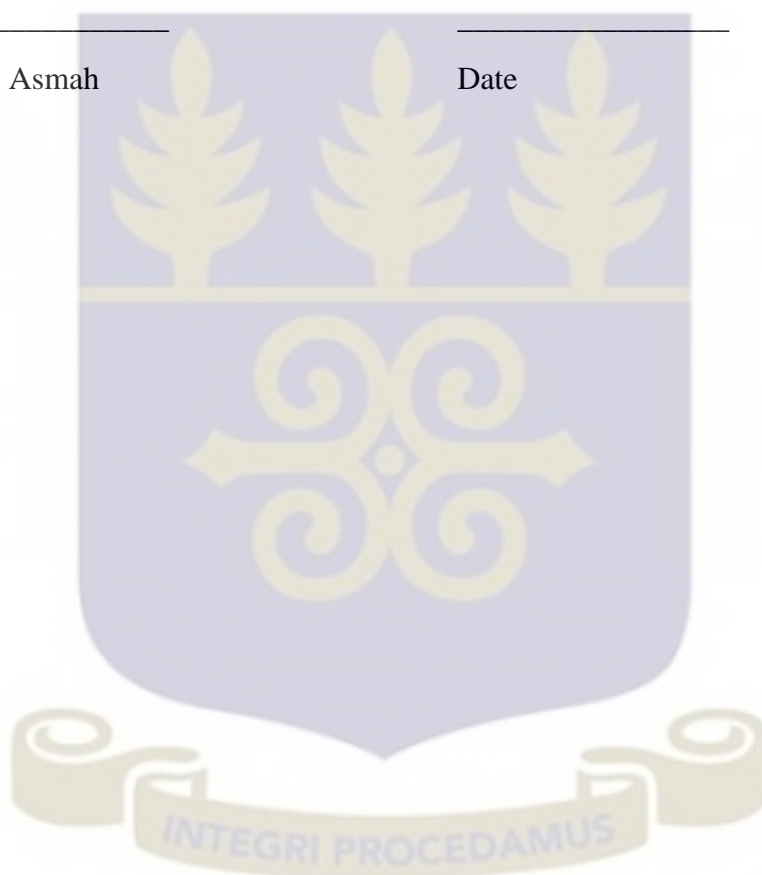
I do hereby declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been fully acknowledged. I bear sole responsibility for any shortcomings.

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## CERTIFICATION

I hereby certify that this thesis was supervised in accordance with procedures laid down by the University.

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Dr. Richard Boateng  
(Primary Supervisor)

Date

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Dr. John Effah  
(Secondary Supervisor)

Date



## **DEDICATION**

*To my dear wife, Juliet Abea Sasu*



## ACKNOWLEDGEMENTS

First and foremost, I give praise to the Almighty God for the strength and vitality He has endowed me with and for his divine favour in my life. I wish I could acknowledge all the people God put in my life to accomplish this dissertation, but the list is too long. Since I cannot mention everyone by name, I will express my gratitude to my family and friends for always believing in my abilities and for their encouragement throughout the journey of my educational pursuits. I couldn't have done it without them.

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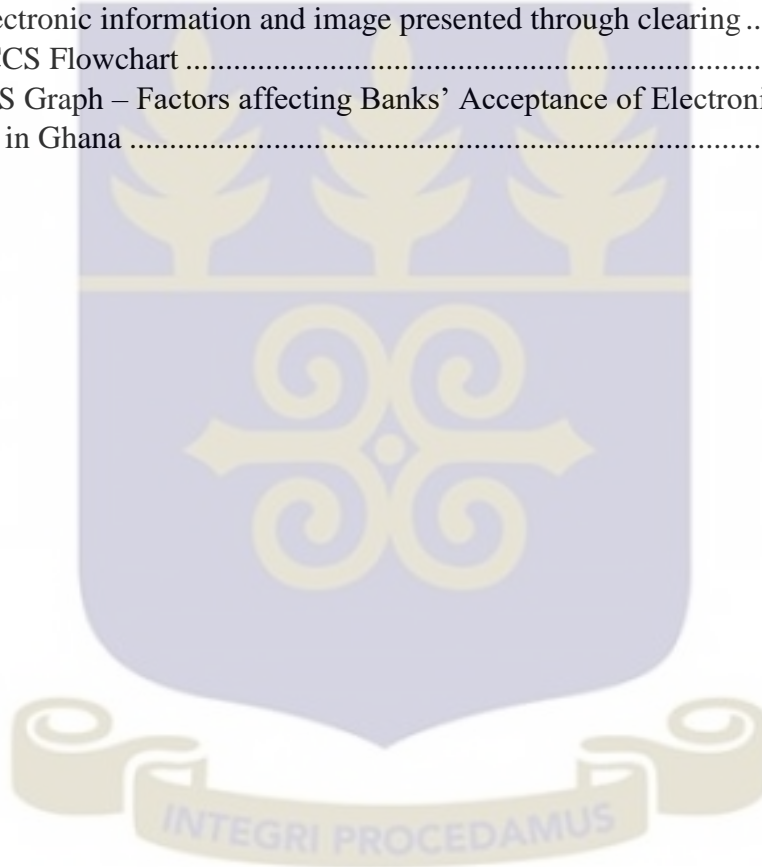
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## LIST OF ACRONYMS AND ABBREVIATIONS

Electronic Cheque Clearing System (ECCS)  
Technology Acceptance Model (TAM)  
System Quality (SQ)  
Information Quality (IQ)  
Structural Equation Modelling (SEM)  
Partial Least Squares (PLS)  
Perceived Usefulness (PU)  
Perceived Ease of Use (PEOU)  
Information Technology (IT)  
Cheque Truncating System (CTS)  
Automated Clearing House (ACH)  
Bank of Ghana (BoG)  
Magnetic Ink Character Recognition (MICR)  
Cheque Codeline Clearing with Cheque Truncation (CCC)  
Bank of First Deposit (BFD)  
Image Cash Letter (ICL)  
Bank for International Settlements (BIS)  
Real-time Gross Settlement (RTGS)  
Theory of Reasoned Action (TRA)  
Theory of Planned Behaviour (TPB)  
Diffusion of Innovation Theory (DOI)  
Critical Realism (CR)  
Ghana Interbank Payment and Settlement Systems (GhIPSS)  
Covariance-based Structural Equation Modelling (CBSEM),  
Linear Structural Relations (LISREL)  
Ghana Interbank Settlement (GIS)  
Point of Sale (POS)  
Mobile Money (MM)  
Clearing House Gateway (CHG)

Public Key Infrastructure (PKI)

Clearing House (CH)

Hardware Security Modules (HSM)



## ABSTRACT

Usage of Electronic Cheque Clearing System (ECCS) has been growing tremendously in many developed and some developing countries. Although cash is the major form of payment system used in most developing countries, with the current trend in value of cheques processed through ECCS, it is a matter of time for cheques to become the dominant payment system. With the upward trend in the adoption and usage of ECCS in many countries, it is important to study the nature of the technology and understand factors that influence banks to accept the system.

Past research in e-banking adoption and acceptance has directed attention towards e-banking channels other than ECCS and level of analysis used is usually focused on the individual rather than the organisation. The few studies on nature of ECCS have also shown jurisdictional differences in the application of the technology. This study addresses these research gaps by studying the nature of ECCS in Ghana and exploring banks' acceptance factors among Ghanaian Banks. The purpose of this research is therefore to understand the process of clearing cheques electronically in Ghana and to analyse and extend knowledge regarding influential factors that affect banks to accept ECCS, in the light of Technology Acceptance Model (TAM) which is expanded with System Quality (SQ), Information Quality (IQ) and Trust.

The researcher undertook the study from the perspective of critical realism, adopting a mix of qualitative and quantitative methodology to achieve the set objectives. The research examines 25 commercial banks and 5 savings and loans companies which have different ways of adopting the technology. To achieve the first objective, data was collected through interviews, observations and direct participation. To satisfy the second objective, a survey instrument was used to gather data and Structural Equation Modelling (SEM) using Partial Least Squares (PLS) was used as the statistical model to analyse the data gathered.

Findings suggest that cheques go through five set of processes before they are cleared electronically. These processes are Pre-Conversion, Conversion, Transaction, Security and

Storage. The pre-conversion process depends on the banks objective, whilst some banks centralise the process to reduce cost, other banks decentralise the process to enhance service delivery to customers. The remaining processes are the same across all banks in Ghana.

The findings also supported all the hypothesis presented and showed that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the major factors influencing banks' acceptance of the technology. Trust, IQ and SQ also affect banks' acceptance of ECCS positively but indirectly through PEOU and PU. The level of significance of PEOU was marginally lower compared to the level of significance for PU. The study therefore concurred with previous studies that in contexts where effective task execution substantially depends on the system such as the case with ECCS, beliefs about the system usefulness are more dominant in shaping acceptance than belief about ease of use.

The study concludes that business sectors should pay attention to the major role of organisational acceptance in determining the success of information system applications and makes a case for future research to focus on the perceived value of ECCS by banks customers' perspective.

The study makes significant contribution to acceptance of technology research by conducting the research on a meso level of analysis and studying a novel technology that is widely adopted in several countries. It provides an expanded TAM model which offers insight into acceptance of ECCS at the organisational level. The author makes a case for future research to validate the model at a different level of analysis and perspective.

## CHAPTER 1 INTRODUCTION

### 1.1 Research Background

Rapid technological advances during the last couple of years have changed the face of the banking industry considerably. E-banking evolved in the mid-1990s when the internet started gaining popularity. The internet served as an ideal platform for commercial exchange helping banks to achieve higher efficiency in financial transactions and strengthened customer relationships, promoted price discovery and ensured wider reach (Hawkins & Mihaljek, 2002). E-banking offers better opportunities to banks to expand their client base and rationalize their business while their customers receive value in the form of savings in time and money (Sreedevi, 2013).

Prior to the emergence of Information Technology (IT), traditional payment systems was mainly cash payments until cheques surfaced and became the major payment method used by individuals and corporations. Cheques are used increasingly to make purchases over the counter as well as to pay bills. Cheques are the most patronised non-cash forms of payments in Ghana, with about 96.8 billion cedis worth of it presented in 2014 (GhIPSS, 2015).

Cheques allow users to make payments for small as well as very large amounts at any time of the day, without needing to obtain cash. They also allowed users to pay bills without visiting physical locations designated by service providers such as utility companies and other major billers. Thus Cheque offers more choices regarding the time and location for making payments and, at the same time, reduces the risk of theft and loss associated with cash payments (Pasupathinathan, Pieprzyk, & Wang, 2005). In developing countries cheque continues to be the major payment model although the case may be different for some advanced developed countries with several payments options. Cheque payments are the preferred method for medium and high value transactions. This is mainly because it provides the payee an assurance

of guaranteed payment as the payments are generally made to the payee's account before goods or services are delivered to the payer.

Hitherto, clearing cheques drawn on different banks was tedious and time consuming as clearing houses required physical cheques from all banks to be sorted manually, perused and accepted by the various banks before values are transferred. This required that the cheques be physically moved from the collecting bank to the paying bank as part of the clearing process. With this practice, cheques were cleared using several days (Norman, Shaw, & Speight, 2011).

However the demands of new payment and clearing methods coupled with regulatory changes in banking are forcing clearing operations to move away from the traditional paper clearing stream to electronic data based and even electronic image exchange based route for quicker clearing and resultant accelerated deposits and returns (Calisir & Gumussoy, 2008). Nowadays, banks have made a compulsion for the use of Cheque Truncating System (CTS) to save much time and effort for depositing cheques.

Another interesting electronic clearing innovation, the Automated Clearing House (ACH), designed to provide a very low cost electronic payment mechanism, has been very successful in automating many types of recurring payments (Peterson, 2008). To make an ad hoc electronic payment over the ACH, for example, would generally have required a special trip to a full-service banking office during regular business hours. From the standpoint of timing and location for making such types of payments, the cheque was clearly a superior instrument for consumers and many types of businesses. Some recent innovations such as point-of-sale check truncation and electronic bill payment systems now provide interfaces between the ACH and consumers and businesses that may significantly stimulate the use of the ACH over the longer term.

Electronic Cheque Clearing system is a payment innovation that has been introduced in developing countries considering the fact that payments innovation is a critical driver of economic development and is influenced by banks, non-banks and regulators (Weichert, 2008).

Cheques have historically constituted a major segment of non-cash payment instruments in Ghana. The Bank of Ghana (BoG) continues to play a catalytic role of ensuring efficiency, reliability and timeliness in the clearing of cheques. In the late 1990s, the Bank introduced the Magnetic Ink Character Recognition (MICR) technology and the standardization of paper payment instruments to enable the semi-automation of cheque clearing in the Accra Clearing zone in 1997 (GhIPSS, 2011).

The problems associated with the manual clearing systems in Ghana and the determination of the BoG to improve cheques clearing led to the decision to migrate to Cheque Codeline Clearing with Cheque Truncation (CCC) under new Rules published by BoG. Ghana moved away from the traditional paper based clearing into the electronic clearing in 2010.

There is a heightened need especially in Africa to study the process of cheque truncation and assess the determining factors of banks' acceptance and the challenges facing parties arising from the technologies used.

## **1.2 Problem Statement**

Bank cheques are still widely used for financial transactions all over the world. Huge volumes of cheques are manually processed every day. The widespread use of bank cheques in daily life makes the development of cheque processing systems of fundamental relevance to banks and other financial institutions. Bank transactions involving cheques are still increasing throughout the world in spite of the overall rapid emergence of electronic payments by credit cards (Talele & Nalbalwar, 2011). Following the proliferation of IT in the banking sector, bank customers

today can access, through a variety of channels, sets of powerful tools which allow them to conduct analyses, make decisions and enact financial transactions from their homes, offices or elsewhere (Hoehle, Scornavacca, & Huff, 2012).

There are clear evidences of the introduction of e-banking systems which have failed to achieve the intended benefits especially in Ghana. For instance E-Zwich was introduced prior to ECCS, but statistical evidence (Bank Of Ghana, 2015) and literature suggest that the patronage has waned drastically since its introduction in 2008 (Agyeiwaah, Anane, Appiah, & Opoku-Ware, 2014; Antwi, Hamza, & Bavoh, 2015). Both Agyeiwaah *et al.* (2014) and Antwi *et al.* (2015) identified some factors that hindered the succesfull implementation of the technology in the country. It is on this premise that the study seeks to explore the factors that influence banks to accept ECCS which was also introduced by the central bank to reduce the usage of cash as a payment system.

Many studies published on e-banking are mostly related to e- banking adoption and acceptance, security and risks of e- banking system (Gikandi & Bloor, 2010; Haghghi, Divandari, & Keimasi, 2010; Subsorna & Limwiriyaikulb, 2012; Hoehle). Focus has also been centred on either the final consumer of the e-banking service or the service provider (Banks) (Kardas & Papathanasiou, 2001; Sohail & Shanmugham, 2003; Calisir & Gumussoy, 2008; Mishra & Bisht, 2013; Kaur, 2013). Thus most of the current literature on e-banking direct their focus towards e-banking systems other than the ECCS which is widely used especially in developing countries. Again, the level of analysis used in technology acceptance research is usually conducted at the individual or the micro level (Legris, Ingham, & Collerette, 2003; Kripanont, 2006; Park & Chen, 2007; Lin, Fang, & Tu, 2010). The individual's acceptance factors have been widely discussed applying different technologies.

This study seeks to close this gap by studying the widely used but scarcely researched technology and conducting a meso level analysis, studying the factors that affect banks' acceptance of ECCS.

Limited number of studies have been conducted in an attempt to understanding ECCS (Jersat, 2007; Al-Shibly, 2011; Alsoof, Al-Dmour, & Al-Shibly, 2011). Al-Shibly (2011) studied users' acceptability using an adapted model of TAM and revealed that with ECCS, beliefs about the system's usefulness are more dominant in shaping user satisfaction than beliefs about Ease of Use. The study indicated the need for further research to consider Trust and User satisfaction as influential factors in determining user acceptance of ECCS. This limitation was partially solved by Alsoof *et al.* (2011) who explored ECCS success by including User satisfaction as an influential factor. Unlike the study by Al-Shibly (2011), Alsoof *et al.* (2011) studied the effects of system and information quality on user satisfaction. The study revealed that the greater the perceived system quality of ECCS, the higher the ECCS success, agreeing with earlier study by Rai, Lang, & Welker, (2002). There is therefore the need to empirically study ECCS acceptance using Trust as an influential factor.

Previous studies on the subject used conventional regression methods to analyse data gathered given the relatively small size in both studies. More versatile and powerful statistical techniques such as structural equation modelling (SEM) which is optimized for large samples of over 250 responses (Starub *et al.*, 2005) may provide another level of analysis which will provide better insight into the topic.

Efforts have also been made by other researchers in recent years to model the ECCS in various countries (Khiaonarong, 2000; Jersat, 2007; Al Shibly, 2011; Sreedevi, 2013) which have indicated that the model applied in countries vary considerably. For example, Sreedevi (2013) modelled the ECCS in India which is different from the model adopted by banks in Thailand

as studied by Khiaonarong (2000). In Africa, arguably no attempt has been made in the literature to model the ECCS process making this study necessary. These model differences in the truncation process in these jurisdictions thereby necessitate the need to investigate the nature and model of cheque truncation in Ghana and assess the benefits and challenges to the model.

### **1.3 Research Purpose and Questions**

From the research problem and the research gaps, the primary purpose of this research is to analyse and extend knowledge regarding influential factors that affect banks' acceptance of ECCS, in the light of technology acceptance model (TAM), to develop a model that can be used to analyse organisational acceptance in the context of developing economy such as Ghana, and also understand how Trust affects banks' decision to use ECCS.

Base on the research purpose, the study addresses two research questions as follows:

1. What is the nature of clearing cheques electronically in Ghana?
2. What are the critical determinants of Banks' acceptance of Electronic Cheque Clearing System?

### **1.4 Research Method**

The research employs the mixed method to fully achieve set objectives. To achieve the first objective, the study uses a combination of interviews, observation and direct participation. The study uses other secondary document to support or confirm the results from the interviews.

To achieve the second objective the study uses a survey instrument to gather the needed data from the respondent. Structural Equation Modelling (SEM) using Partial Least Squares (PLS) is used as the statistical model to analysis the data gathered.

## 1.5 Chapter Outline

Chapter one covers the introductory part of the study, which includes the background to the study, the research problem, research purpose, questions and significance of the research.

Chapter two goes a step ahead to past research work on ECCS. Inclusive in this chapter is the explanation of the various concepts related to the topic under study. Theoretical and conceptual issues necessitating the need for the study are discussed under this section. Gaps in past literature are identified to guide the study and future research.

Based on the review in chapter two, chapter three discusses the theoretical framework of this study, providing the hypotheses used. There after chapter four expands on the methodology for the study. This includes the research paradigm, research method, data collection method, sample size, population.

Chapter five provides an overview of e-banking in Ghana focusing on ECCS, as well as a brief background of the payment systems in Ghana.

Data collected is analysed using appropriate multivariate techniques and thematic analysis in chapter six. Also a discussion on the findings; thus interpretation of the data provided and linkage to existing literature is made, which provides a basis for the conclusion in chapter seven. Chapter seven which is also the final chapter highlights on the implication of the study to practice, policy and research. Future research directions are also highlighted.

## **CHAPTER 2 LITERATURE REVIEW**

### **2.1 Introduction**

The previous chapter provided an overview of the entire research, providing the background to the research, discussing the problem statement, the purpose and the research method. This chapter reviews contemporary and pertinent literature on ECCS and e-Banking. This chapter begins by providing an overview of the ECCS phenomenon by discussing the general foundation of ECCS which includes its nature and process, models, types and benefits. A rigorous review of ECCS research was conducted to reveal current knowledge gaps and openings for future research, taking into consideration issues and evidences from other geographical locations as well as theoretical and conceptual coverage. The result of the review helped to uncover areas concerning ECCS that require further research.

### **2.2 Overview of e-Banking**

The advancement in IT and the advent of the Internet have resulted in various business activities and services to be conducted online, which is popularly known as e-commerce. It is in this situation that the quantity of cross-border and financial activities have increased dearly. One business institution that has taken great advantage of these technologies and the internet are banks hence the term electronic banking. E-banking has therefore gained the interest of both practitioners and academics. E-banking generally is the process of conducting banking activities using electronic media (Habibi & Sara, 2014). It enables customers to perform transactions through personal computers by simply connecting to the bank's website (Jagtap, 2013).

Miranda, Cortés, & Barriuso, (2006) reasoned that there are two different strategies for internet banking. On one hand, is existing banks with physical offices who can implement internet banking as an additional channel to reach their customers. This is an advantage for banks and

customers alike in that, the banks are able to afford other services that the customer may need to be satisfied directly which can be addressed through e-banking. And on the other hand, is an internet only bank or virtual bank without any physical offices. They do all their banking online. The advantage with this kind of banking is that the banks are able to operate on low cost since no physical locations is required. This means lower cost to the customers through lower interest rates on loans and credit cards.

### **2.3 Cheque Truncation System / Electronic Cheque Clearing System**

Sreedevi (2013) defined CTS as an online image based cheque clearing system where cheque images and Magnetic Ink Recognition (MICR) data are captured at the collecting bank branch and transmitted electronically without the actual cheque movement of physical cheques. Al Shibly (2011) also defined the automatic clearing of a bank cheque as the extraction and recognition of handwritten or user entered information from different data fields on the cheque such as courtesy amount, legal amount, and date. Given the definitions cited above, it can be gathered that ECCS involves the process of capturing bank cheques electronically and transmitting them to other banks without physical movement of the cheques.

Electronic Cheque Clearing System (ECCS) also known as the Cheque Truncation System (CTS) involves the process of inter-bank cheque settlement by using both cheque electronic records and scanned copy of the cheque (Pasupathinathan *et al.*, 2005). Once the teller in the bank of first deposit (BFD) receives the cheque item, the scanned copy is sent to the paying bank through central bank to be technically and financially cleared through high speed secure connection lines, the reply for that action to pay or reject the cheque is generated from the paying bank to the central bank and then sent back to BFD (Jresat, 2007).

Generally, Cheque truncation is the process in which the physical movement of cheque within a bank, or between banks and clearing house is replaced by electronic records. Implementation

of CTS usually brings all the participating banks to a common platform in the cheque processing operations. Cheque truncation is one of the ways to compress the clearing cycle to provide faster clearances of local and intercity cheques (Sreedevi, 2013). The system enables banks to enjoy greater efficiency and provide better service to their customers.

Cheques are written orders from account holders instructing their banks to pay specified sums of money to named beneficiaries (Hancock & Humphrey, 1998). When customers deposit their cheques to the collecting banks, the scanned copy is sent to the paying bank through the central bank to be technically and financially cleared through high speed secure connection lines. The digital image can also be transferred through a data link, CD-ROM or cartridge (Madasu & Lovell, 2005; Pasupathinathan *et al.*, 2005). The collecting banks or the clearing house will capture the transaction electronically and transmit the transaction as part of the transmission of the digital images. The centre of the cheques clearing process is the clearing house, central bank, monetary agency. The role of these institutions is to verify the cheque clearing process and enforce financial procedures, regulations and laws, as well as to monitor and follow up their implementation (Alsoof *et al.*, 2011).

Truncated cheques will then be presented to the drawee's bank electronically for verification. The reply for that action to pay or reject the cheque is generated from the paying bank to the central bank and then sent to collecting bank for final payment to the customer (Jresat, 2007). The physical cheques are kept at the collecting bank or the clearing house although the drawee bank may still be able to examine it in order to make payment decisions.

There is no change to the traditional practice pertaining to the writing of cheques by payers, the deposit of cheques by payees, the schedule of making funds made available by banks and returning of unpaid cheques to payees.

## **2.4 Participation Models**

According to Akshatha (2013) there are two modes in which banks may participate in CTS which are the Direct and Indirect Membership.

### **2.4.1 Direct Membership**

A Bank may participate as direct member provided it has a settlement account with the settlement bank and have put in place necessary infrastructure for participating in CTS.

### **2.4.2 Indirect / Sub-membership**

A Bank may become sub-member / indirect member of the direct members by using the infrastructure and / or settlement services of the direct members. The settlement for such indirect / sub-member could be done either directly (if such banks have settlement accounts with the settlement bank) or through the direct member through whom they are participating. For instance in some countries with many licensed banks, savings and loans and other financial service institutions are not given license to participate in the clearing house. As such these institutions in order to clear their cheques, become sub-members by clearing their cheques through the licensed banks.

## **2.5 Truncation Models**

There are generally three main models that explain the cheque truncation process flow (Sreedevi, 2013). The selection of any of the models is usually decided by the central bank or the clearing House, and all participants are required to follow.

### **2.5.1 Image Cash Letters**

A traditional cash letter is an inter-bank transmittal letter that accompanies paper cheque items sent from one financial institution to another. In the simplest case, the cash letter contains

cheque that were deposited in the sending institution (Bank of Deposit) and drawn on the receiving institution. The financial institutions would settle on the total amount of the items as summarized in the accompanying cash letter.

With the introduction of the electronic cheque clearing system the Image Cash Letter (ICL) is now an electronic document which includes images of the items instead of the original paper items. The presenting bank in the clearing process transmits both the images and the list of cheques (known as cash letter) deposited and drawn on the paying institution (Sreedevi, 2013).

With ICL services, bank branches and companies can gather a large number of cheque images together with associated data into a structured file that can be transmitted to an electronic deposit (Bills, 2006).

### **2.5.2 Image to Follow**

Unlike the process flow for image cash letters where the collecting bank sends both the cheque images along with the cash letters, with this model the data flows to the paying bank and the images follow after the data has been transmitted (Sreedevi, 2013).

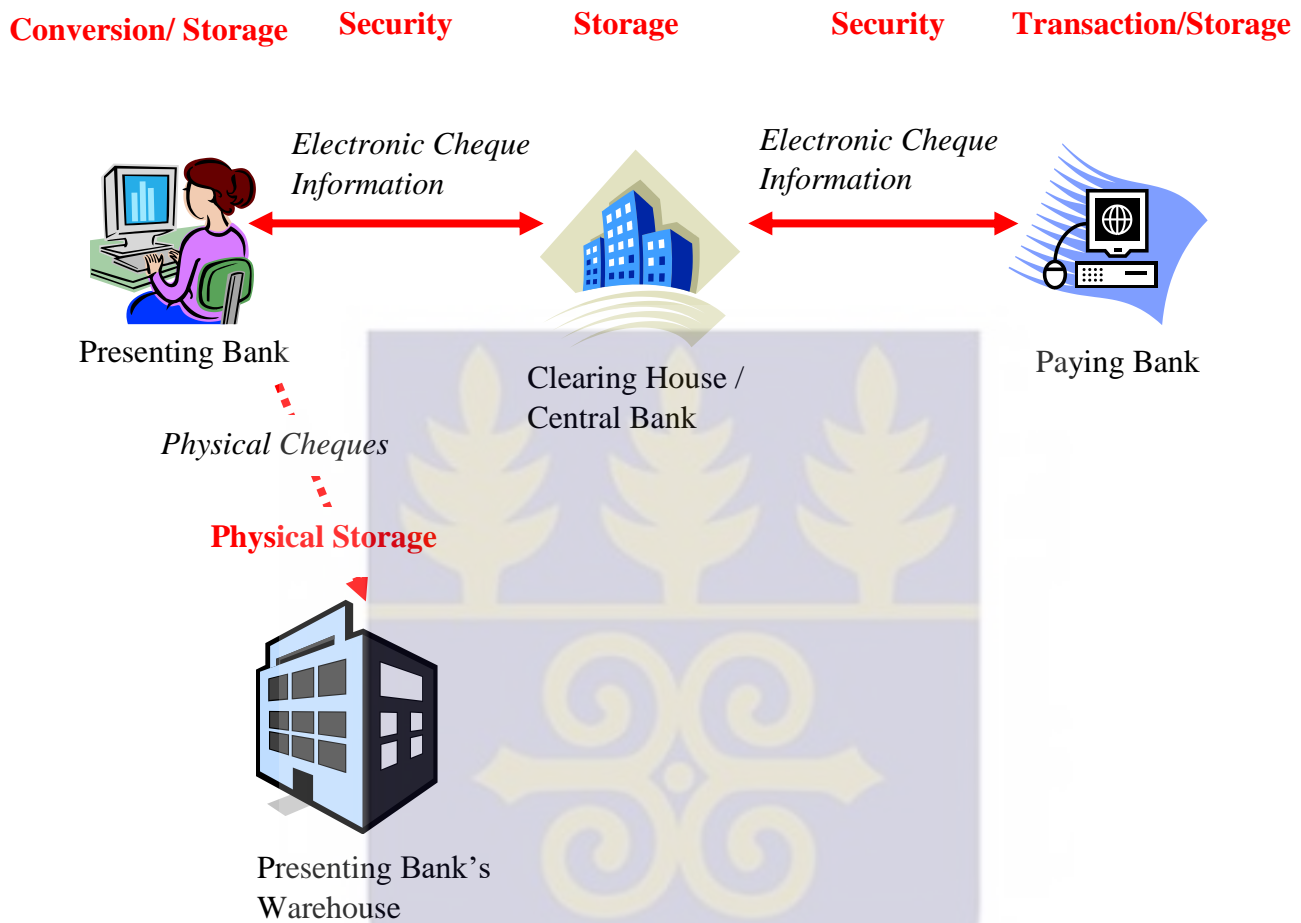
### **2.5.3 Image on Request**

Under the Image on request model of truncation, payment is based on data and the paying bank can selectively request images of the cheques for verification if needed.

## **2.6 Typical Cheque Truncation System**

The detailed structure of the electronic cheque clearing system usually is different from bank to bank. In general, the receiving bank is required to scan all incoming paper cheques into digital representations using appropriate scanning equipment and software programs. The electronically scanned cheques should not only capture the image of the cheque, but also other

crucial information such as the account number, amount are required to be captured and added to the image cash letters which would be secured transmitted along with the image.



**Figure 2.1 Cheque Truncation Model**

### 2.6.1 Conversion

The first step in the cheque truncation system is to produce an electronic representation of the physical cheque (Sreedevi, 2013). When a customer deposits a cheque at a local teller branch of his or her bank, the cheque is scanned and read. Essential information such as the account number, the payee's name, and the amount are captured (Bills, 2006) along with the front and back images of the check. Together, these elements make up the electronic cheque, which is sent to the bank's processing centre for the next step in the cheque truncation system.

### **2.6.2 Transaction**

The next step in the system is to digitally send incoming electronic cheques through the web from the receiving bank to a central clearing-house usually managed by the central bank. There, incoming cheques from receiving banks are sorted immediately and made available for the paying banks to download. After downloading an electronic cheque, the paying bank must verify whether the cheque is indeed valid (Jresat, 2007). Details such as signature is verified, funds availability is also verified before confirmation of payment is made. When confirmed as valid, the paying bank will go on to debit the drawer's account. Mostly the clearing house rule is to pay unless the paying bank issues a return ticket. A return ticket is usually issued in the case of invalid account, insufficient funds, mismatch in signature etc.

### **2.6.3 Security**

The security of information and data is crucial in all information systems. Information security is the practices, procedures and technology put in place to ensure that information is safeguarded from modification or accidental change (integrity), unauthorized access (confidentiality), and is readily available (availability) to authorized users on request (Drtil, 2013).

The process of sending digital data must be protected due to fraud and other risks. Many different types of security measure can be taken. It is important that the central clearing-house has a secure website protected by advanced encryption mechanisms where banks can register and access. The security of the process flow is tightened due to the financial nature of bank transactions to prevent unauthorised access to cheques and cash letters in either the transmission process or at the various banks (Sreela, Kumar, & Binu, 2014).

To increase security, it is ideal to build a private separate network just for the electronic clearing system. Though this network offers more security, it also comes with greater costs. New network cables will have to be installed between the central clearing-house and each participating bank's processing centre. The greater the distance in-between, the more manual labour and raw materials are required (Daya, 2009). As a result, the implementation of this network can result in a tremendous construction project. However, the biggest flaw of this methodology is its high vulnerability. If anyone with malicious intentions tries to destroy the payment system, it is easier for them to seek out which cables are responsible for the communication.

The most commonly used security is the Public Key Infrastructure (PKI) where transmitter digitally signs the message and the documents being transmitted. PKI can be used over the internet which makes it cheap. It enhance security, safety and non-repudiation of data / images, end-to-end (Sharma, 2014).

#### **2.6.4 Storage**

After an electronic cheque is created, the original paper cheque is no longer needed. The depository bank can either store it in its storage warehouse or return it to the customer along with his monthly statement. Certainly, if kept in the warehouse, a paper cheque can only be stored for a limited amount of time or the bank will run out of space in its warehouse. The amount of time that paper cheque must stay in the warehouse is determined by the regulatory authority. If no regulations exist on this matter, then it is up to the bank to decide how to store its paper cheques.

Similarly, each depository bank must deal with the storage of its electronic cheques as well. Each electronic cheque will be stored in the bank's virtual database for a certain amount of time. The exact length is usually determined by regulation.

## 2.7 Automatic Processing of Handwritten Bank Cheque Images

In many countries, the present cheque processing procedure requires a bank employee to read and manually enter the information on a cheque (or its image) and also verify the entries such as signature and date (Jayadevan, Kolhe, Patil, & Pal, 2012). Relying on the technology of Pattern recognition, document analysis and biometrics, recent literature (Madasu & Lovell, 2005; Talele, Nalbalwar, & Rane, 2011; Feng, Ren, Zhang, & Suen, 2014; Mehta, 2010) makes attempt to study the possibility of reviewing bank cheque automatically without manual intervention in order to streamline the process flow, save cost and time and prevent errors. As a large number of cheques have to be processed every day in a bank, an automatic reading system can save much of the work. Even with the success achieved in character recognition over the last few decades, the recognition of handwritten information and the verification of signatures present on bank cheques still remain a challenging problem in document image analysis. Mehta (2010) explained that automatic bank cheque processing systems are also needed to counter the growing cheque fraud menace.

The automatic processing of a bank cheque involves extraction and recognition of handwritten or user entered information from different data fields on the cheque such as courtesy amount, legal amount, date, payee and signature. This is a formidable task and requires efficient image processing and pattern recognition techniques. The only two fields on a cheque that can be processed automatically with near perfect accuracy by character recognition systems are the account number and the bank code as they are printed in magnetic ink (Madasu & Lovell, 2005). The other fields may be handwritten, typed, or printed; they contain the name of the recipient, the date, the amount to be paid (textual format), the courtesy amount (numerical format) and the signature of the person who wrote the cheque. The multiplicity of handwriting styles although easily recognized by the human brain, is too difficult for electronic systems (Coelho, Batista, Teixeira, & Cardoso, 2008).

## 2.8 Benefits of Electronic Cheque Clearing Systems

Moving away from the traditional forms of clearing to the ECCS offers some benefits to all parties involved. This section discusses some of the benefits to the banks.

**Cost Saving:** Humphrey & Hunt (2013) analysed the cost saving in the US since adopting the electronic cheque clearing system and posited that by shifting to electronic cheque payment system, Federal Reserve per item cheque processing costs fell by over 70%, reducing estimated overall U.S. payment system costs by \$1.16 billion in 2010. Payment collection times and associated float fell dramatically for collecting banks and payees with consequent additional savings in firm working capital costs of perhaps \$1.37 billion and indebted consumer benefits of \$0.64 billion. For financial institutions, reduction in the number of staff required in processing cheque is a major cost saving as most of the streamlined process work are now being done by the system under strict regulations (Sreela, Kumar, & Binu, 2014).

**Faster Clearing Cycle:** Moving from manual clearing towards electronic cheque clearing systems saves time for customers (Akshatha, 2013) and enhances the efficiency of the clearing process (Al Shibly, 2011) by the banks and other financial institutions involved (Balakrishnan, 2010). The adoption of ECCS have reduced the number of days required to clear cheques from more than seven days to three days and in some cases one day (Khiaonarong, 2000; Norman *et al.*, 2011).

**Cheque Standardisation:** To facilitate MICR based Cheque Processing, instruments passing through clearing are required to be issued in standard format and definitive size (Mittal, 1999). Security features are required to be harmonised to assist verification by other banks in the clearing process and to reduce the incidence of cheque misuse, tampering and alterations. The use of unstandardized cheques was sometimes mishandled by a magnetic-ink character recognition machine and created system errors (Khiaonarong, 2000).

**Faster Cheque Tracing and Statement Re-Creation:** In the traditional cheque clearing environment, cheques were stored centrally on microfilm. Branch staff send trace requests to a central location, and the result is sent back to the branch to be passed on to the customer. Cheque statement re-creation requests are dealt with in much the same way, except they require more research by the data centre. With imaging, all cheques will be imaged and stored in an electronic archive. Front-line staff will be able to perform searches from an in-branch terminal and immediately print a hard copy showing both the front and the back of the cheque. Statement re-creation will be faster as well. Cheque images are stored both by the clearing house, the paying bank and the receiving bank. This means that in the case of any eventuality on any side the images and the cash letters can be retrieved easily for either the other bank or the clearing house.

**Signature verification software:** Today, due to large volumes and manual processing, only a small percentage of the signatures on cheques are actually reviewed by financial institutions. Digitized images will allow for the use of software applications that compare signature profiles systematically against signatures on cheques (Madasu & Lovell, 2005; Talele & Nalbalwar, 2011).

**Embedded verification:** Another potential fraud reduction service involves encrypted codes representing critical information printed on cheques, for example, in bar code or an encrypted seal. Paying financial institutions would be able to match encrypted codes with the cheque image, and intercept altered cheques faster than is possible today (Sreela, Kumar, & Binu, 2014).

## **2.9 Electronic Interbank Payments Models**

According to Chiu & Lai, (2007), there are three main types of interbank payments systems: net settlement systems, gross settlement systems, and correspondent banking.

### 2.9.1 Net Settlement Systems

*Net settlement* is a payment settlement system between banks, in which a vast number of transactions are collated and offset against each other, with only the net difference being transferred and paid by banks. In other words the participating banks exchange huge sums during the business day and make settlement of net balances at the end of day (Angelini , Maresca, & Russo, 1996).

A clearinghouse acts as an intermediary and collects good funds from due-to banks and releases good funds to due-from banks. Final settlement occurs when the clearinghouse has successfully completed this process. The primary reason that net settlement systems exist is to reduce the cost to settle a given value of payments. If banks had to settle payments individually, they would on average need to hold more reserves (Chakravorti, 2000).

The clearing institution normally completes its daily summarization process and transmits net transfer information to the settlement institution after the cut-off time of the settlement institution. This means that the transfer of funds to the account of the beneficiary bank will be delayed by one business day.

On the economic aspect, the accumulation of huge number of unsettled payments can generate considerable credit exposures among members of the payment system. Moreover, the largest risk in a netting settlement system is the risk that the failure by one participant to fulfil its obligations will lead to a system crash, which is known as the systemic risk (Angelini, *et al.*, 1996; Chakravorti, 2000). The increase of systemic risk in Daily Net Settlement (DNS) systems due to the increasing value of interbank transfers has been a constant concern for monetary authorities. The Bank for International Settlements (BIS) has therefore recommended the adoption of real-time gross settlement (RTGS) systems for large-value transfers (Penaloza, 2009).

### **2.9.2 Real Time Gross Settlement Payment Systems**

Real Time Gross Settlement (RTGS) payment systems have replaced the netting systems around the world in the recent decades. A real-time gross settlement system is a payment system in which all payments take the form of transfers of central bank funds from the account of the paying bank to the account of the receiving bank. In contrast, under net settlement system, payment messages are exchanged continuously, and participants' net positions vis-a-vis all other participants are settled on a periodic basis, usually at the close of business (Kahn & Roberds, 2001).

RTGS uses very advanced hardware, software and communications technology and is based on the processing and settlement of a payment transaction on a real time continuous basis (Khiaonarong, 2000).

As banks could make payment orders at any time during a business day, comparing with the net settlement payments system, the RTGS payment system takes the advantage, for which transfers are settled individually, and the system effects final settlement continuously but not periodically. Hence, it prevents the sizeable credit exposures between banks, and the credit risk to receiving banks is at least reduced or even eliminated (Chakravorti, 2000). This, however, comes at a higher demand for liquidity. To prevent the credit and liquidity risk, in almost all RTGS systems, central banks provide intraday credit to participating banks. The terms for such credit vary from system to system, though in most cases, credit is only available in limited amounts or at some cost. In some systems, interest is charged for intraday credit, usually at an administered rate rather than at a market rate. Collateral of various types is often required before credit can be granted (Kahn & Roberds, 2001).

### **2.9.3 Correspondent Banks**

A correspondent bank is a bank that regularly performs services for another financial institution which is usually located in another country. Typical services include handling out of area cheques, trusts and technical services. Overall, a correspondent bank is one that backs up the limitations of a smaller bank, a foreign bank, a merchant bank, or any other financial institutions that would need to “farm out” certain procedures, or services not available at the respondent bank. Many Community banks clear out-of-town cheques through reserve accounts at larger banks (Naughton & Chan, 1998; Al Abbadi, *et al.*, 2011).

Correspondent banking allows foreign banks to conduct business in the home country and provide services for their customers in areas where the bank does not maintain a physical presence. In a nutshell, foreign banks open correspondent accounts with local banks to avoid the expenses of operating a local bank.

### **2.10 ECCS Research**

This section discusses the various issues discussed by researchers on ECCS to suggest conceptual gaps for the study and future research. An attempt is also made to classify ECCS literature and discuss the trending issues on the subject. To achieve this aim, the researcher reviewed journal articles on the topic and classified the trending issues into themes. The four major themes identified include Users Acceptance, Nature of Cheque Truncation System, Automatic Cheque Processing and ECCS Security.

Many studies published on e-banking are mostly related to e- banking adoption and acceptance, security and risks of e- banking system (Gikandi & Bloor, 2010; Haghighi, Divandari, & Keimasi, 2010; Subsorna & Limwiriyakulb, 2012; Hoehle, Scornavacca, & Huff, 2012). Focus has also been centred on the final consumer of the e-banking service (Kardas & Papathanasiou, 2001; Sohail & Shanmugham, 2003; Calisir & Gumussoy, 2008; Mishra & Bisht, 2013; Kaur,

2013) with very little attention on the back-end processes that deliver the service. This is probably because banks thrive on confidentiality as such research into their processes is extremely difficult to conduct. Researchers usually focus their attention on customers who are easily accessible. Considering that the entire ECCS process is a bank-end process of a bank, this research contributes to knowledge by explaining the processes used by banks.

### Major Themes in Electronic Cheque Clearing System Research

Themes	Studies
Acceptance of ECCS	Al Shibly, (2011); Alsoof, Al-Dmour, & Al-Shibly, (2011)
Nature of ECCS	Akshatha, (2013); Sreedevi, (2013) Khiaonarong, (2000); Sreela, Kumar, & Binu, (2014)
Automatic Cheque Processing	Madasu & Lovell, (2005); Madasu & Lovell, (2005); Mehta, Sanchati, & Marchya, (2010); Talele & Nalbalwar, (2011); Talele, <i>et al.</i> , (2011)
Security in ECCS	Sreela <i>et al.</i> , (2014); Gjomemo, Malik, Sumb, Venkatakishnan, & Ansari, (2014);

**Table 2.1 Major Themes in ECCS Research**

#### 2.10.1 Automatic Cheque Processing

Literature in Automatic cheque processing has discussed the various ways to reduce human efforts in the cheque truncation process, enhance efficiency and streamline the operations. Talele & Nalbalwar (2011) explained that with automatic cheque processing the incidence of signature forgery can be reduced in the ECCS. Considering that the amount of cheques processed by banks using the ECCS is so much, the manual process of reviewing all signatures before payments may be tedious. In this case several instances where an individual has forged the signature of another person and provided a self-cheque to himself will be observed. They proposed a mechanism for recognition of cheque fields, like name, amount and also verify the signature and its authenticity with an acceptance rate of 85% and rejection rate of 15%.

Like Talele & Nalbalwar (2011), Mehta *et al.* (2010) recognised the widespread use of bank cheques in daily life which makes the development of cheque processing systems of fundamental relevance to banks and other financial institutions. They explained that bank transactions involving cheques are still increasing throughout the world in spite of the overall rapid emergence of electronic payments by credit cards. They further highlighted that, fraud committed in cheques are also growing at an equally alarming rate with consequent losses and recommended automatic cheque processing systems not only to counter the growing cheque fraud menace but also improve productivity and allow for advanced customer services. They also developed a system with the main emphasis on recognition of skilled forgery, and approach which could only process the cheques of a particular bank.

### **2.10.2 Security In ECCS**

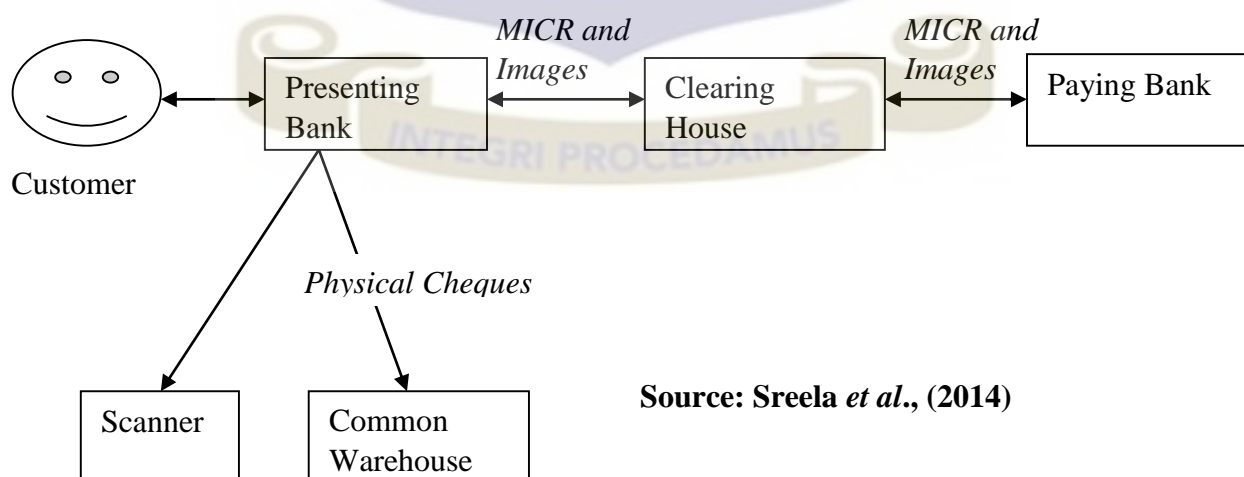
Concerning security in the cheque truncation systems, attempts have been made in literature to study and understand ways images can be transmitted between and among banks, and the clearing house with any form of breach to prevent fraud, forgery and enhance the process, making it secure to facilitate trust among users (Sreela *et al.* 2014; Gjomemo *et al.* 2014).

Sreela *et al.* (2014) explained that existing system where cheque images are protected using public key infrastructure like digital signature require lots of computation and recommended that in order to reduce the amount of computation and usage of keys, secret image sharing should be used for protecting cheques in CTS. They demonstrated that the proposed schemes for secret image sharing provides efficient security in CTS with no usage of keys and minimum computation.

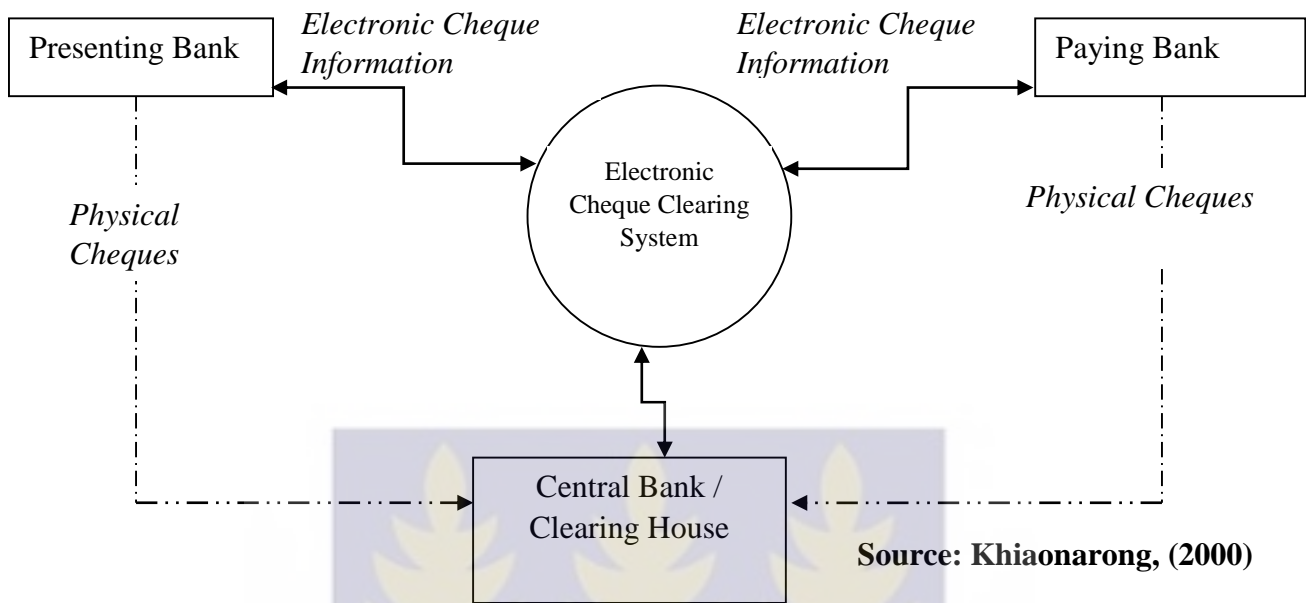
### 2.10.3 Nature of Cheque Truncation System

Literature addressing the nature and benefits has discussed the process of the cheque truncation process in the various jurisdictions. Sreedevi (2013) studied the cheque truncation processes in India, a country which is far advanced in the process, and modelled the process which appears different from what is discussed by Khiaonarong (2000) as the process in Thailand. In Thailand the process begins with a cheque encoder reader capturing information written on cheques. Second, the information is sent and received through telecommunications links between front-end processor machines located at both commercial banks and the Bank of Thailand. Lastly, cheque information in original physical form is delivered and matched with their electronic versions for verification and settlement in the evening. Sreedevi (2013) and Akshatha (2013) explained that unlike in Thailand, all the cheques are archived in a common warehouse of the presenting bank in India. This is to say that the physical cheques are kept by the receiving bank in India instead of presenting to the central bank for verification as is the case in Thailand. Due to this, the receiving bank in India is responsible for verification of the physical cheque to ensure that it has not been altered in any way.

**Figure 2.2** Cheque Truncation Model in India



Source: Sreela *et al.*, (2014)

**Figure 2.3 Cheque truncation Model in Thailand**

#### 2.10.4 Acceptance of ECCS

The review only identified two literature discussing acceptance of ECCS. Al Shibly, (2011) studied users' acceptance of ECCS among 24 banks with the objective to explore the determinants of ECCS acceptance. His study tested the hypothesis that ECCS' acceptance is a joint function of system and information characteristics, usefulness, and Ease of Use. The main study conclusions is that ECCS' acceptance is positively associated with perceived ease of use, perceived usefulness, systems quality and information quality and recommended that business sectors should pay attention to the major role of users' acceptance in determining the success of information systems application, in addition to importance of future investigation in the perceived value of ECCS by banks customers' perspective.

Alsoof *et al.* (2011) expanded on Al-Shibly's study, extending the model used by integrating DeLone and McLean IS success model and including User satisfaction to determine the factor that eventually influence users' acceptance. They concluded that ECCS' success is positively associated with ECCS users satisfaction, which is positively associated with perceived ease of use, perceived usefulness, information quality and system quality and also made

recommendations similar to Al-Shibly's (2011) study but indicated that the business sector should pay attention to the major role of user attitudes in determining the success of information systems application.

Both Al-Shibly (2011) and Alsoof *et al.* (2011) recommended that future research should include more factors to understand other determinants of ECCS. This study has responded to the call by expanding the TAM model to include trust as an influential factor.

### **2.11 Conceptual Approaches to ECCS Literature**

This section discusses the conceptual approaches to ECCS research to suggest conceptual gaps for the study and future research. Heeks & Bailur (2007) identified six types of such research works and their approaches including **1) *theoretically-based work*** which makes clear use of an identifiable theory that can be applied or tested, **2) *framework-based work*** which make use of a framework derived from a body of theoretical work, for analysis, **3) *model-based work*** which makes use of a model without reference to a deeper body of knowledge, **4) *concept-based approaches*** which uses a defined concept with no theoretical grounding, **5) *category-based approaches*** which presents a set of categories or a prescribed set of factors for analysis and **6) *Schema based work*** which uses a schema of techniques or a technical architecture.

For the purposes of this study, the review concentrates its discussions on theoretical and framework based approaches used in ECCS literature. From the review of literature on ECCS it was identified that most of the studies did not adopt any framework or theory except two studies which used the TAM theory. However according to Heeks & Builar (2007) only theoretical and framework based studies provides strong theoretical grounding.

Other e-Banking adoption theories that are relevant to this study include Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB) and Diffusion of Innovation Theory (DOI).

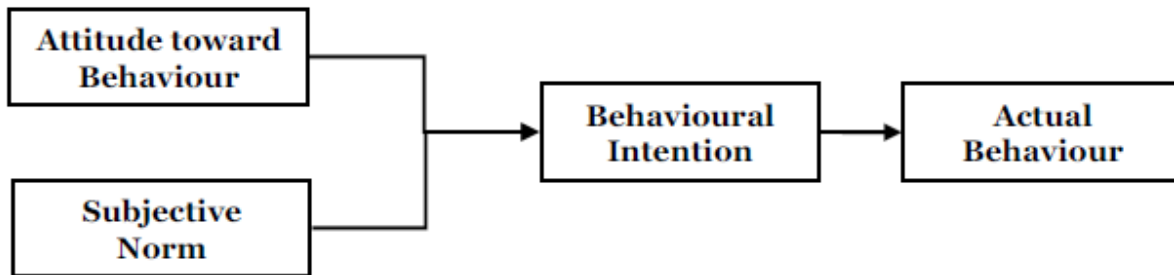
These theories are further discussed below to establish one that provides better theoretical grounding to this study.

### **2.11.1 Theory of Reasoned Action**

Fishbein & Ajzen (1975) developed the Theory of Reasoned Action (TRA) in 1975. They later refined it with empirical evidence to support its validity and reliability (Fishbein & Ajzen, 1975). TRA proposed that behaviour results from the formation of specific intentions to behave (Fishbein & Ajzen, 1975). According to the TRA model, two major factors determine behavioural intentions namely: first, a person's attitude towards the behaviour, and second, the subjective norm. Attitude towards the behaviour refers to the person's judgment that performing the behaviour is good or bad. The subjective norm reflects the person's perception of social pressures put on him to perform or not to perform the behaviour in question (Fishbein & Ajzen, 1975). The favourable or unfavourable perception an individual has in relation to a specific behaviour is referred to as attitude and the subjective judgement of an individual with regards to the preference and support for the behaviour of others is the subjective norm. Nonetheless, the theory has been criticized for ignoring the social factors that may influence specific behaviour (Bandura, Adams, Hardy, & Howells, 1980; Grandón, Nasco, & Mykytyn Jr, 2011) hence, the introduction of the Perceived Behavioural Control and subsequent change of name to Theory of Planned Behaviour (Ajzen, 1991).

TRA has been applied in electronic banking studies to predict the performance of behaviour and intention. For example, Nor, Shanab, & Pearson (2008) have used TRA in Malaysia to study internet banking acceptance and found that individuals' behavioural intention to use Internet banking is influenced by their attitude and subjective norm. Wan, Luk, & Chow, (2005) also used TRA to investigate the factors that influence Hong Kong bank customers to

adopt four major banking channels services including electronic banking and found that TRA was less applicable when behaviour is habitual.



**Figure 2.4 Theory of Reasoned Action**

**Source: Fishbein & Ajzen, (1975)**

### **2.11.2 Theory of Planned Behaviour**

The theory of planned behaviour (TPB) was developed by Ajzen in 1991. The theory proposes a model which can measure how human actions are guided. It predicts the occurrence of a particular behaviour, provided that behaviour is intentional. TPB is an extension of TRA (Fishbein & Ajzen, 1975) made necessary by the original model's limitations in dealing with behaviours over which people have incomplete volitional control. As in the original theory of reasoned action, a central factor in TPB is the individual's intention to perform a given behaviour (Ajzen, 1991).

TPB posits that individual behaviour is driven by behavioural intentions where behavioural intentions are a function of an individual's attitude toward the behaviour, the subjective norms surrounding the performance of the behaviour, and the individual's perception of the ease with which the behaviour can be performed (Ajzen, 1991).

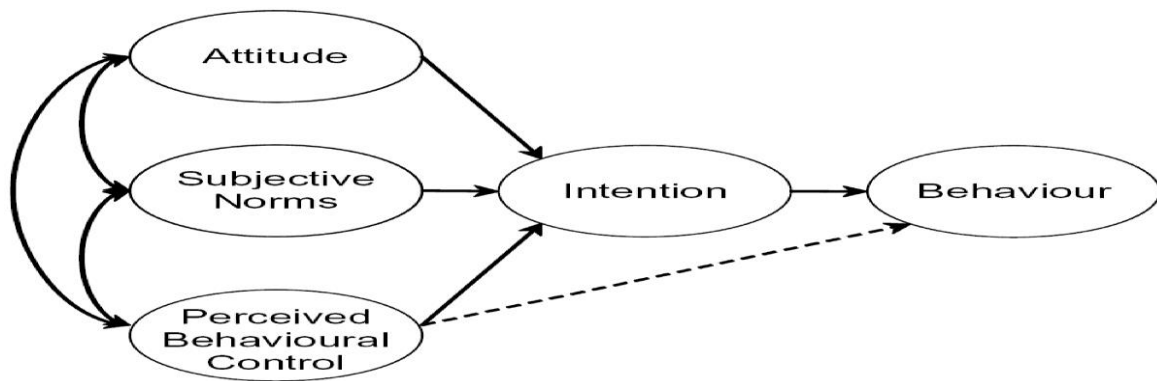
Attitude toward the behaviour is defined as the individual's positive or negative feelings about performing behaviour. It is determined through an assessment of one's beliefs regarding the consequences arising from behaviour and an evaluation of the desirability of these

consequences. Formally, overall attitude can be assessed as the sum of the individual consequence X desirability assessments for all expected consequences of the behaviour.

Subjective norm refers to the perceived social pressure to perform or not to perform the behaviours (Ajzen, 1991). Perceived Behavioural control is defined as one's perception of the difficulty of performing behaviour (Ajzen, 1991). TPB views the control that people have over their behaviour as lying on a continuum from behaviours that are easily performed to those requiring considerable effort, resources, etc. Although Ajzen has suggested that the link between behaviour and behavioural control outlined in the model should be between behaviour and actual behavioural control rather than perceived behavioural control, the difficulty of assessing actual control has led to the use of perceived control as a proxy (Eagly & Chaiken, 1993).

Al-Majali & Nik Mat (2010) used TPB to understand the antecedents of Internet Banking Adoption in Jordan and suggested that the formation of positive attitude about internet banking services (IBS) should take place before the technology can be adopted and emphasized the need for banks to make internet technology useful to customers whilst making this technology easy to use. Conversely, the study found that compatibility has no significant influence on attitude toward IBS and highlighted that a positive attitude, support from subjective norms and perceived behaviour control are important for positive behaviour intention towards IBS.

Aboelmaged and Gebba (2013) explored TPB integrating it with the TAM model to study mobile banking adoption in Dubai and found a significant positive impact of attitude toward mobile banking and subjective norm on mobile banking adoption but surprisingly revealed that the effects of behavioural control and usefulness on mobile banking adoption were insignificant.



**Figure 2.5 The Theory of Planned Behaviour**

**Source: (Ajzen, 1991)**

### 2.11.3 Diffusion of Innovations

The theory of Diffusion of Innovations (DOI) as described by Rogers (1995) is well known. Rogers (1995) described diffusion of innovations as: the process by which an innovation is communicated through certain channels over time among the members of social systems. It is a special type of communication, in that the messages are concerned with new ideas (Rogers, 1995). A decision not to adopt an innovation relates to the rejection of the available new idea. However, in order to explain the rate of adoption of innovations, Rogers suggests measurement of the five perceived characteristics of innovations which are; relative advantage, compatibility, complexity, trial ability, and observability. Rogers (1995) postulated that the adoption of innovations is influenced by these five characteristics, and that they can explain the rate of technology adoption.

In the banking industry Al-Jabri and Sohail (2012) using this theory indicated that relative advantage, compatibility, and observability have positive impact on adoption. However contrary to the findings in extant literature, they found that trialability and complexity have no significant effect on adoption and Perceived risk has a negative impact on adoption. They suggested that banks should offer mobile banking services that are compatible with various current user requirements, past experiences, lifestyle and beliefs in order to fulfil customer

expectations and should focus on understanding customer behaviour and designing reliable mobile banking systems that will meet their needs and provide useful and quality services.

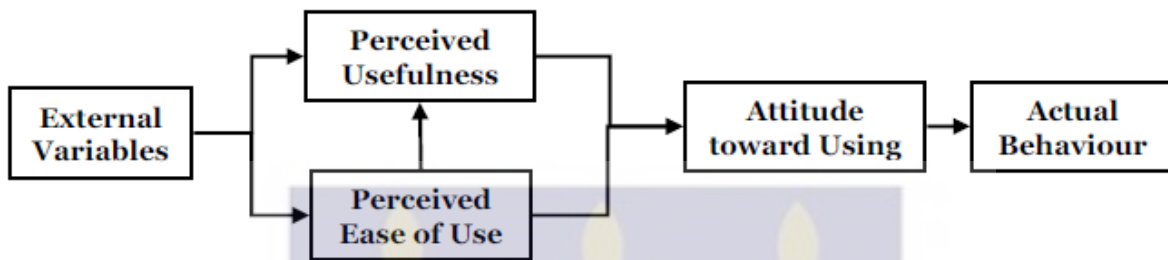
The theory was also used by Chaipooirutana, Combs, Chatchawanwan, and Vij (2009) to study internet banking adoption in Thailand and India. Their results revealed that only complexity had a negative relationship with intention to adopt innovative Internet banking both in India and Thailand, while other attributes of innovation showed a positive relationship and suggested that Banks should consider providing Internet banking service for free (especially for high-value customers) and waive any transaction cost for the Internet banking transactions so that more customers will intend to experiment the Internet banking service.

#### **2.11.4 Technology Acceptance Model**

Technology Acceptance Model (TAM) developed by Davis (1989) is an extension of Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) and the Theory of Planned Behaviour (TPB) by (Ajzen, 1985). TAM is an information system theory that models how users come to accept and use a technology. TAM explains the relationship between beliefs (perceived usefulness and perceived ease of use of an information system) and users' attitude, intentions, and actual usage of the system. TAM posits these two theoretical constructs; perceived usefulness (PU) and perceived ease of use (PEOU) as fundamental determinants of user's acceptance of an information system (Davis, 1989).

One limitation that led to the development of TAM was the time gap between the assessment of behaviour and the actual behaviour in the TRA and TPB. TAM model comprised two main factors, Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). Perceived Ease of Use measures the degree to which an individual conceives minimal effort to be able to use a technology while Perceive Usefulness measures the degree to which their performance on a job is enhanced by a technology (Davis, 1989). TAM accepts the influence of external variables

on an individual hence, their inclusion in the model. The model further suggests that, the intention of an individual to adopt a technology is determined collectively by Perceived Usefulness and Perceived Ease of Use which in turn influences attitude and subsequently an actual behaviour.



**Figure 2.6 Technology Acceptance Model (TAM)**

**Source: (Davis, 1989)**

In the context of ECCS, a study of user acceptance of ECCS in Jordan by Al Shibly, (2011) found that perceived usefulness, perceived ease of use, information quality and system quality had positive effects on user's acceptance of ECCS. Also, in evaluating ECCS usage in Jordanian banks, Alsoof *et al.* (2011) using TAM found that there was a positive relationship between User satisfaction and perceived usefulness and perceived ease of use. Both studies highlighted the need to include other factors in the TAM such as trust for future research.

The purpose of this study is to empirically explain the nature of ECCS and the critical determinants that influence banks' acceptance in Ghana. To this end, the TAM theory integrated with other factors such as information quality, system quality and trust is deemed fit to achieve this purpose. This is because the model has been tested as a much superior model compared to TRA and TPB in understanding e-banking usage behaviour (Yousafzai, Foxall, & Pallister, 2010). Further elaboration on the TAM theory is provided in Chapter three of the study.

## 2.12 Trust, Important factor Influencing User Acceptance

### 2.12.1 Definition of Trust

Trust has been defined in multiple disciplines reflecting its complex nature, although the definitions vary across the disciplines. Rousseau *et al.* (1998) define trust, firstly, as a perception about others' attributes and, secondly, as a related willingness to become vulnerable to others. With greater trust, people can resolve their uncertainty regarding the motives, intentions, and prospective actions of others on whom they depend (Kramer, 1999) as well as save money and effort, because trust reduces monitoring and legal contract costs (Fortin, Dholakia, & Dholakia, 2002).

Drawing on literature in social psychology, and marketing, Moorman, Deshpandé and Zaltman (1993) define trust as *“the willingness to rely on an exchange partner in whom one has confidence”*. Morgan and Hunt, (1994) defined trust as something that arises when one group or individual believes in the reliability and integrity of the exchange partner. Other approaches to trust were suggested. Mayer, Davis and Schoorman (1995) defined trust as *“the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party”*. Moreover, Gefen (2000) defined trust as *“the confidence a person has in his or her favourable expectations of what other people will do, based, in many cases, on previous inter-actions”*.

Rousseau, Sitkin, Burt, and Camerer (1998) reveal that, regardless of the underlying disciplines of authors, confident expectations and willingness to be vulnerable are critical components of all definition of trust.

In the case of ECCS banks and customers make themselves vulnerable to the actions of the internet. Both the banks and the consumers are willing to be dependent upon the internet, based

on the expectation the internet will deliver a seamless process of cheque clearing and perform effectively as planned.

### **2.12.2 Multidimensional Nature of Trust**

Trust can take different forms in different relationships (Rousseau *et al.*, 1998; Kaouther, Kaouther, & Utama, 2014). Rousseau *et al.* (1998) identified three different forms of trust: Calculus-based trust, relational trust and institutional trust. Calculus-based trust is based on rational choice – characteristics of interactions in economic exchange. Trust emerges from calculated weighing of the perceived gains and losses in the intended relationship. Relational trust derives from the repeated interactions over time between trustor and trustee. Information available to the trustor for within the relationship forms the basis of relational trust. Relational trust is similar to personality-based trust posited by Kaouther *et al.* (2014). With personal based trust, the trustor gains credibility and integrity with the trustee after several relationship together. Institutional trust derives from the institutional factors which can act as broad support for the critical mass of trust that sustains further risk taking and trusting behaviour. Institutions can be important and efficient facilitators of trust that develop through legal provision, corporate reputation, certification exchange partners and community norms, structures and procedures. However institutions matter differently according to the stages of a trustor-trustee relationship, level of asset specificity, level of maturity of the business and the rapidity of decision making requirement. Institutional-based trust can ease the way to formulating both calculus-based trust and relational trust.

### **2.12.3 Trust and TAM**

The connections between trust and TAM have been widely discussed in literature in that the relationships between PU, PEOU and trust are hypothesized in many online based business settings (Gefen *et al.*, 2003; Wu & Chen, 2005; Egea & González, 2011; Belanchea, Casaló, &

& Flaviána 2012). In particular, a model of Trust and TAM was well defined in online shopping setting (Gefen *et al.*, 2003). This model explicitly indicated their relationship as trust is an antecedent of PU, PEOU is an antecedent of Trust and trust has a direct influence on behavioural intention to use. Trust is one of the determinants of PU, especially in an online environment, because part of the guarantee that consumers will sense the expected usefulness from the website is based on the sellers behind the website. Moreover, trust is recognized to have positive effect on PU since trust allows consumers to become vulnerable to e-vendor to ensure that they gain the expected useful interaction and service (Pavlou, 2003). While consumers initially trust their job performance, they will believe the online service is useful (Gefen *et al.*, 2003).

On the other hand, PEOU is hypothesized to have influence on trust because PEOU can help promote customers' favourable impression on e-vendors in the initial adoption of online service and further, cause customers to be willing to make investment and commitment in buyer-seller relationship (Gefen *et al.*, 2003).

### **2.13 Geographical Approaches to ECCS Literature**

A review of the selected literature for this study showed that much of the studies emanated from countries in Asia who are far advance in electronic cheque clearing such as Jordan (Al Shibly, 2011; Alsoof *et al.*, 2011), Thailand (Khiaonarong, 2000) and India (Sreedevi, 2013; Talele, 2011; Madasu & Lovell, 2005; Talele & Nalbalwar, 2011). Other studies on the topic was also cited from US. It was interesting to note that there were no study from Africa although the system is being used on the continent by several countries including Ghana, Nigeria and Kenya. Hence a study from this regard would provide more insight on the topic from the context of Africa.

## **2.14 Implication for this study**

### **2.14.1 Research Gap – Why Electronic Cheque Clearing System**

The previous sections attempted a review and discussion of previous research about ECCS. From the evidence presented and the future directions suggested, this research intends to study the nature or model of ECCS in Ghana and the factors influencing user's acceptance of the system. Since the model for ECCS is different in some jurisdictions there is the need to study the nature in Ghana and compare it to models in other jurisdiction, hence this study would be exploratory. Also there is the need to understand other factors that influence users' acceptance of the system (Alsoof *et al.* 2011; Al Shibly, 2011).

The decision to study these gaps is informed by

1. the need for research about the nature of ECCS
2. the need for research into the adoption of ECCS

### **2.14.2 Research Framework – Why TAM**

TAM is one of the most influential theories in predicting and explaining end-user behaviour and system use and able to provide strong theoretical foundation (Chen, Gillenson, & Sherrell, 2002; Wen, Prybutok, & Xu, 2011). Several studies have confirmed its reliability and robustness. Besides it's known to be flexible by allowing the integration of other factors to create a new framework that improves the explanatory and predictive power of the model (Wen *et al.* 2011). TAM has been classified as a good model for evaluating intention and actual use of IT and a mature model which has been validated in different contexts. Some studies have successfully adopted TAM to study ECCS and e-banking in general and it has been validated as an effective instrument for evaluating ECCS acceptance (Al Shibly, 2011; Alsoof *et al.*, 2011). Although the measures presented in Davis (1989) study targets users acceptance of

computers it has been widely tested and validated for other systems, users etc. (Wixom & Todd, 2005).

Generally, the goal of TAM is “ to provide an explanation of the determinants of computer acceptance that is in general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified” (Davis *et al.* 1989).

### **2.14.3 Research Context – Why Ghana.**

As compared to developed countries, many developing countries have market conditions such as technical abilities, business ethics and regulations, different customer profiles which affect the deployment of banking services on the Internet (Guraău, 2002). Many interrelated factors such as quality and security of the information technology, the level of the population with IT knowledge, level of support from government usually negatively influence user decision to accept and use technology (Riyadh, Akter, & Isla, 2009; Berndt, Saunders, & Petzer, 2010).

With developing countries such as Ghana the deployment of ECCS began in the recent years (2010 for Ghana and 2011 for Nigeria). Little or no attempt have been made in the literature to study the system and identify influencing factors of Bank’s acceptance of the entire system. The regulatory body impose the system on the various banks, however for any information system to function effectively users of the system should accept the system. As such it is very necessary to study factors affecting users’ acceptance of ECCS in a developing country like Ghana.

### **2.15 Summary**

This chapter examined literature on the electronic cheque clearing system. The chapter began by explaining ECCS and the various stages involved. This was followed by review of literature

on banks' perspective of ECCS. Following this, literature on some IS theories that have been used to study electronic banking adoption were reviewed. Finally, literature on electronic banking in developing countries was discussed. In general this chapter serves as the general cornerstone of the next chapter, which examines the theoretical foundation of the study.



## **CHAPTER 3 THEORETICAL FRAMEWORK**

### **3.1 Introduction**

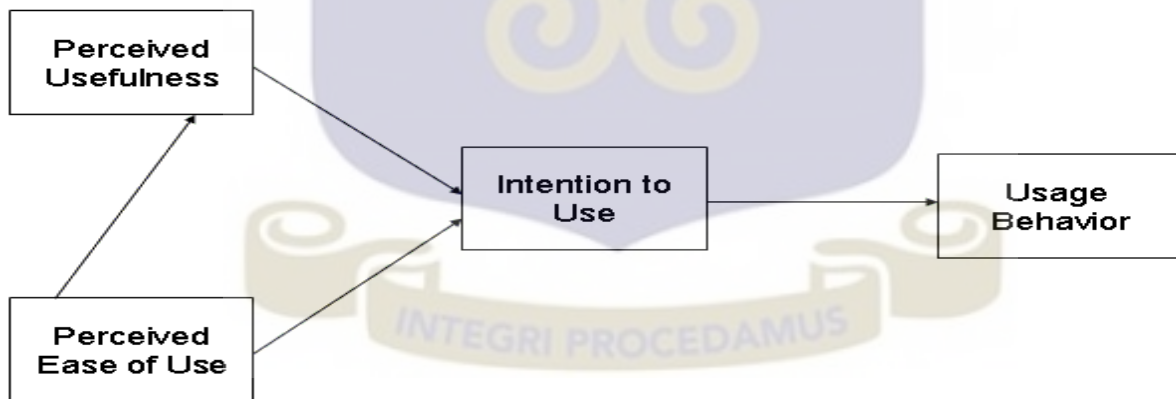
Previous chapters of this study looked at the introduction as well as the problem that necessitated this study. The second chapter further discussed literature concerning this subject. This chapter presents a theoretical framework upon which the research will build the current study.

### **3.2 The TAM Theory in Information Systems**

TAM is one of the most widely used models in Information Systems due to its simplicity and understandability (King & He, 2006). The TAM theory was originally introduced by Davis (1989). It was developed based on two theories from psychology, the expectancy-value theory and the theory of reasoned action (King & He, 2006). TAM uses two primary variables, namely perceived usefulness (PU) and perceived ease of use (PEOU) and the dependent variables known as attitude toward use and behavioural intention (BI), which is assumed to be closely related to actual behaviour to predict the use of a technology or information system. Originally, Davis (1989) found a weak link between perceived usefulness and attitude, but a strong link between perceived usefulness and behavioural intention; therefore, he dropped attitude from the final model. The revised model of TAM has two versions: pre-and post-implementation. Davis *et al.* (1989) expressed that in both phases of implementation, individuals would depend more on perceived usefulness and perceived ease of use to form intention which predicts acceptance behaviour. Some authors have argued that BI to use may be different from actual usage. In this regard, Turner, Kitchenham, Brereton, Charters, & Budgen (2010) found that TAM can act as an accurate predictor of actual usage. Accordingly TAM considers perceived usefulness and perceived ease of use to both influence one's attitude toward system usage,

which influences one's behavioural intention to use a system, which, in turn, determines the actual system usage.

Perceived usefulness was defined by Davis as “prospective users’ subjective probability that using a specific application system will increase his or her job performance within an organisational context”. PU affects attitude towards the use of system which in turn affects the Behavioural Intention to use the system. In other words, the usefulness of a system or technology will directly influence the attitude towards that system and in an indirect way affect the behavioural intentions towards the system. PEOU on the other hand is the degree to which a prospective user expects the new technology or information system to be free of effort. Stated differently, this is how easy the technology is used. However, some researchers have established that the perceived ease of use will influence perceived usefulness (Davis, 1989; Gefen & Straub, 2004; Hong, Thong, & Tam, 2006).



**Figure 3.1 Technology Acceptance Model**

**Source: Davis (1989)**

### **3.3 Studies that use the TAM Theory**

A literature review of the theory by Surendran (2012) revealed that Technology Acceptance Model is one of the most popular theories that is used widely to explain Information System

usage. So many studies have been conducted which have led to the changes in the originally proposed model. A new model called combined TAM-TPB model which integrated the Technology acceptance model and theory of planned behaviour was proposed by Taylor and Todd (1995). Venkatesh & Davis (2000) proposed a new version of TAM called TAM2 which added new variables to the existing model. Venkatesh *et al.* (2003) in a study published in MIS quarterly proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) Model.

Chau & Hu (2002) combined the factor of peer influence with TAM. According to a study by Sánchez-Franco & Roldán (2005) the relationship between PU and behavioural intention was strong among goal-directed users. Chau & Hu (2002) compared three models Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB), and a decomposed TPB model that is potentially adequate in the targeted healthcare professional setting in Hong Kong. The results indicated that TAM was superior to TPB in explaining the physicians' intention to use telemedicine technology. The study conducted by Sun & Zhang (2003) found that voluntariness can be a factor in determining the behavioural intention to use.

Some studies have conceptualised the TAM to study behaviour of customers towards e-banking, e-payment systems and e-commerce in general. Ozkan, *et al.* 2010 used the Theory to understand critical factors that may ensure consumer adoption of electronic payments systems. Zhu, O'Neal, Lee, & Chen (2009) also used the TAM theory to develop a consumer trust model. Their findings indicated that trust, perceived ease of use, perceived usefulness, and perceived risk have a significant impact on consumers' purchase intention. Oh *et al.* (2009) adopted TAM to study adoption of e-commerce. In their model they employed playfulness, trust, information richness, system quality along with two constructs from the original TAM, thus, PU and PEOU. It is evidenced that TAM has been constantly conceptualised with trust to understand user's behaviour toward e-banking and payment systems. With regards to ECCS

TAM has been used to study users' adoption or acceptance of ECCS (Al-Shibly, 2011; Alsoof, *et al.*, 2011). Alsoof *et al.* (2011) integrated TAM with DeLoene and McLean IS success model to explore the determinants of ECCS success.

**Table 3.1 Reviewed Studies based on Technology Acceptance Model**

<b>Author</b>	<b>Technology Studied</b>	<b>Factors Analysed</b>	<b>Method</b>
<b>Kripanont, (2006)</b>	Internet	PU, PEOU, Social Influence, Self-efficacy, facilitating conditions, User Behaviour, Behaviour Intentions	Structural Equation Modelling
<b>Lin <i>et al.</i>, (2010)</b>	Online Shopping	PU, PEOU, User satisfaction, Concentration, Enjoyment, Intention to return	Factor Analysis using LISREL
<b>Lu, Yu, Liu, &amp; Ya, (2003)</b>	Wireless Internet	Perceived near term and Long term usefulness, PEOU, System Complexity, Individual Differences, Facilitating Conditions, Social Influence, Wireless Trust Environment, Attitude Towards Use, Intention to Use	Structural Equation Modelling
<b>Mir, Ara, &amp; A Dar, (2013)</b>	e-Banking	PU, PEOU, Perceived Credibility, Customer Attitude, User Acceptance	Factor Analysis
<b>Moon &amp; Kim, (2001)</b>	World Wide Web	PU, PEOU, Perceived Playfulness, Attitude towards use, Behavioural Intention to Use, Actual Usage	Principal Component Analysis, and Factor Analysis
<b>Park &amp; Chen, (2007)</b>	Smartphone	PU, PEOU, Compatibility, Self-Efficacy,	Factor Analysis

		Environment, Organisational, Task, Individual, Trial ability, Observability, Behavioural intention to use, Attitude towards use	
<b>Park, (2009)</b>	e-Learning	PU, PEOU, Subjective Norm, Self-Efficacy, System accessibility, Attitude, Behavioural Intention	Structural Equation Modelling
<b>Rose &amp; Fogarty, (2006)</b>	e-Banking	PU, PEOU, Subjective Norm, Personal Contact, Perceived Risk, Technology Discomfort, Perceived Self Efficacy, Attitude towards Use, Intention to use, Future Intention to use	Factor Analysis
<b>Shroff <i>et al.</i>, (2011)</b>	e-Portfolio system	PU, PEOU, Attitude towards use, Behavioural Intention	Confirmatory Factor analysis
<b>Wangpipatwong <i>et al.</i>, (2008)</b>	e-Government	PU, PEOU, Self- Efficacy, Continuance intention	Series of linear regression
<b>Belanchea <i>et al.</i>, (2012)</b>	e-Government	PU, PEOU, Trust, Attitude, Intention to use	Structural Equation Modelling
<b>Egea &amp; González, (2011)</b>	e-Health care records system	PU, PEOU, Perceived Risk, Information Integrity, Trust, Attitude, Intention to use	Confirmatory factor analysis and structural equation modelling

<b>Gefen <i>et al.</i>, (2003)</b>	Online Shopping	PU, PEOU, Trust, Intention to use	Confirmatory factor analysis
<b>Lui &amp; Rodger, (2003)</b>	e-Commerce	Propensity to Trust, Perceived Risk, PU, PEOU, Intention to Transact	Structural Equation Modelling
<b>Reid &amp; Levy, (2008)</b>	e-Banking	PU, PEOU, Trust, Self-Efficacy, Attitude, Intention to Use	Structural Equation Modelling
<b>Tung <i>et al.</i>, (2008)</b>	e-Logistics	PU, PEOU, Trust, Compatibility, Perceived Finance Cost, Intention to use	Structural Equation Modelling
<b>Wang &amp; Benbasat, (2005)</b>	Online Recommendation Agents	PU, PEOU, Trust, Adoption	Structural Equation Modelling
<b>Wu &amp; Chen, (2005)</b>	Online Tax	PU, PEOU, Trust, Perceived Behaviour control, Subjective Norm, Attitude, Intention	Confirmatory Factor Analysis
<b>Al Shibly, (2011)</b>	Electronic Cheque Clearing System	System Quality, Information Quality, PU, PEOU, ECCS Acceptance	stepwise multiple regression
<b>Alsoof <i>et al.</i>, (2011)</b>	Electronic Cheque Clearing System	System Quality, Information Quality, PU, PEOU, User Satisfaction, ECCS Success	Factor Analysis

### 3.4 Conceptual Model and Hypothesis Development

Drawing upon IS existing literature, this study suggests that using TAM alone to measure ECCS success and wide acceptability may not fully capture the various factors. Alsoof *et al.* (2011) explained that ECCS success is a joint function of system and information characteristics and acceptance. This is because the success of any system has a direct relationship with its acceptability. The study therefore adapt the two factors of the DeLone and

McLean Information Success Model (i.e. perceived system and information quality) which characterises the success of a system to study the success of ECCS that lead to its acceptance.

Again, although TAM has generally been used to explain users' initial intention to adopt an information system after a brief period of interaction with the system, it has also been employed for predicting users' intention to use an information system after having a long period of experience with the system. Taylor and Todd (1995) explained that TAM can be applied to examine the behaviour of inexperienced and experienced users, with different emphasis on the determinants of intention. In addition, TAM has been used in longitudinal studies (Venkatesh and Davis, 2000; Venkatesh and Davis 2000; Venkatesh & Morris, 2000; Kim & Malhotra, 2005) that confirmed that both PU and PEOU remain significant determinants of behavioural intention over time, as well as the significant influence of perceived ease of use on perceived usefulness. This evidence implies that TAM is appropriate for predicting the acceptance and continuous usage of information system.

However, researchers suggested that there is the need for TAM expanded with additional factors or incorporated with other IT acceptance models to provide an even stronger model and account for specific task (Moon & Kim, 2001; Legris *et al.*, 2003; Lu *et al.*, 2003). When applied in the context of ongoing use, continuing capability to overcome obstacles would be necessary for continuance intention. Hence, Trust, information and system quality will be integrated and tested as additional factors influencing users' acceptance of ECCS.

IQ and SQ represent two aspects of e-resource characteristics and serve as independent variables in the model. IQ and SQ are beliefs about resources themselves rather than beliefs about using resources (Tao, 2008).

Trust is essential in any social interaction that involves uncertainty and risk. For any user to accept and use ECCS the users should first trust that the system would work as planned. This

is the major reason why this study suggests Trust is an additional factor to determine users' acceptance of ECCS. Conceptually this study postulates that Information quality, System Quality, Perceived ease of use, perceived usefulness, and Trust are key drivers of users' acceptance of ECCS.

### **3.4.1 Perceived Usefulness**

PU measure “the degree to which a person believes that using a particular system would enhance his/her job performance” (Davis 1989). Several of the existing literature have established the significant effects of PU on IS acceptance and usage (Lai & Li, 2005; Tao, 2008; Soud & Fisal, 2011; Mir, *et al.*, 2013).

Pikkarainen *et al.* (2004) found that PU had a direct effect on internet banking usage. People use online banking services because they find that using banking web sites enhances the productivity of their banking activities and that they are useful for performing financial transactions. Gerrard & Cunningham (2003) explained that PU depends on the type of banking services such as checking bank balances, applying for a loan, paying utility bills, transferring money abroad, and obtaining information on mutual funds. This study will use Davis' definition of perceived usefulness. The proposed relationship between PU and behavioural intention is based on the theoretical argument by Wang *et al.* (2003); Guriting & Nelson, (2006); Soud & Fisal, (2011). Wang *et al.* (2003) discovered that PU effect Taiwan's intentions to adopt e-banking systems significantly. In other words, PU has a significant relation with behavioural intention. Hence, the greater the PU of using e-banking services, the more likely that e-banking will be accepted by users (Polatoglu & Ekin, 2001).

TAM suggests that PU is influenced by PEOU because the easier a system is to use, the more useful it can be. The hypothesis below is used to test the theory and answer the research objective.

**H1:** PU will have positive effect on bank acceptance of ECCS.

### 3.4.2 Perceived Ease of Use

The term “perceived ease of use” is defined as the “degree to which a person believes that using a particular system would be free of effort” (Davis, 1989). Davis, (1989) claimed that all other things being equal an application perceived to be easier to use than another is more likely to be accepted by users. As such PEOU is a major factor that affects acceptance of information system (Davis *et al.*, 1989). Igbaria, Guimaraes, & Davis, (1995) believe that ease of use refers to their perceptions regarding the process leading to the final e-banking outcome. In simple terms the ease of use refers to how easy is the e-banking used (Gefen and Straub, 2000). Consult (2002) also affirmed that the drivers of growth in e-banking would be determined by the PEOU which is a combination of convenience provided to those with easy internet access, the availability of secure, high standard e-banking functionality, and the necessity of banking services.

Venkatesh (2000) further highlighted that with increasing direct experience with the target system individuals adjust their system-specific ease of use to reflect their interaction with the system. He added that PEOU in the case of e-banking can be quoted as savings of time, money, and convenience. As a result, the current study will utilize the definition of Davis (1989) to define perceived ease of use.

**H2:** PEOU will have positive effect on PU of ECCS.

**H3:** PEOU will have positive effect on bank acceptance of ECCS.

### 3.4.3 Perceived Information and System Quality

According to Petter *et al.* (2008) IQ is the desirable characteristics of the system outputs such as management reports and Web pages. Information quality is often a key dimension of user satisfaction measurement and it is crucial for both the use and the impact of any IS.

The original study by DeLone & McLean (1992) used both system and information quality to measure the usage and the user satisfaction of information systems. Their study postulated the use and user satisfaction can be used to determine the success of any IS. However recent studies (Tao, 2008; Al Shibly, 2011; Alsoof *et al.*, (2011) have tried to conceptualized the model integrating them into the TAM model to assess users' acceptance of technology. Al Shibly (2011) posited that information and system quality do not have a direct relationship with users' acceptance but indirectly influence users' acceptance through perceived ease of use and perceived usefulness. He integrated system and information quality as an external variables influencing the factors originally developed by Davis (1989). Alsoof *et al.* (2011) also extended the TAM model including the system and information quality as an influential factor. In this study the researcher decided to explore system and information quality as an additional factors influencing banks' acceptance of ECCS.

The items for measuring perceived information and system quality were adapted from (Petter *et al.*, 2008; Lee *et al.* 2002; Prybutoka, Zhangb, & Ryan , 2008).

**H4:** IQ will have positive effect on PEOU.

**H5:** IQ will have positive effect on PU.

**H6:** IQ will have positive effect on bank acceptance of ECCS

**H7:** SQ will have positive effect on bank acceptance of ECCS.

**H8:** SQ will have positive effect on PEOU.

**H9:** SQ will have positive effect on PU.

#### 3.4.4 Trust

Stewart *et al.* (2001) defined trust in electronic commerce as the subjective probability with which consumers believe that an online transaction with a web retailer will occur in a manner consistent with their expectations. Lack of trust has been proposed to be one of the main reasons for consumers' decision to not engage in electronic commerce (Keen, Schrupp, & Chan, 2000).

Trust has been identified as a key driver for adoption and acceptance of IS (Lui & Rodger, 2003; Reid & Levy, 2008) due to its relevance to deal with two critical conditions of digital means: uncertainty and risk of vulnerability. Trust is defined by Schoorman *et al.* (2007) as “the willingness of a party to be vulnerable to the actions of another party based on the expectations that the other party will perform a particular action important to the trust or, irrespective of the ability to monitor or control that other party”. Thus, in uncertain scenarios trust reduces vulnerability and helps the human need to understand the social surrounding of the interchange (Pavlou, 2003), which means identifying the what, when, why and how others behave (Gefen *et al.*, 2003). This is probably the reason why trust has been validated (Wang & Benbasat, 2005) as an important variable in studies concerning online commerce, and particularly in online services, as it is the case of this study

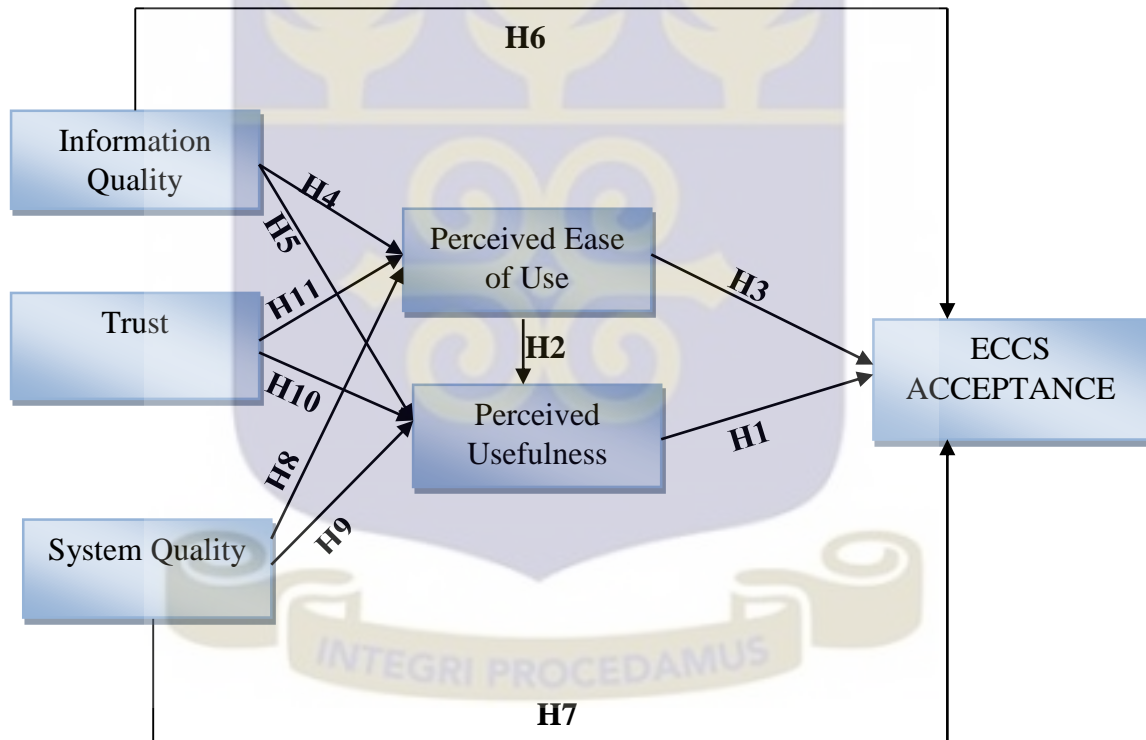
The connections between trust and TAM have been widely discussed in literature in that the relationships between PU, PEOU, and trust are hypothesized in many online- based settings (Gefen, *et al.*, 2003; Wu & Chen, 2005; Egea & González, 2011; Belanchea *et al.*, 2012). For instance Egea and González (2011) in their study of physicians' acceptance of electronic health care records (ECHR) systems postulated that perceptions of institutional trust exerted strong direct effects on physicians' PU, PEOU, and attitude towards the use of ECHR systems. However their hypothesized relationship between trust and usage intentions was not supported,

thus providing further evidence of the mediating value of attitude towards IT usage. Belanchea *et al.* (2012) also in their study of e-government services adoption explained that trust is affected by PEOU and directly affects PU confirming that the inclusion of trust as a third belief into the TAM model is relevant in the online context.

The items for measuring trust were adapted from (Lee & Turban, 2001; Cheung & Lee, 2006; Belanchea *et al.*, 2012).

**H10:** Trust will have positive effect on PU of the ECCS.

**H11:** Trust will have positive effect on PEOU.



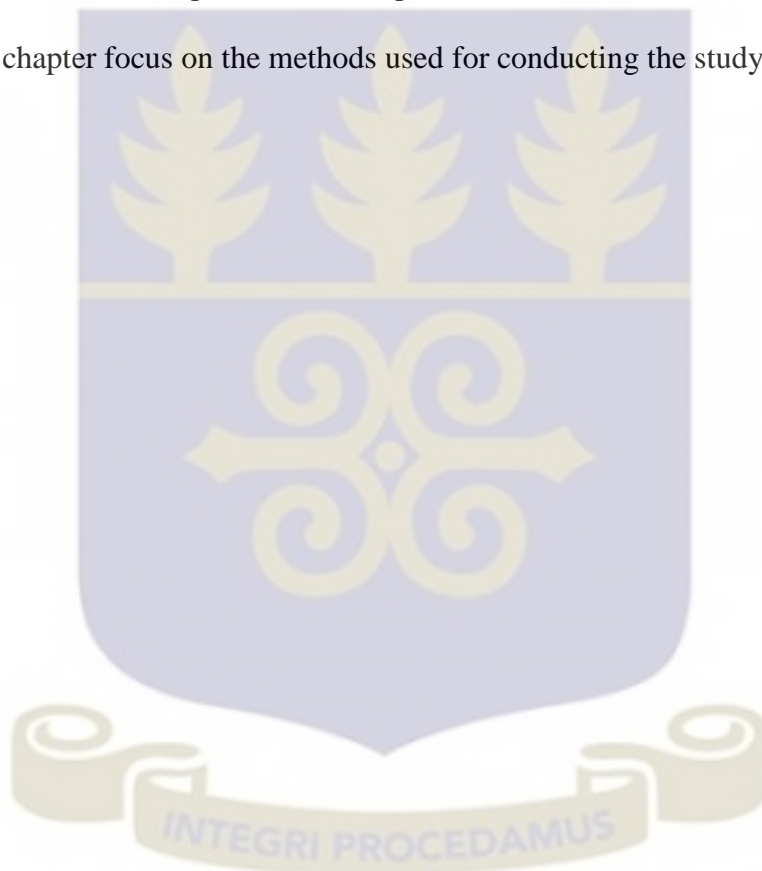
**Figure 3.2 Research Model**

### 3.5 Summary

The chapter discussed the TAM theory and a conceptual model was deduced from the eleven hypotheses proposed under the contexts in the framework. The TAM theory was selected from

the lot of adoption model since, other model such as TPB and DOI were inadequate in explaining adoption from different context as presented in the chapter.

The chapter also showed the extent to which TAM has been used and conceptualised in prominent studies. Moreover, specific hypotheses were proposed under each context of the framework with the view of satisfying the second research question set out at the beginning of the study: What are the critical determinants of banks' acceptance of ECCS? What makes the conceptualised framework unique is the incorporation of Trust in the framework to study ECCS. The next chapter focus on the methods used for conducting the study.



## **CHAPTER 4 METHODOLOGY**

### **4.1 Introduction**

This chapter discusses the research methodology for conducting the study. The chapter begins by discussing the research paradigm, the research methodology, and data collection techniques used in the study and how the data analysis was carried out. Under research paradigm, the three most commonly used paradigms in information systems which are positivism, critical theory and interpretive paradigms are discussed. Both qualitative and quantitative methods used in the study is discussed as well as the instruments.

### **4.2 Research Paradigm**

A paradigm is defined as a “set of beliefs, values and techniques which is shared by members of a scientific community, and which acts as a guide or map, dictating the kinds of problems scientists should address and the types of explanations that are acceptable to them” (Kuhn, 1970). The research paradigms determine the nature of reality researchers study (ontology), the nature of knowledge they need to get on the reality they are learning (epistemology) and the way knowledge about the reality is sought (methodology) (Guba & Lincoln, 1994). It is important for researchers to state the assumptions underlying the study they are conducting (Myers, 1997). These underlying assumptions are referred to as research paradigms (Orlikowski & Baroudi, 1991; Myers, 1997).

The positivist, interpretive and critical paradigms are the three most commonly used research paradigms in information systems studies (Myers, 1997; Sobh & Perry, 2005). The oldest and the most commonly used among the three is the positivist paradigm (Walsham, 1995).

#### 4.2.1 Positivism

The term positivism was first introduced by the sociologist, Auguste Comte (Giddens, 1974). Although quantitative investigation of the world has existed since people first began to record events or objects that had been counted, the modern idea of quantitative processes have their roots in Auguste Comte's Positivist framework. It is depicted as the traditional scientific approach to research for the philosophical paradigm for human inquiry. It is based on the numerical representation of observations for the purpose of describing and explaining the phenomena. Methodology approaches that avail themselves to this paradigm include cross-sectional studies, experimental studies, longitudinal studies and surveys.

The positivist paradigm is based on the assumption that social reality has an objective ontological structure and that individuals are responding agents to this objective environment (Morgan & Smircich, 1980; Hanson & Grimmer, 2007; Aliyu, Bello, Kasim, & Martin, 2014). Quantitative research involves counting and measuring of events and performing the statistical analysis of a body of numerical data (Smith, 1988). The assumption behind the positivist paradigm is that there is an objective truth existing in the world that can be measured and explained scientifically. The main concerns of the quantitative paradigm are that measurement is reliable, valid, and generalizable in its clear prediction of cause and effect.

Being deductive and particularistic, quantitative research is based upon formulating the research hypotheses and verifying them empirically on a specific set of data (Frankfort-Nachmias & Nachmias, 1992). Scientific hypotheses are value-free. The researchers' own values, biases, and subjective preferences have no place in the quantitative approach. Researchers can view the communication process as concrete and tangible and can analyse it without contacting actual people involved in communication (Sobh & Perry, 2005).

The importance of positivism, particularly logical positivist explanation, is recognized as one of the most viable approach to explain a phenomenon. In the more recent evaluation research, logical positivism clearly forms the basis of *realistic evaluation* or *scientific realism* where programmes and policies demand realistic evaluation results (Pawson & Tilley, 2004).

This approach is strictly structured design that imposes certain constraints on the results and may ignore the relevant findings. It cannot be objective as the researchers also bring their values and interests to this research work and be part of what they observe.

#### **4.2.2 Interpretive**

The theoretical assumptions of the interpretative paradigm is based on the notion that social reality is created and sustained through the subjective experience of people involved in communication (Aliyu, Bello, Kasim, & Martin, 2014). Qualitative researchers are concerned in their research with attempting to accurately describe, decode, and interpret the meanings of phenomena occurring in their normal social contexts (Fryer, 1991). The researchers operating within the framework of the interpretative paradigm are focused on investigating the complexity, authenticity, contextualization, shared subjectivity of the researcher and the thing being researched and minimizing of illusion (Andrade, 2009). It is most useful for inductive and exploratory research as it can lead researchers to build hypothesis and explanation (Ghauri & Grønhaug, 2005).

Within the fundamental beliefs of the interpretative paradigm, there are three characteristics of qualitative research (Knoblauch, 2013). *First*, qualitative research is the study of symbolic discourse that consists of the study of texts and conversations. *Second*, qualitative research is the study of the interpretive principles that people use to make sense of their symbolic activities. *Third*, qualitative research is the study of contextual principles such as the roles of the

participants, the physical setting and a set of situational events that guide the interpretation of discourse.

The interpretivist paradigm is the social sciences that deal with action and behaviour (Hanson & Grimmer, 2007). There is a clear interrelationship between the investigator and what is being researched. Verifying what actually exists in the social and human world depends on the researcher's interpretation. Any interpretative analysis of subjective meanings depends upon *empirical rules* hence the development of the methodological tools, notably the typology of *rational action* and *ideal type* ( de Gialdino, 2009). Methodology approaches most appropriate include action research, case studies, ethnography, grounded theory and participatory enquiry.

In addition, phenomenology is closely aligned to the interpretivism paradigm as it revolves around the meaning of the lived experiences for participants in the study about a phenomenon. However, there are number of weaknesses in this paradigm. There are difficulties associated with time required and costs involved to undertake qualitative research (Easterby-Smith, Thorpe, & Lowe, 1991).

#### **4.2.3 Critical Realism**

The Critical Realism (CR) paradigm bridges the ontology and epistemology of the positivist and interpretive. Critical realists hold that perceptions have certain plasticity (Cupchik, 2001) and that there are differences between reality and people's perceptions of reality (Bisman, 2002). This paradigm seeks not to predict but to explain social phenomena, through examining the Context-Mechanism-Outcome such as patterns of associations and possible explanation.

Callahan, (2010) notes that critical theorists assume that people can consciously act to change their social and economic conditions. Researchers who carry out critical research normally want change in the status quo and want to help liberate the less fortunate in society from their peculiar circumstances (Orlikowski & Baroudi, 1991). Critical researchers recognize the ability

of people to change their social and economic situations but contend that this ability is constrained by various forms of social, cultural and political dominations as well as laws and resources limitations (Wikgren, 2005). Critical researchers therefore seek to bring such restraining circumstances to the fore in order to bring about a positive change in the lives of the oppressed so that they can exploit their potential and liberate themselves from the less fortunate circumstances they are found (Hirschheim & Klein, 1994).

The ontological position of critical researchers is that reality is socially constructed and this is the same as the interpretivists positions (Hirschheim & Klein, 1994). But researchers using critical paradigm assume that social reality is also constituted historically hence social reality possess some cultural, political, economic and social powers that make people dominate others. Orlikowski & Baroudi (1991) observed that since social relations are changing constantly thereby resulting in conflicts by giving some people in society privileges and constraining others, solutions are needed to address these conflicts and liberate the oppressed. The critical approach takes an epistemological position which is knowledge grounded in social and historical practices and that facts and knowledge are seen not to be value-free as under the positivist tradition but value-laden. The methodological stance of the critical researcher supports ethnographic as well as long-term historical studies that analyse the comparison between past and present events and bring to fore militating conditions.

#### **4.2.4 Choice of Critical Realism**

From the above discussion of the three dominant paradigms, it can be deduced that no paradigm is superior to another. This study was guided by the critical realist paradigm. Hearly and Perry (2000) posit that critical realism as a paradigm provides a researcher with both constructivist and positivist perspectives. CR asserts that there is a significant variation between what is real and what people perceive as reality (Bisman, 2002).

A major idea in using CR is that reality is both intransitive and stratified (Easton, 2010). First, intransitivity means that the existence of reality does not depend on the existence of humans. The first form of stratification is between mechanisms, the events that they generate, and the subset of events that are actually experienced. These are known as the domains of the real, the actual, and the empirical (Mingers, Mutch, & Willcocks, 2013). The real contains mechanisms, events, and experiences (i.e., the whole of reality); the actual consists of events that do (or perhaps do not) occur and includes the empirical, those events that are observed or experienced. A second form of stratification is within the realm of objects themselves, where causal powers at one level can be seen as generated by those of a lower level (Easton, 2010).

Critical realism offers exciting prospects in shifting attention toward the real problems that is faced and their underlying causes, and away from a focus on data and methods of analysis (Zachariadis , Scott , & Barrett, 2010). As such, it offers a robust framework for the use of a variety of methods in order to gain a better understanding of the meaning and significance of information systems in the contemporary world.

CR accepts the existence of different types of objects of knowledge, physical, social, and conceptual which have different ontological and epistemological characteristics. They therefore require a range of different research methods and methodologies to access them (Mingers, Mutch, & Willcocks, 2013). Since a particular object of research may well have different characteristics, it is likely that a mixed-method research strategy (i.e., a variety of methods in the same research study) will be necessary and CR supports this.

The use of both methods (mixed methods) according to Creswell & Plano Clark (2007) enables the researcher to undertake both qualitative and quantitative studies sequentially. The qualitative methodology is based on interviews (in-depth), participant observations and case studies while the quantitative methodology is based on the admission of questionnaires as a form of data collection (Bisman, 2002). Using a mixed methodology allows the researcher to

validate hypothesis as well as conceptual models and also enables the researcher to gain in-depth understanding of the findings (Newman, Compo, & Alexander, 2003). Moreover, the qualitative study can help the researcher to better explain unexpected results that the quantitative study may reveal (Maxwell & Loomis, 2003).

This study therefore, used the critical realist paradigm because it employs both qualitative and quantitative approach which is essential in achieving the objectives of this study.

The first objective can better be achieved using a qualitative approach because of the provision of in-depth understanding of this methodology. The second objective is better explained using the quantitative method which will use surveys to understand the various factor that influence bank's acceptance of ECCS in Ghana.

#### **4.3 Qualitative study**

As indicated earlier, the qualitative aspect of this study enables the research question of exploring the nature of ECCS in Ghana be answered. Following this approach the case study was deemed appropriate. According to Yin (1994, p.13) the case study method is *“an empirical enquiry that investigates a contemporary phenomenon within its real life context especially when the boundaries between phenomenon and context are not clearly evident”*.

##### **4.3.1 Selecting the case firms**

The research population comprises Banks, Savings and Loans and other Financial Service providers operating in Ghana. Within the selected institution, Clearing officers and IT officers were interviewed. A number of Banks were contacted through formal letters provided by the department of Operations and Management information system (OMIS), personal visits, emails, website contact forms, and phone calls.

For the case study interviews, only three Banks and one Savings and Loans Company in Ghana were contacted. United Bank for Africa, Guaranty trust Bank and Standard Chartered bank were the banks used for the case study. In Ghana, savings and loans are not given the license to participate directly at the clearing house. As such they clear their cheques through other banks with the full license. Opportunity International Savings and Loan was selected to study how they clear their cheques through the licensed banks.

#### **4.3.2 Development of Interview Questions**

Interviews were used as the data collection method. Both open-ended and close-ended questions were written down as a guide prior to the interview. This was done in order to avoid deviating from the subject matter during the interview. In developing the interview guide the following issues were considered:

**Time** - 30 minutes of conversation is a limit for bankers due to their busy schedules.

**Types of questions**- the questions were formulated to satisfy the objective of this study. Clarity of the questions was ensured so that they could easily be understood.

#### **4.3.3 Data Collection Procedure**

Data was collected through the use of interviews. The interviews took place in the convenience of the interviewees' offices. The researcher conducted the various interviews with an interview guide prepared on the subject matter. There was however some fluidity in the questioning to allow more insight to be gained on the subject matter and also to allow follow up questions. Permission was sought from interview respondents so that a voice recording device could be used to capture all responses whilst putting down notes.

Secondary material were reviewed, this include the Codeline Clearing rules by Ghana Interbank Payment and Settlement Systems (GhIPSS) and other internal documents from the case Banks that were made available to the researcher.

To get first-hand knowledge of the clearing process, the researcher used his personal cheque through the clearing process and observed the various activities that transpired to clear. Being an internal audit staff of Private Bank A, the researcher had full access to all documents, and the right to ask officers any question. The researcher used the privilege position to conduct an in-depth study on the nature of ECCS in Ghana. Participant observation enabled the researcher to learn about the activities of the people under study in the natural setting through observing and participating in those activities (Kawulich, 2005).

#### **4.3.4 Analysis Technique**

In order to categorize the qualitative data, the researcher used thematic analysis. Thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data. It minimally organises and describes the data set in (rich) detail. However, it also often goes further, and interprets various aspects of the research topic (Braun & Clarke, 2006). It is a qualitative research technique where the researcher makes notes and sort the data into various categories according to identified themes (Hinson *et al.*, 2009). Qualitative approaches are incredibly diverse, complex and nuanced and thematic analysis should be seen as a foundational method for qualitative analysis (Braun & Clarke, 2006). According to Braun & Clarke, (2006), *“Thematic analysis can be an essentialist or realist method, which reports experiences, meanings and the reality of participants, or it can be a constructionist method, which examines the ways in which events, realities, meanings, experiences and so on are the effects of a range of discourses operating within society. It can also be a “contextualist”*

*method, sitting between the two poles of essentialism and constructionism, and characterised by theories such as critical realism.”*

In the conduct of this study, the recorded interviews were transcribed, sorted, and classified according to the major themes gathered through the literature review as the process of cheque truncation in a systematic and interactive manner. Clarifications were sought on nagging issues after the transcription. The data was further categorized according to major themes that answer the research question.

#### **4.4 Quantitative Study**

As mentioned earlier a part of the objective was answered using a quantitative approach. Hence, in validating the hypothesis and the conceptual model, this study adopted a survey as an appropriate method. According to Creswell (2009 pp. 14) *“survey provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of the population”*. Hair, Black, Babin, & Anderson (2010 ) also assert that it is appropriate to use surveys where the cause of a phenomenon is being studied. With reference to the objective of this study the “cause of the phenomenon” under study here is what influences banks’ acceptance of ECCS.

##### **4.4.1 Data Collection Procedure**

A website was developed solely for the purpose of this survey to gather the data required. The link to the website was emailed to the respondents. This was done considering the busy schedules of Bankers. Assessing and answering the question online made it easy for the respondents and helped the researcher to reach many respondents. They researcher was therefore able to reach the needed respondent in less time. Responses were downloaded in excel format and uploaded into the statistical software for analysis.

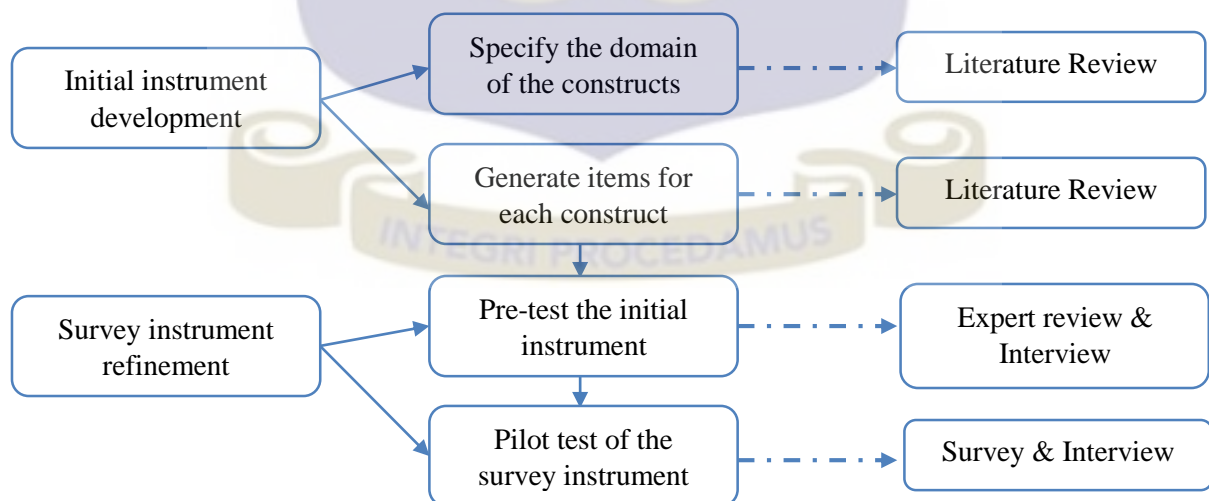
#### 4.4.2 Response Rate and Timeline

The link to the online questionnaires was emailed to 420 bank officials in 25 banks and 5 savings and loans companies in Ghana. Specifically the email was sent to 15 officials from each bank and 9 officials from each savings and loans. 312 out of the 420 responded to the email and filled the questionnaire.

After close scrutiny only 290 were considered for the analysis because 22 of the responses received were not acceptable for processing since they were defective basically questionnaires that were partially completed. The data collection started from the 30<sup>th</sup> October 2014 and ended on the 12<sup>th</sup> of December, 2014.

#### 4.4.3 Conducting a Survey

In developing the survey instrument, Churchill, (1979) and Straub's (1989) proposal for designing a survey instrument was used as a guide to ensure reliability and validity. They proposed that, the process of survey instruments development involves initial instrument development and refinement.



**Figure 4.1 Survey Instrument Development Procedure**

After the initial survey instrument was developed, from constructs postulated by literature on ECCS acceptance, the second stage of refinement was undertaken to ensure reliability and

accuracy. The pre-test of the initial survey instrument was conducted by seeking expert opinion from the researcher's supervisor who has experience in the field of technology adoption with the intention to validate that content of the survey instrument (Hair, Black, Babin, & Anderson, 2010). Content validity measures the extent to which the items on the survey instrument adequately capture different dimensions of a construct (Straub, Boudreau, & Gefen, 2004; Hair *et al.*, 2010) through examination of wording, interpretation, consistency, logical sequencing and overall impression from look and feel of the survey. In all, constructive feedback was provided which helped improve the questionnaire during the refinement stage.

To measure the PU in the research model, the researcher used Davis' (1989) proposal of a six items measurement tool. The six items include; using (application) finishes work more quickly, increases job performance, increase productivity, enhances effectiveness, makes job easier and overall is useful. Out of the measure predicted by Davis, Legris *et al.* (2003) indicated that four is commonly used by researchers and are found to lead to an acceptable level of internal consistency. The commonly used measures include; using (application) increases my productivity; using (application) increases my job performance; using (application) enhances my effectiveness on the job; and overall, the (application) is useful.

The measurement tool as described by Davis (1989) in his study for perceived ease of use include; ease of learning, controllable, clarity and understandability, flexibility, easy to become skilful, and ease of use. Four of these items are commonly used with a degree internal consistency, with an alpha most at times greater than 0.79 in 12 or more articles (Legris *et al.*, 2003). This study will therefore study users' PEOU using ease of learning, controllable, flexibility and overall ease of use as the measures. These measurements were used in generating the survey instrument.

#### **4.4.4 Data Editing, Entry, Coding and Cleaning**

The first step in any statistical analysis is to edit the raw data. The researcher checked the responses to the closed-ended questions to detect errors. After the data were edited, the next step was to code the responses. Because the survey was conducted online the download data was uploaded into the SPSS for Windows programme for examination.

The values for PEOU, PU, SQ, IQ and TRUST were coded from 1-5 using the likert scale. Responses to questions on age, education, and Cheque clearing experience and ECCS Usage hours were entered as ordinal scales, while remaining constructs were entered as nominal scales.

#### **4.4.5 Missing Data and Outliers**

After entering coding and cleaning, the data was examined for missing values and outliers. The variables and cases were examined for percentages of missing values. Out of the 312 respondent who responded to the survey, 17 of the questionnaires were incomplete (respondents stopped half way through the process). Five (5) others had more than 25 per cent missing values each. This research therefore adopted Sekaran's (2000) recommendation, deleting listwise all cases with 25 per cent missing values from subsequent analysis. However, this did not lead to any significant decrease in the sample size, and the final sample was 290.

#### **4.4.6 Data Analysis**

Structural equation modelling (SEM) is a technique that allows separate relationships for each of a set of dependent variables. It provides the appropriate and most efficient estimation technique for a series of separate multiple regression equations estimated simultaneously (Hair *et al.*, 2010). The term 'structural equation modelling' is characterised by two basic components: 1) the structural model and 2) the measurement model. The structural model is

the path model, which relates independent to dependent variables. The measurement model enables the researcher to use several variables for a single independent or dependent variable.

There are two main approaches to SEM. These are the covariance-based structural equation modelling (CBSEM), such as Linear Structural Relations (LISREL), and the variance-based approach, Partial Least Squares (PLS) (MacCallum R. , 1986). The covariance-based approach enables researchers to construct unobservable latent variables, model errors in measurement, and statistically test a priori theoretical and measurement assumptions against empirical data. However, they involve constraints in the form of normality assumptions, sample size, model complexity, and identification and factor indeterminacy (Chin and Newsted 1999). In order to use the covariance-based approach, it is assumed that observed variables follow a specific multivariate distribution and that observations are independent of one another. Also critical is the sample size requirement of ten times the number of parameters to be estimated (for example if the number of parameters are 30 then the minimum sample size is 300).

Small samples that are not "asymptotic" in characteristics can lead to poor parameter estimates and poor model test statistics (Chin and Newsted 1999). Equally critical with small sample sizes is the potential for a type II error whereby a poor model can still falsely achieve adequate model fit. Thus, the CBSEM involves continually speculating parameter estimates in order to minimise the fitting function between the sample correlations and those implied by the parameter estimates until no further improvement can be made. Under exploratory conditions with small-to-moderate sample sizes (i.e. 100 to 400), MacCallum (1986) demonstrated that final models derived via post-hoc modifications should not be trusted.

Furthermore, the covariance-based approach typically requires indicators to be in the reflective mode. Under these conditions indicators are viewed as being influenced by the underlying latent construct. However, there can be situations where indicators can be modelled as

formative variables such that they are viewed as causing rather than being caused by the latent variable (MacCallum & Austin, 2000). The covariance-based approach does not make room for such variables. To address these limitations of the CBSEM, an alternative approach, PLS, is recommended (Chin, Marcolin, and Newsted 2003).

SEM in various ways tone down the critics of statistical sciences. Concerns have been raised on the validity of the assumptions implied by statistical models. Examples of such assumptions include linearity, additivity, no serial correlation, homoscedasticity and multivariate normality. Some of these assumptions - such as the assumptions of multivariate normality and homoscedasticity - can be relaxed in Structural Equation models, due to recent developments in statistical theory and due to the robustness of the Maximum Likelihood estimator to deviations from normality (Bollen & Stine, 1990; Browne, 1984; Browne & Cudeck, 1992; Satorra, 1990).

SEM also addresses the issue concerning the dependence of statistical models on observed variables. Unobserved variables can also be included in Structural Equation Models, providing an additional means of bridging the gap between theoretical and statistical models (Bollen, 1989; Byrne, 1994; Dunn et al., 1993; Loehlin, 1992). It is simply not the case that statistical models are confined to the realm of 'superficial appearances'. Latent variables, whilst not directly observable, can be identified on the basis of their observed effects and may be used to represent complex, multifaceted concepts that would otherwise be impossible to measure.

Pratschke, (2003) debunked arguments from other realist concerning statistical sciences by explaining the benefits of SEM which provide much insights needed by critical realist in their research. He explained that Structural Equation Models combine qualitative, theoretical insights regarding causal mechanisms, on one hand, and quantitative data, on the other, permitting the evaluation of complex hypotheses involving networks of cause and effect

relationships and concluded that statistical analysis particularly causal modelling are in principle consistent with critical realism.

#### **4.4.7 PLS Structural Equation Modelling (PLS-SEM)**

PLS-SEM is a regression based modelling approach which uses a component-based (similar to principal components factor analysis) technique in analysing path models (Vinzi, Trinchera, & Amato, 2010). PLS path models comprises of two sets of linear equations: the outer model also referred as measurement model and the inner model also referred to as structural model. The inner model specifies the relationships between unobserved or latent variables, whereas the outer model specifies the relationships between a latent variable and its observed or manifest variables (Ringle, Sarstedt, & Mooi, 2010).

Advantages of PLS are its ability to handle multiple exogenous and endogenous constructs at the same time, multi-collinearity among endogenous constructs, and an ability to create latent construct scores directly on the basis of cross products involving multi-item measures (Barclay, Higgins, and Thompson 1995). In addition, by using multiple indicators PLS contributes to an increase in the variability and stability of the measurements with the attendant benefit of minimizing measurement errors. More importantly, PLS has no distributional assumptions and is useful in handling studies involving small sample sizes.

#### **4.5 Summary**

This chapter outlined the research methodology used to answer the research questions posed at the beginning of the study by taking into considerations the research paradigm, research method, data collection and analysis methods. The realism paradigm was selected among other likes Interpretivism and positivism since, their dogma, principles, standards and techniques fits well in the combined use of both quantitative and qualitative methodology. Structural Equation

Model (SEM) using PLS was adopted to test and validate the hypothesis. Qualitative techniques such as interviews, observation and direct participation were used to explain the nature of cheque clearing in Ghana.



## **CHAPTER 5 CONTEXT OF STUDY**

### **5.1 Introduction**

In this chapter, the context of the study is discussed. Available issues that are related to the payment systems in Ghana are presented.

### **5.2 Overview Payment Systems In Ghana**

Globally, central banks continue to have a keen interest in the safety and efficiency of payment and settlement systems (Caruana , 2014). Apart from supplying of notes and coins, central bank is also concerned with payments in its broader context. Guarding public confidence in money, the central bank is aware that it critically depends on the ability of economic agents to transfer money as well as other financial instruments.

Central banks by virtue of the fact that they provide payment and settlement services to the commercial banks have always influenced payment and settlement systems. Central banks provide a safe settlement asset and in most cases operate systems that allow for the transfer of that settlement asset (Bank of Ghana, 2013).

BoG has a statutory responsibility for payment and settlement in Ghana. This responsibility requires the Bank to promote, regulate, and supervise these systems to ensure that they are safe, reliable and efficient. Inability to make payments in any economy would have far reaching and widespread impact on society. The Bank's task is therefore to ensure that the public and businesses can make payments in a safe and efficient manner.

The Payments systems act of 2003 empowered the BoG to play a pivotal role in establishing, operating and promoting payments systems (among other things) in Ghana.

BoG then established GhIPSS which owns and operates e-payments schemes and infrastructure within the country and many of these infrastructures have been established within the 2008-2012 window.

Currently, the country's payment and settlement landscape is made up of the following channels:

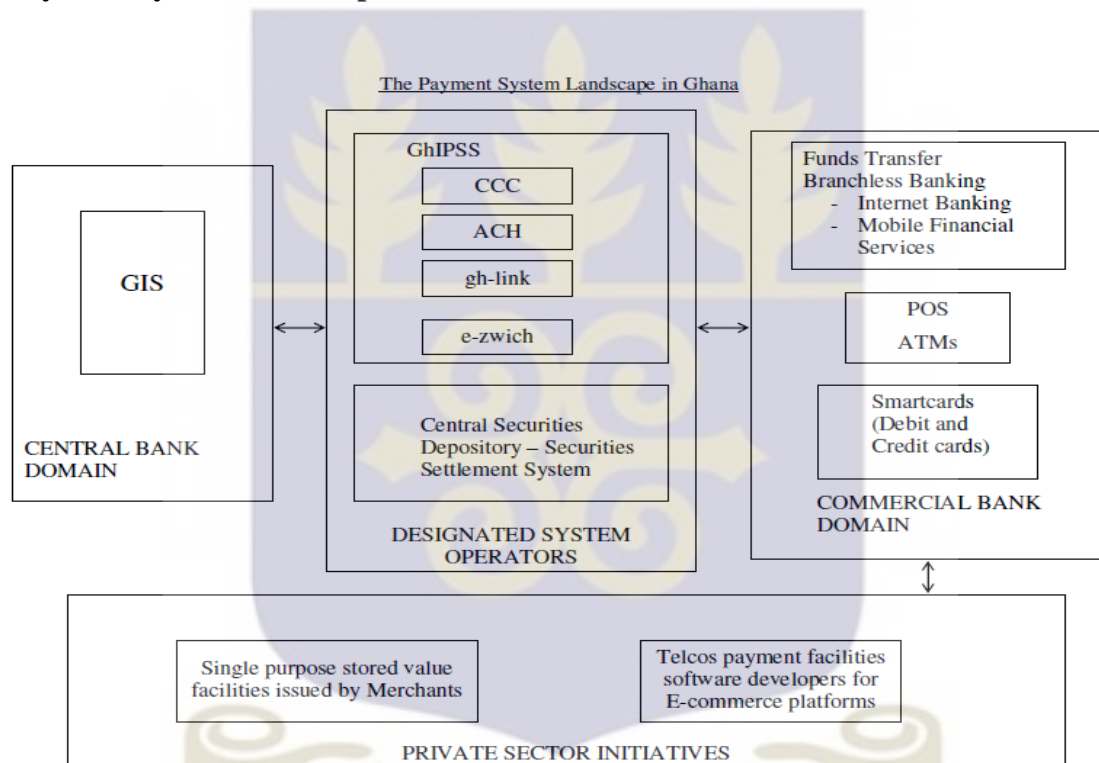
1. The Real Time Gross Settlement (Ghana Interbank Settlement) for wholesale payment and settlements (2002)
2. CCC and ACH (medium tier) – gaining significant use by both individuals and corporate businesses (2009 & 2010)
3. National switch – gh-link (2012)
4. Small value transactions systems such as the credit cards, ATM/POS cards, debit cards, ezwich smartcards, stored valued facilities.
5. Internet banking and mobile phone banking has also begun to experience stronger growth.

The payment system is the entire matrix of institutional infrastructure arrangements and processes in a country set up to enable economic agents (individuals, businesses, organisations and Government) initiate and transfer monetary claims in the form of commercial and central bank liabilities.

Ghana's payment system has improved significantly since 1997 when the MICR cheques were introduced, and continues to evolve to meet the developmental needs of the country. The current trend in Ghana's payment systems development is being driven by economic, financial, public policy factors as well as a growing local ICT industry and global trends in payment systems development.

The development of payment and settlement systems in Ghana has been mainly to prevent and contain risks in payment, clearing and settlement systems whilst establishing a robust oversight and regulatory regime for the payment and settlement systems. This will introduce efficiency to fiscal operations of the Ghana government and deepen financial intermediation. In the end the use of cash for transactions will be discouraged leading to encouragement in the use of paper-based instrument for payments.

### 5.3 Payment System Landscape in Ghana



**Figure 5.1 Payment System Landscape**  
**Source: (Bank of Ghana, 2010)**

From Figure 5.1, it is clear that the payment system landscape of Ghana is broad, covering different type of technology to achieve the goal of a cash less society. The main Ghana Interbank Settlement (GIS) which is operated by BoG itself provide the means of transferring high value funds in real-time among banks. BoG further established GhIPSS to be responsible for the operation of CCC, ACH, gh-link and e-zwich. CCC and ACH provide the technological

support behind ECCs in Ghana. Gh-link brings all financial institutions on one platform for electronic transactions such as ATM and online internet transactions.

Besides these systems implemented by BoG, various banks have introduced various forms of conducting electronic transaction which include the internet banking applications, mobile banking applications, Point of Sale (POS) devices. Finally other operators outside the banking industry, specifically the telecommunication companies have relied on the infrastructure to introduce payment systems such as mobile money which has received widespread adoption.

The next section will show the volume and value of transactions for the various payment systems.

#### 5.4 Payment System Statistics

Payment System	Volume of Transaction - 2014	Value of Transactions – 2014 (GHS million)
<b>Ghana Interbank Settlement (RTGS)</b>	699,956	758,312.16
Cheques Cleared	6,962,297	113,698.39
ACH – Direct Debit	341,875	31.48
ACH – Direct Credit	3,963,802	10,815.21
<b>E-zwich Transactions (Biometric Payment Card)</b>	625,167	272.67
<b>National Switch (gh-link™)</b>	1,346,963	183.32
<b>Mobile Money</b>	106,431,007	11,592

**Table 5.1 Payment Systems Statistics**

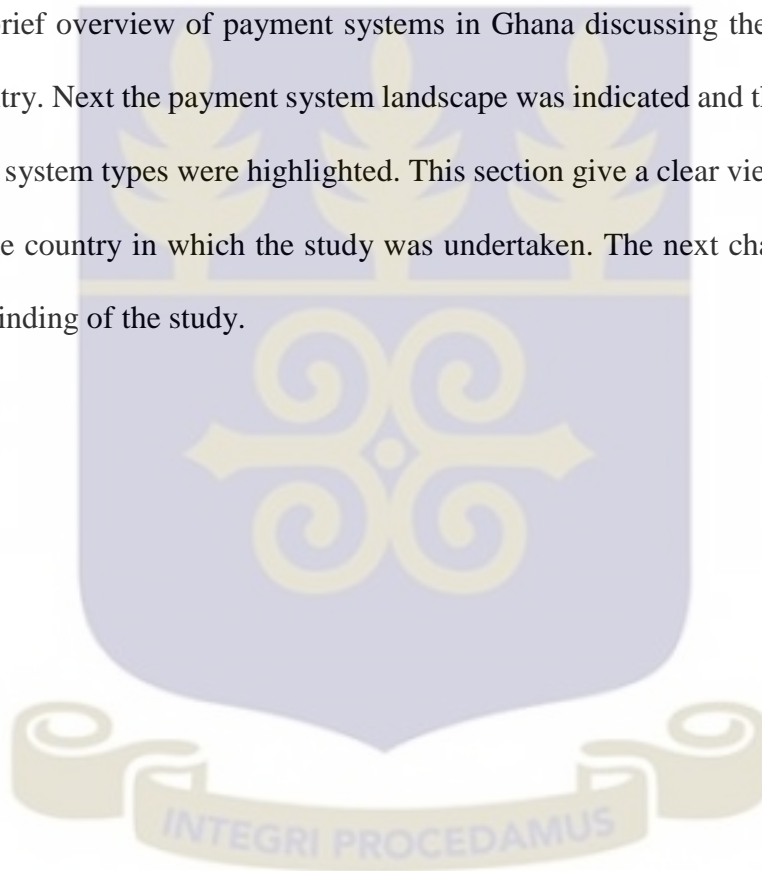
**Source: (Bank Of Ghana, 2015)**

Table 5.1 provides clear evidence that ECCs is the widely patronised as a payment system. Mobile Money (MM) transactions received the most patronage with over 100million transactions. However the value of transactions for MM is not comparable to ECCs which received almost 7million transactions in 2014 alone.

From the discussions and analysis above there is the clear indication of the dominance of ECCS in the payment systems in Ghana other than cash. This therefore necessitate the need to study the dynamics of the system, and factors that affects banks' acceptance which will inform policy makers to make informed decisions.

### **5.5 Summary**

The chapter discussed the context which the entire study was based on. At the beginning the chapter gave a brief overview of payment systems in Ghana discussing the payment system types in the country. Next the payment system landscape was indicated and the statistics of the various payment system types were highlighted. This section give a clear view of the payment system within the country in which the study was undertaken. The next chapter will analyse and discuss the finding of the study.



## **CHAPTER 6**

### **ANALYSIS AND DISCUSSIONS OF FINDINGS**

#### **6.1 Introduction**

This chapter presents the data examination, analysis and discussion of the findings from the data collected through the methods described in Chapter three. The chapter has been segregated into two to satisfy the two objectives presented earlier for the study. The first section details the findings of the interviews, observations and the secondary reviews conducted to answer the first research question '*What is the nature of clearing cheques electronically in Ghana?*' Presenting the finding of the interview, the researcher performs interpretive validity which capture how well the researcher reports the participants' meaning of events, objects and/or behaviours (Thomson, 2011). This is followed by a discussion of the findings in relation to existing literature.

The next section of the chapter focuses on the second objective. This section is in three subsections, first description of demographic characteristics of the participants. The second section of the analysis comprise series of Structural Equation Modelling (SEM) analysis to test the reliability and validity of the conceptual model proposed in Chapter Three of this study. Thirdly, the hypothesis proposed are tested. The combination of the results from the model validation and the hypothesis testing answers the question '*What are the critical determinants of banks' acceptance of ECCS?*' The second section of the chapter later delves into the discussion of the findings from the three sections and the final section provides summary of the chapter.

#### **6.2 Objective One - Case Findings**

One of the main objectives of this study was to explain how cheques are cleared in Ghana. To achieve this objective, five institutions were visited. Clearing officers as well as IT officers were interviewed to provide insight on the entire process of clearing in Ghana. The researcher

further issued one cheque and followed the cheque through the process to get a practical understanding of the clearing process.

The study used thematic analysis (Braun & Clarke, 2006) to understand how cheques are cleared in Ghana. An iterative review process of the coding and themes was then undertaken to ensure accuracy and consistency of the analysis. Illustrative quotations as well as system images were gathered to support the analysis and results were also identified during this process. Finally, the findings of the case study were linked to existing models of cheque truncation systems.

### **6.2.1 Pre-Conversion**

The pre-conversion process is the first process in ECCS. The process begins after a customer has presented a cheque drawn on another bank for deposit into his or her account. The conversion process differs from Bank and other financial institution. Within Banks individual processes differ. To capture the entire process, the three dominant conversion processes are discussed under the cases below:

#### ***Case of Private Bank A***

Private Bank A is a commercial bank with a license to operate at the clearing house. The Bank has 25 branches across four different regions in Ghana, namely Greater Accra, Western, Ashanti and Volta Regions.

The Bank runs a cluster cheque data conversion system. Under this system, cheques are converted to images at a central location but segmented based on the geographical location. Cheques presented within the branches in Greater Accra are dispatched to the Head Office Clearing Units who are tasked to do all the conversion. This is the same for the other regions. One branch is designated the head branch within the region and is used as the clearing unit. All

images and captured data from the various clusters are transmitted to the Accra Head Office for onward submission to the clearing house.

When asked why the bank adopts the cluster system the Head of Clearing, explained;

*“The system helps the bank to achieve the objective to be a lean bank. With this system the bank employs as few people as possible for clearing. There is no need to employ clearing officers for each branch and there is also no need to procure hardware and software requirement for each branch.”*

She however lamented about the inherent risk with the system explaining that;

*“The process of dispatching cheques using motor bikes poses some challenges, for instance on one occasion a dispatch rider was involved in an accident and in the process lost some of the cheques. It also causes delay, as the clearing unit has to wait for all the branches to submit their cheques before the scanning process can begin. All cheques must be scanned in a batch before transmission to the GhIPSS. The bank has however put in adequate measures to prevent the reoccurrence of such dispatching issues.”*

### ***Case of Public Bank B***

Bank B is a licensed commercial bank with 52 branches across 8 regions in Ghana which are Greater Accra, Ashanti, Brong Ahafo, Northern, Western, Eastern, Volta and Central Regions.

In clearing, the bank runs a decentralized system where the various branches have been provided with the necessary hardware, software and staff requirement for the clearing process.

When a cheque is submitted by a customer, the clearing officer at the branch does the scanning and onward submission to the clearing house.

### ***Case of Financial Services A***

Financial Services A is a private microfinance company based mainly in Accra. The company is not licensed to operate at the clearing house, as such participate in the clearing process through Private Bank A. Private Bank A deals with the Financial Services A as a one of its branches with one sort code and present all its instruments to the central clearing unit of the Bank for clearing.

### 6.2.2 Conversion

The actual conversion begins with scanning the image through the scanner and the capture of data associated with the images such as date, amount, cheque number, sort codes, drawer and payee. Before scanning, the clearing officer is required to ensure that the cheque meets basic banking rules and is not a forged or cloned cheque. Clearing Officer for Public Bank B explained

*“It is against the clearing rules to present a defective cheque for clearing. The onus lies on the presenting bank to peruse the cheque properly before scanning and presentment. It is also important that the right amount on the cheque is captured else the wrong amount will be paid.”*

All banks and their branches have *sort codes*. These codes have been published by the clearing house and have also been printed on the cheques. The scanner automatically picks the account number, sort code, cheque number from the scanned cheque. The clearing officer is responsible for keying the amount on the cheque which cannot be picked by the scanner. However, in some occasions due to wrong scanning the scanner is unable to pick the sort code and other cheque details. In that instance the clearing officer is responsible for keying the cheque details manually. It is important that the clearing officer keys in the right sort code.

The Head of Clearing for Private Bank A explained;

*“Keying the wrong sort code will result in cheques drawn on a particular bank being sent to another bank. For instance on a particular occasion, an error by one of our clearing officers resulted in a GT Bank cheque being sent to Ecobank. Ecobank returned the cheque and the customer threatened legal action against the bank.”*

An IT officer at Public Bank B explained that;

*“Scanned images must conform to certain laid down procedure enshrined in the Clearing Rule and banks are required to employ vendors who have the requisite technology to conform.”*

According to section 2.6 of the Cheque truncation guidelines and procedures published by GhIPSS, Banks shall ensure that the scanning of physical instruments conforms to the prescribed standards as indicated in Table 6.1 below. Image quality assurance is required at the scanning stage so that the images meet the processing quality standards.

**Table 6.1 Image Standards**

SI	Image Type	Minimum DPI	Format	Compression
1	Front Grey Scale	200 DPI	JFIF	JPEG
2	Reverse Grey Scale	200 DPI	TIFF	CCITT G4

Below is an image of a scanner used in the clearing process and the scanned image of the personal cheque of the researcher which was sent through the clearing process.

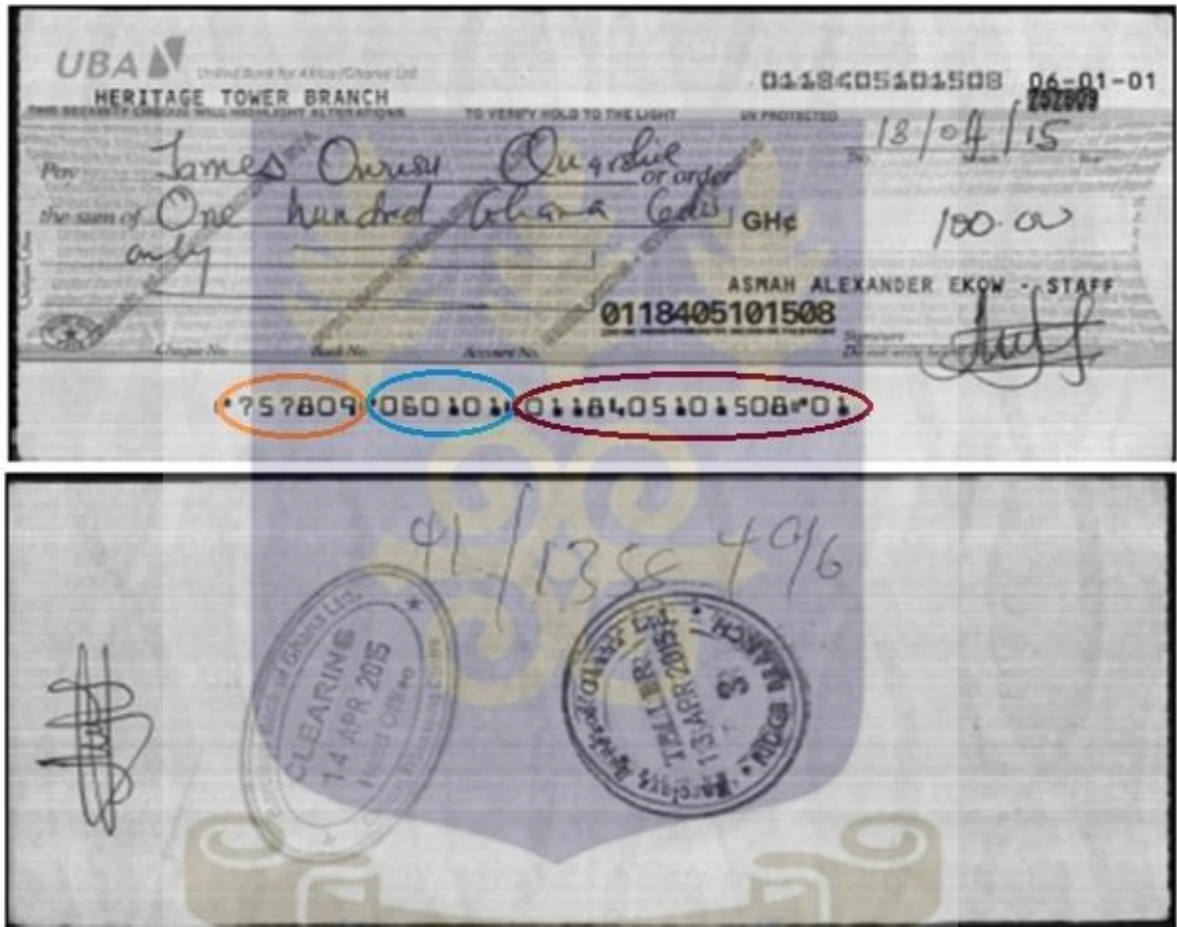
**Figure 6.1 Scanner used in the Conversion process**



Figure 6.2 Electronic information and image presented through clearing

Online Enquiry Item

Installation: UBA	Filter: Serial:757809,"Work Source:20"
Operator: encess08173	Business Date: 20150414
Created: Tuesday, April 14, 2015 11:44:12 AM	
DIN: 990000652	RT: 060101
Transaction: 18	Account: 0118405101508
Category: 1	Tran Code: 01
Batch: 990390039	Amount: GH¢100.00



Cheque No: 

Bank Sort Code: 

Customer Account Number: 

All scanned images need to be presented for clearing at a particular time, known as the clearing session. Section 1.4 of the Cheque truncation guidelines and procedures indicates the sessions as below:

**Table 6.2 Session Timings**

Clearing Session	Weekday Timings	
	Opening	Closing
Presentment Clearing Session – I (Cheques) ( <b>Normal Clearing Session</b> )	6.00pm (Previous day)	9.00am
Return Clearing Session – III (Cheques) ( <b>Normal Return Clearing Session</b> )	2.00pm	4.00pm
Presentment Express Clearing Session – IX (Cheques)	11.00am	12.00pm
Return Express Clearing Session – XI (Cheques)	1.00pm	2.00pm

Clearing officer for Public Bank B emphasised that;

*“The presentment session is the time which the presenting banks can submit their cheques for clearing. The Return session is the time which the paying banks can return any of the cheque presented during the presentment session.” These timeline must be followed as nothing can be done outside the session unless informal among the banks.”*

A platform has been created different from the main clearing application which shows whether or not a particular session has been closed. In some cases, GhIPSS can extend the timeline depending on some circumstances. The two main sessions are the Normal Clearing Session and the Express clearing session.

The capture system transmits the MICR codeline data and images of the cheques to its Clearing House Gateway (CHG) electronically.

The researcher presented his cheque at Public Bank B for deposit into another account drawn on Private Bank A. The image was scanned and sent to the clearing house. Nine (9am) the following morning an image as well as the cheque information as shown in Figure 6.2 was sent

to Private Bank A for payment. After due diligence was conducted on the image the researcher's account was debited and kept in a designated office account pending settlement.

### **6.2.3 Security**

The images along with the cash data are then sent to the clearing house in a secured manner. The clearing house rules require that systems shall be configured to apply digital signatures to individual images and MICR codeline data in the Clearing House Gateway (CHG) using Public Key Infrastructure (PKI). In addition, files shall be encrypted for transmission to the Clearing House (CH). All images and data files shall be transmitted over dedicated networks connecting all the CHGs with the CH.

It is the responsibility of the collecting banks to affix digital signatures on the cheque images and the MICR Codeline data in the CHG before transmission to the CH. Banks shall use Public Key Infrastructure (PKI) for this purpose to ensure data authenticity, integrity and non-repudiation. Banks and GhIPSS shall ensure that images and the MICR codeline data are duly digitally signed and encrypted.

According to Section 4.9 of the clearing rules;

Files and data digitally signed shall conform to the following:

1. Hash/digest algorithm Secure Hash Algorithm (SHA-1)
2. Padding algorithm Public Key Cryptology Standard (PKCS)#1
3. RSA asymmetric encryption with 1024 bit key length.

File encryption shall also conform to Triple Data and Encryption Standard (Triple DES) (3DES, TDES) symmetric encryption with 168 bit key length. The cryptographic keys shall be generated and stored in Hardware Security Modules (HSM).

When asked, the IT officer in charge of the clearing application in Private Bank A explained *“Currently images and data are not sent over a dedicated network as recommended by the rules, but with the digital signatures and the PKI system being implemented the system is secured enough. Cost of setting up a dedicated network is huge and would require large investment.”*

#### **6.2.4 Transaction**

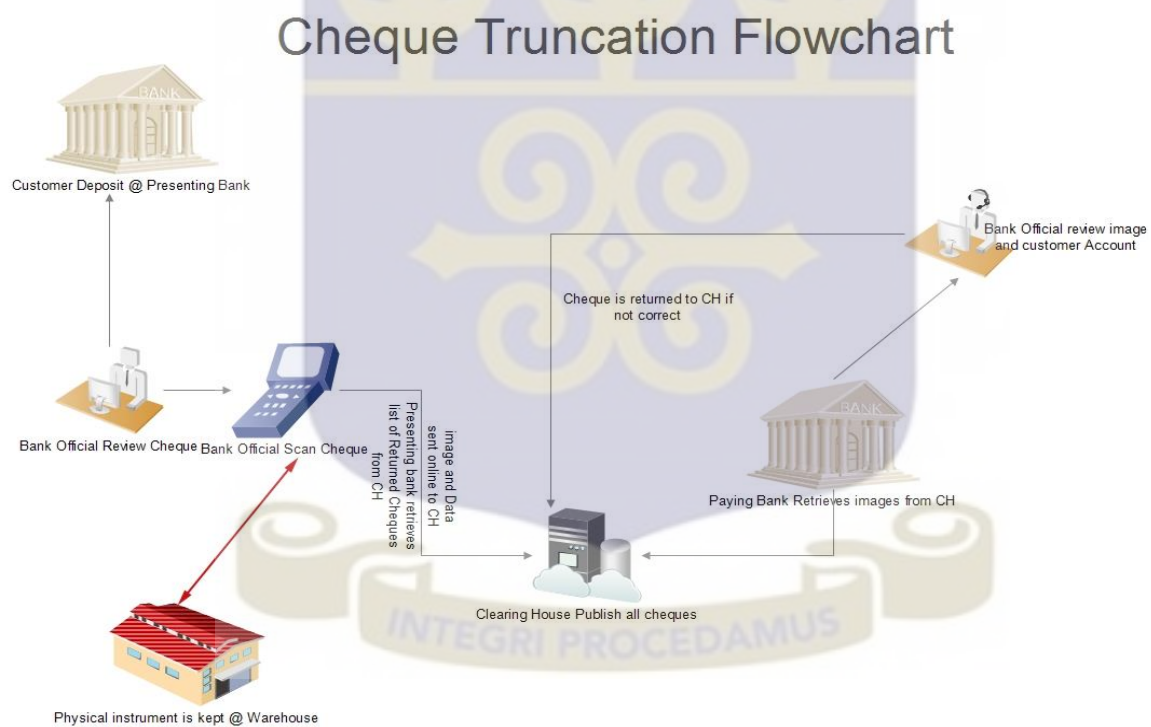
Images and Codeline data transmitted to the CH are immediately sorted using the sort codes keyed by the collecting banks. These sorted data are made available to the paying banks by CH to download. After download the paying bank verifies the cheque data and image to confirm the validity. The signature, amount, cheque number and payee are confirmed before payment. The transaction is confirmed if the paying bank does return the cheque through the issuance of a debit note during the return session as stated above.

The head of Clearing for Private Bank A lamented that *“The default principle where the paying bank pays if no debit ticket is sent in some occasion cost the banks. For instance recently the bank could not send the debit ticket within the stipulated return session because the internet system for our head office was down. However the debit ticket was sent during the regular presentment session the next day. The presenting bank did not adhere to the debit ticket which was sent on the next day and credited the customer’s account with the full amount of the cheque which was GHS121,250.00. This customer had only GHS4.00 in the account on which the cheque was drawn on. By the next day the customer withdrawn the money from the account making it difficult to retrieve. I recommend that a platform preferably using social media be set-up to aid communication on such occasions.”*

The settlement is done on Net basis. The Bank of Ghana account of each bank is Debited and Credited with the net amount arising out of the clearing sessions.

### 6.2.5 Storage

Storage of files and documents in the clearing process occurs in two fold, i.e. storage of physical cheques and storage of electronic document. The practice is for the presenting bank to store the physical instruments. The paying bank can only request for the physical instrument when there is an issue that needs to be resolved with the physical instrument. Mostly all cheques are kept with the presenting banks and not moved along with payment. Electronically, the presenting bank, CH, and the paying bank all store the images and the cash data associated with the clearing transactions. The minimum statutory period for the storage of the file is Six (6) years.



**Figure 6.3** ECCS Flowchart

## 6.3 Discussion of Findings

### 6.3.1 Pre-Conversion

Studies discussing the pre-conversion process among banks in the Cheque truncation process were non-existent. To this end, this study expands current knowledge of ECCS to some extent.

### 6.3.2 Conversion

The conversion process is consistent with the process depicted by both Khiaonarong (2000) and Sreedevi (2013) as the processes in Thailand and India respectively. The quality of the images in the clearing process presented is consistent with the quality indicated by Balakrishnan (2010) as the required quality in India. However Balakrishnan (2010) stated that in India, although the standards required can be Black and White, greyscale or coloured it was decided that the image quality to be the greyscale technology. This is because the Black and white images do not reveal all the subtle features of cheques and coloured images increase storage and network bandwidth requirements.

**Table 6.3 Image Quality Standards**

Image	Type	Minimum DPI	Format	Compression
Front	Greyscale	100DPI	JFIF	JPEG
Front	Black and White	200DPI	TFIF	CCGITT-G4
Reverse	Black and White	200DPI	TFIF	CCGITT-G4

**Source: (Balakrishnan, 2010)**

### 6.3.3 Security

The security system in the cheque truncation process is consistent with the systems described by Balakrishnan (2010) and Sreela *et al.* (2014). The use of Public Key infrastructure such as digital signature and encryption for protecting cheque images and data need a lot of computation and usage of keys and thus, in order to reduce the computation and usage of keys,

cheque image can be protected using secret image sharing (Sreela *et al.* 2014). With secret image sharing technique, a secret image is distributed to some of the participants through splitting the image into different pieces called shares and recover the secret image by collecting the sufficient number of shares from authorized participants.

Kota and Pal (2014) explained that although the transfer of cheques images from the presenting bank to the clearing house and from the clearing house to the paying bank is secured using asymmetric key encryption, the end to end (from the point of scanning the cheque at the presenting bank to the point where decision about payment is made at the payee bank) encryption cannot be adopted because the content of the image has to be accessed at the presenting bank, at the clearing house and at the paying bank for various purposes. Therefore an unencrypted image of the cheque is available at these processing nodes, leaving the images vulnerable to malicious tampering. They therefore recommended the use of watermarking which will help detect tampering the images.

#### **6.3.4 Transaction**

The net settlement system practice in the cheque truncation process is in line with the system indicated by literature Angelini *et al.*, (1996) and Chakravorti, (2000). Clearinghouse acts as an intermediary and collects funds from due-to banks and releases funds to due-from banks. Final settlement occurs when the clearinghouse has successfully completed the clearing session. The primary reason that net settlement systems exist is to reduce the cost to settle a given value of payments. If banks had to settle payments individually, they would on average need to hold more reserves (Chakravorti, 2000).

#### **6.3.5 Storage**

Existing literature have conflicting views on the storage of the physical cheques. Khiaonarong (2000) highlighted that the physical cheques are delivered to the clearing house and matched

with their electronic versions for verification and settlement in the evening. However the process is consistent with the process depicted by Sreedevi (2013) and Akshatha (2013) which places the verification on the presenting bank, thus there is no need for physical movement of the cheques to the clearing house for verifications.

The storage of the image and other electronic information was however consistent in both jurisdictions.

#### **6.4 Nature of Electronic Cheque Clearing in Ghana (Cross Case Analysis)**

From the findings and the discussions presented in the earlier sections, it can be noted that in Ghana, cheques undergo five different set of processes before they are finally cleared for customers to have their needed fund. The first stage being the Pre-conversion stage is the process which involves the activities directed at collating all the physical cheques to be scanned. Private Bank A uses the centralised method where all physical instruments are dispatched to the clearing department for scanning. The bank explained that the approach was to reduce cost of hiring clearing officers at the various branches. Private Bank B however recognises the need to employ clearing officers at the various branches to decentralise the process. The Bank explained that the focus is rather on effective service delivery and turnaround time rather than the cost of operations. Financial institutions which do not have license to operate in the clearing house have to adopt the system implemented by the bank clearing their cheques. In effect the differences between the cases are the need to reduce cost (as is the case of Bank A) and the need to enhance service delivery (as is the case of Bank B). Both cases arrive at the same end where all cheques received from customers are scanned into an electronic format and transmitted to the CH.

The remaining processes (i.e. Conversion, Transaction, Security and Storage) have similar activities across the various banks. With the Conversion, images are scanned using the specially

developed scanning instrument. The scanner automatically captures the details such as MICR code, cheque number and sort codes. The amount stated on the cheque requires manual entry as the scanner is not configured to capture handwritten information on the instrument.

The images along with the cash data are then sent to the clearing house in a secured manner applying digital signatures to individual images and MICR codeline data and using PKI.

The paying bank, upon download the image along with the codeline data, peruse the drawers account to verify the signature and the adequacy of funds in the account. A debit note is sent in the return session if the verification identifies any inconsistencies or inadequate funds.

Physical image is stored by the depository bank, while the CH, depository and paying banks all store the digital images and the cash data.

## 6.5 Objective Two

### 6.5.1 Demographics

This section discusses the demographic profile of the banks and the respondents who took part in the survey. They have been profiled in accordance with their Year since establishment, average cheques cleared, educational qualification, banking and ECCS experience.

	Frequency	Percentage
3 - 5 Years	1	3.33
6 - 10 Years	10	33.33
More Than 10 Years	19	63.34
<b>Total</b>	<b>30</b>	<b>100</b>

**Table 6.4 Years since establishing**

Out of the 30 financial institutions surveyed, only 1 (representing 3.33%) had been in operation within 3-5 years. 10 institutions representing 32% have been in establishment for 6 -10 years. 16 institutions representing 64% have been in establishment for over 10 years.

**Table 6.5 Employee Size of Surveyed Financial Institutions**

	Frequency	Percentage
1 - 300 Employees	6	20.00
301 - 600 Employees	7	23.33
600+ Employees	17	56.67
<b>Total</b>	<b>30</b>	<b>100.0</b>

56.67% of the banks surveyed are institutions with over 600 employees. This is followed by 23.33% which represent banks with 301-600 employees. 6 banks had less than 300 employees.

**Table 6.6 Average No. of Cheques Cleared per day**

	Frequency	Percentage
0 – 50 cheques	0	0
51 – 100 cheques	88	30.34
150 + cheques	202	69.65
<b>Total</b>	<b>290</b>	<b>100.0</b>

Respondents were further asked to indicate the average number of cheques their banks clear within a single day. 69.65% of the respondent indicated that the average cheques cleared in a day is over 150 cheques. 30.34% of the respondents indicated that their bank cleared 51 -100 cheques within a single day. None of the banks surveyed clear less that 50 cheques in a day.

**Table 6.7 Position of participants**

	Frequency	Percentage
Clearing Officer	180	62.07
IT Officer	91	31.38
Marketing Officer	10	3.45
Auditor	9	3.10
<b>Total</b>	<b>290</b>	<b>100.0</b>

The respondents were asked of their position in their various banks. 62.06% of the total respondents are clearing officers who are in direct operations with the clearing application and have first-hand understanding of ECCS. 31.38% of the respondents are IT officers who perform system maintenance, upgrades and ensure system quality. 3.45% and 3.10% are marketing officers and Auditors respectively.

**Table 6.8 Gender of Respondents**

	Frequency	Percent
Male	108	37.2
Female	182	62.8
Total	290	100

Results from the demographic data of the sampled respondent reveal that there were 108 males signifying 37.2% and 182 females signifying 62.8% of the total number of respondents.

**Table 6.9 Educational Level of Respondents**

	Frequency	Percent
HND	42	14.5
Bachelor's Degree	155	53.4
Master's Degree	65	22.4
Professional Qualification	28	9.7
Total	290	100

In terms of educational level of the respondents as of the time of the study, most of them were Bachelor's degree holder making 53.4% (n=155) of the total number of respondents, Masters Holders were 22.4% (n=65), 14.5% (n=42) were Higher National Diploma holders whereas 9.7% of the respondents had other Professional Qualifications. The educational background of the respondents indicates their intellectual maturity and their level of understanding of the various constructs indicated in the questionnaire.

**Table 6.10 Banking Experience of Respondents**

	Frequency	Percent
Less than 1 year	39	13.4
1-5 years	82	28.3
5-10years	110	37.9
10-15years	31	10.7
More than 15 years	28	9.7
Total	290	100

Majority of the respondents have between 5-10 years of banking experience forming 37.9% of the total respondents followed by 1-5years which is represented by 28.3% of the total respondent. 13.4% of the total respondents have less that year banking experience whilst 9.7% of the total respondents have more than 15years of experience. The statistic shows clearly that

most of the respondent have enough banking experience to understand the terminologies used in the questionnaire and give a candid opinion about ECCS.

**Table 6.11 Cheque Clearing Experience of Respondents**

	Frequency	Percent
Less than 1 year	62	21.4
1-5 years	156	53.8
5-10years	44	15.2
10-15years	28	9.7
Total	290	100

To effectively give a true opinion of ECCS a respondent need to have cheque clearing experience in order to understand the dynamics of the entire system. The table above shows that majority (53.8%) of the respondents have 1-5years of cheque clearing experience. A combined total of 24.9% of the total respondents have over 5years experience with cheque clearing in Ghana. Considering that ECCS is less than five years old in Ghana, it means that these respondents had experience with the earlier system of clearing before the current system and can provide much insight to the factors that affect their acceptance of ECCS. 21.4% of the respondents have less than a year experience with cheque clearing Ghana.

**Table 6.12 ECCS Usage (hrs per day)**

	Frequency	Percent
Less than 2 hrs	6	2.1
2-4hrs	46	15.9
4-6hrs	23	7.9
6-8hrs	140	48.3
8 hrs and more	75	25.9
Total	290	100

It is important a respondent of the questionnaire uses the system regularly and understand the various dynamics of the software and the hardware used in the clearing process. The ECCS usage of the respondents gives a clear indication that 48.3% of the respondents use the system on daily basis for about 6-8hours. 25.9% of the respondents also use the system for more than 8 hours per day. Only 2.1% of the respondents use the system for less than 2 hours. This shows

that the respondents are regular users of ECCS and stand in a solid position to explain that factors that influence their acceptance of the system.

### **6.5.2 Assessment of the Measurement Model**

This section begins by validating the indicators used to measure each construct. The measurement model is used to evaluate the psychometric properties of each measure. This implies the calculation of item reliabilities, composite reliability, average variance extracted, and discriminant validity. For each construct the measurement model was assessed through the PLS bootstrapping procedure. The guiding principles recommended by Hair *et al.* (2010) for determining the significance and relative importance of the factor loadings of each item were implemented. They suggested that only items with loadings of 0.7 or greater are significant. Thus, only these items were included in the final measurement model. The minimum acceptable guideline for composite reliability is 0.7 (Hulland, 1999) and 0.5 for average variance extracted (Hair *et al.* 2012).

Individual Item Reliability is the extent to which measurements of the latent variables measured with multiple-item scale reflects mostly the true score of the latent variables relative to the error. It is assessed by calculating standardized loadings of each variable where items with loadings of less than 0.5 should be dropped (Krishnan & Ramasamy, 2011; Bin Hassan, Bin Abdul Talib , Binti Harun, & Hj. Johari, 2012).

Cronbach's Alpha is also the coefficient of reliability (or consistency). It measures how well a set of items (or variables) measures a single one dimensional latent construct. Bin Hassan *et al.* (2012) suggested that value of Cronbach alpha should be higher than 0.7.

Composite Reliability (CR) measure is used to check how well a construct is measured by its assigned indicators. However, the composite reliability takes into account that indicators have different loadings, and can be interpreted in the same way as Cronbach's Alpha (Henseler,

Ringle, & Sinkovics, 2009). Hair *et al.* (2012) suggested 0.7 as a benchmark for ‘modest’ composite reliability.

Average Variance Extracted (AVE) test is used to assess internal consistency of the construct by measuring the amount of variance that a latent variable captures from its measurement items relative to the amount of variance due to measurement errors (Fornell & Larcker, 1981). A basic assumption is that the average covariance among indicators has to be positive. Barclay *et al.*, (1995) and Hair *et al.*, (2012) stated that AVE should be higher than 0.5. This means that at least 50% of measurement variance is captured by the latent variables.

#### 6.4.2.1 System Quality

The reliability and validity of the indicators for System Quality (SQ) were also tested by using the Krishnan & Ramasamy (2011), Hair *et al.* (2012), and Bin Hassan *et al.* 2012) benchmarks for factor loadings, composite reliability and AVE. Table 6.13 shows the factors loading, composite reliability, and AVE of the system Quality measure.

**Table 6.13 Factor Loadings, Composite Reliability and Convergent Validity (AVE) for System Quality (Measurement model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Service Quality (SQ) Composite reliability = 0.9159 AVE= 0.6377			
SQ1: ECCS allows information to be readily accessible to you.	3.7793	0.93356	0.9545
SQ2: ECCS makes information very accessible.	3.4448	1.09358	0.8447
SQ3: ECCS is easy to use at the first time.	3.731	0.96839	0.9436
SQ4: ECCS can be integrated with other banking systems	3.6621	1.0405	0.8873
SQ5: ECCS can flexibly adjust to new work demands.	3.6966	0.976	0.4566
SQ6: ECCS returns answers to my requests quickly.	3.8793	1.03699	0.2166
SQ7: ECCS is versatile in addressing needs as they arise.	3.7552	0.96946	0.9522

An examination of the factor loadings for the Service Quality measures showed that some indicators (ECCS’ flexibility to new demand and its quick response to request) had loadings

less than the 0.5 threshold proposed by Krishnan & Ramasamy (2011). Although the composite reliability was above the cut-off point of 0.7, and the AVE was 0.6377, Hulland (1999) suggested that indicators may have low loadings because they are not generalizable across settings. Even if the researcher has a strong theoretical rationale for including such indicators, they may bias the estimates of the parameters linking the construct. Thus, all items which loaded below the cut-off point were dropped. The composite reliability and AVE improved from 0.9159 to 0.9663 and 0.6377 to 0.8159 respectively.

**Table 6.14 Factor Loadings, Composite Reliability and Convergent Validity (AVE) System Quality (Revised Measurement Model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Service Quality (SQ) Composite reliability = 0.9663 AVE= 0.8516			
SQ1: ECCS allows information to be readily accessible to you.	3.7793	0.93356	0.9561
SQ2: ECCS makes information very accessible.	3.4448	1.09358	0.8565
SQ3: ECCS is easy to use at the first time.	3.731	0.96839	0.9514
SQ4: ECCS can be integrated with other banking systems	3.6621	1.0405	0.8878
SQ7: ECCS is versatile in addressing needs as they arise.	3.7552	0.96946	0.9575

#### 6.4.2.2 Information Quality

In order to assess the measurement model for information Quality, the results of the PLS procedure were analysed and considered for the validity and reliability of the IQ's measures.

The results are represented in Table 6.15.

**Table 6.15 Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Information Quality (Measurement model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Information Quality (IQ) Composite reliability = 0.977 AVE= 0.7945			
IQ1: ECCS provides sufficient information.	3.6172	1.05311	0.901
IQ2: Information content provided by ECCS meet my needs	3.8138	1.06525	0.9102
IQ3: ECCS outputs is presented in a useful format	3.5793	1.1597	0.8513

IQ4: ECCS provides reports that seem to be just about exactly what I need	3.7586	1.11781	0.9181
IQ5: ECCS produces comprehensive information.	3.7241	1.11599	0.921
IQ6: ECCS provides up-to-date information about cheque clearing process	3.6552	1.0613	0.9109
IQ7: I get from ECCS the information I need in time	3.7	1.13896	0.8804
IQ8: I am satisfied with the accuracy of the ECCS	3.9069	1.08543	0.9131
IQ9: ECCS' information is clear	3.6621	1.07324	0.8823
IQ10: ECCS' information is accurate	3.8138	1.06525	0.9102
IQ11: ECCS provides the precise information	3.5724	1.13604	0.7987

The initial result from the table above indicates that all the loadings are above the threshold of 0.5 and hence were all supposed to be maintained. However IQ11 was found to be highly correlated to other variables showing that the indicator was explaining other variables more than the IQ (Refer to Appendix B on Factor Loadings). As such the factor was dropped from the model. Both composite reliability and AVE as indicated above are more than the benchmark of 0.7 and 0.5 respectively.

The final revised measurement model is illustrated in **Table 6.16** below shows a much improved model for IQ after IQ11 was dropped.

**Table 6.16 Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Information Quality (Revised Measurement model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Information Quality (IQ) Composite reliability = 0.9776 AVE= 0.8135			
IQ1: ECCS provides sufficient information.	3.6172	1.05311	0.9075
IQ2: Information content provided by ECCS meet my needs	3.8138	1.06525	0.9069
IQ3: ECCS outputs is presented in a useful format	3.5793	1.1597	0.8562
IQ4: ECCS provides reports that seem to be just about exactly what I need	3.7586	1.11781	0.9212
IQ5: ECCS produces comprehensive information.	3.7241	1.11599	0.9265
IQ6: ECCS provides up-to-date information about cheque clearing process	3.6552	1.0613	0.9161
IQ7: I get from ECCS the information I need in time	3.7	1.13896	0.8852
IQ8: I am satisfied with the accuracy of the ECCS	3.9069	1.08543	0.9028
IQ9: ECCS' information is clear	3.6621	1.07324	0.8881
IQ10: ECCS' information is accurate	3.8138	1.06525	0.9069

### 6.4.2.3 Trust

A similar analysis was carried out for TRUST. The initial measurement model for the personal value indicators, including their respective factor loadings, composite reliability, and AVE are shown in the **Table 6.17** below.

**Table 6.17 Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Trust (Measurement model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Trust – Composite reliability = 0.9611 AVE = 0.8917			
TRUST1: I trust this ECCS	3.5724	1.13604	0.9705
TRUST2: This ECCS is reliable	3.7034	1.23178	0.9215
TRUST3: This e-service is trustworthy	3.5586	1.18454	0.9401

All the factor loadings, composite reliabilities, and AVE for the TRUST indicators exceeded the various benchmarks. Thus, there was no need to modify the indicators for this construct.

### 6.4.2.4 Perceived Ease of Use

**Table 6.18 Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Perceived Ease of Use (Measurement model)**

Latent Variable	Mean	Std Dev	Factor Loadings
Perceived Ease of Use (PEOU) – Composite reliability = 0.9928 AVE = 0.972			
PEOU1: Learning to operate ECCS is easy for me	3.7966	1.04732	0.9735
PEOU2: I find it easy to get ECCS to do what I want it to do	3.831	1.02684	0.9954
PEOU3: It is easy for me to become skilful at using ECCS	3.8241	1.02568	0.9945
PEOU4: I find ECCS easy to use	3.8276	1.038	0.98

The factor loadings for PEOU indicators were greater than 0.5. The composite reliability was 0.9928 and beyond the cut-off point. The convergent validity also exceeded 0.5, indicating that the variance shared between the construct and its measures is greater than the unexplained error.

#### 6.4.2.5 Perceived Usefulness

**Table 6.19** Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Perceived Usefulness (Measurement model)

Latent Variable	Mean	Std Dev	Factor Loadings
Perceived Usefulness (PU) – Composite reliability = 0.9659 AVE = 0.8764			
PU1: Using ECCS improves my job performance.	4.0069	0.97368	0.9597
PU2: Using ECCS in job increases my productivity.	3.8793	1.07307	0.8935
PU3: Using ECCS enhances my effectiveness on the job.	4.0103	0.97542	0.9678
PU4: Overall, I find ECCS useful in my job	3.8034	1.09069	0.9215

The PU measures had significant factor loadings above 0.5, a composite reliability greater than 0.7, and an AVE of 0.69. All indicators were therefore retained in the final measurement model.

#### 6.4.2.6 Acceptance

The adequacy of the indicators of ECCS acceptance was examined. The results are presented in **Table 6.20**.

**Table 6.20** Factor Loadings, Composite Reliability and Convergent Validity (AVE) for Acceptance (Measurement model)

Latent Variable	Mean	Std Dev	Factor Loadings
Acceptance (ACC) – Composite reliability = 0.9543 AVE = 0.8745			
ACC1:I like the idea of using ECCS because it enhances cheque clearing process	3.9621	1.03332	0.9274
ACC2:I have a generally favourable attitude toward using ECCS	3.9207	0.92481	0.962
ACC3:I believe it is a good idea to use ECCS in the cheque clearing process	3.969	0.99257	0.9155

All the indicators of Acceptance had significant factor loadings above 0.5, a composite reliability greater than 0.7, and the AVE was also greater than 0.5. All indicators were therefore retained in the final measurement model.

### 6.5.3 Discriminant Validity

Discriminant validity of the constructs in the PLS model was evaluated by comparing the square roots of the AVE to the correlation between constructs. This provided an assessment of the extent to which each construct shared more variance with its measures than with other constructs (Hulland 1999). The results presented in the correlation matrix in Table 6.18 include correlations among constructs in the off-diagonal cells and the square root of AVE in the diagonal cells. For adequate discriminant validity, the diagonal values should be significantly greater than the off-diagonal values in the corresponding rows and columns. The diagonal values (the square root of AVE) in Table 6.21 are all greater than their respective off-diagonal values, indicating adequate discriminant validity. In other words, for each construct the root of the AVE measures is significantly larger than the latent variable correlation. This demonstrates that the final revised measurement model for all the constructs have adequate discriminant validity.

The results from the preceding analysis of the measurement model signify that the indicators are reliably and validly represent the constructs they measure, providing adequate grounds to proceed to the next stage of analysis; the testing of the hypotheses.

**Table 6.21 Discriminant Validity for Overall Measurement Model**

	ACC	IQ	PEOU	PU	SQ	TRUST
ACC	<b>0.935147</b>					
IQ	0.8446	<b>0.901942</b>				
PEOU	0.7786	0.7491	<b>0.985901</b>			
PU	0.9306	0.8954	0.7807	<b>0.936162</b>		
SQ	0.7844	0.7854	0.6644	0.8467	<b>0.922822</b>	
TRUST	0.7862	0.7797	0.6844	0.7742	0.6265	<b>0.944298682</b>

Diagonal elements = square root of AVE; off-diagonal elements = correlation between constructs

## 6.6 Structural Model

### 6.6.1 Assessing the Structural Model for Collinearity issues

There is the need to examine the structural model for collinearity. This is because the estimation of path coefficients in the structural models is based on OLS regressions of each endogenous latent variable on its corresponding predecessor constructs. The path coefficients might be biased if the estimation involves significant levels of collinearity among the predictor constructs. Hair *et al.* (2014) highlighted that a researcher should consider eliminating constructs, merging predictors into a single construct, or creating higher-order constructs to treat collinearity problems.

Using the SPSS linear regression option, the following sets of (predictor) constructs were run to assess collinearity: (1) IQ, SQ, TRUST, as predictors of PU; (2) PU, IQ, SQ and PEOU as predictors of ACC;

**Table 6.22 IQ, SQ, TRUST as Predictors of PU**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-2.68E-06	0.021		0	1		
IQ	0.466	0.043	0.466	10.779	0	<b>0.247</b>	<b>4.05</b>
SQ	0.368	0.035	0.368	10.598	0	<b>0.383</b>	<b>2.614</b>
TRUST	0.181	0.034	0.181	5.27	0	<b>0.391</b>	<b>2.554</b>
Dependent Variable: PU							

**Table 6.23 PU, IQ, SQ, PEOU as predictors of ACC**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	5.01E-06	0.021		0	1		
IQ	0.027	0.048	0.027	0.549	0.6	<b>0.189</b>	<b>5.283</b>
SQ	-0.017	0.04	-0.017	-0.415	0.7	<b>0.279</b>	<b>3.58</b>
PEOU	0.13	0.034	0.13	3.793	0	<b>0.378</b>	<b>2.647</b>
PU	0.819	0.059	0.819	13.937	0	<b>0.129</b>	<b>7.758</b>
Dependent Variable: ACC							

Hair *et al.* (2014) explained that the rule of thumb for collinearity assessment is for each predictor construct's tolerance (VIF) value to be higher than 0.20 (lower than 5). However Wooldridge (2013) posited that setting a cut-off value for VIF above which we conclude multicollinearity is a “problem” is arbitrary and not especially helpful and explained that the value 10 is sometimes chosen as the rule of thumb (Henseler *et al.* 2009). For the purpose of this analysis, Wooldridge position is used to assess the multicollinearity of the constructs. From the table above, using the VIF and tolerance for all the constructs are all well within the threshold of 10. As such all the constructs were maintained in the assessment of the structural model.

### **6.6.2 Results of the Structural Model Using PLS**

The test of the structural model includes estimating the path coefficients, t-statistics and R<sup>2</sup>s. These statistics assess the proportion of the variance in the endogenous variable that can be explained by the exogenous variables. To test for the effects of the determinants on the acceptance of ECCS the bootstrapping technique was used (Chin 2000). The results of the relationships are discussed in the subsections that follow. In each case, results related to the direct and indirect relationship of the determinants of ECCS Acceptance are presented, indicating whether or not the factors have a final influence on user acceptance of the technology.

**Table 6.24 Summary of Hypotheses**

<p><b>Perceived Usefulness</b></p> <p><b>H1:</b> Perceived usefulness will have positive effect on banks' acceptance of the ECCS.</p> <p><b>Perceived Ease of Use</b></p> <p><b>H2:</b> Perceived ease of use will have positive effect on perceived usefulness of the ECCS.</p> <p><b>H3:</b> Perceived ease of use will have positive effect on banks' acceptance of the ECCS.</p> <p><b>Information Quality</b></p> <p><b>H4:</b> Information quality will have positive effect on Perceived ease of use.</p> <p><b>H5:</b> Information quality will have positive effect on Perceived usefulness.</p> <p><b>H6:</b> Information quality will have positive effect on banks' Acceptance of ECCS</p> <p><b>System Quality</b></p> <p><b>H7:</b> System quality will have positive effect on banks' acceptance of the ECCS.</p> <p><b>H8:</b> System quality will have positive effect on perceived ease of use.</p> <p><b>H9:</b> System quality will have positive effect on perceived usefulness.</p> <p><b>Trust</b></p> <p><b>H10:</b> Trust will have positive effect on perceived usefulness of the ECCS.</p> <p><b>H11:</b> Trust will have positive effect on perceived ease of use.</p>
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### 6.5.2.1 Perceive Usefulness and ECCS Acceptance

Hypothesis 1 predicted that perceived usefulness will have a positive effect on bank's acceptance of ECCS. As the results in Table 6.22 reveal, there is a positive relationship between perceived usefulness and banks' acceptance of ECCS and the result was significant ( $\beta=0.8191$ ,  $p<0.01$ ). Hence, the hypothesis that perceived usefulness will have a positive effect on banks' acceptance was supported.

**Table 6.25 Perceived Usefulness Path to Banks' Acceptance**

Perceived Usefulness Path to.	Hypothesis	Path Co-efficient	<i>t</i> -value
Banks' Acceptance	1	0.8191	17.6115***

\*\*\* $p0.01$ , \*\* $p0.05$ , \* $p0.10$

### 6.5.2.2 Perceived Ease of Use, Perceived Usefulness and Banks' Acceptance

The results of the relationships between perceived ease of use, perceived usefulness, and banks' acceptance are presented in Table 6.23.

**Table 6.26 Perceived Ease of Use Path to PU and ACC**

Perceived Ease of Use Path to.	Hypothesis	Path Co-efficient	<i>t</i> -value
Perceived Usefulness	2	0.1598	5.024***
Banks' Acceptance	3	0.1302	2.6651***

\*\*\**p*0.01, \*\**p*0.05, \**p*0.10

Hypothesis 2 posited that perceived ease of use and perceived usefulness will have a positive relationship. The result indicated the positive relationship between PU and PEOU ( $\beta=0.1598$ ,  $p<0.01$ ). This provides support for hypothesis 2. Also the result shows a positive relationship between PEOU and ACC and is significant. The result depicts that bank's acceptance of ECCS in Ghana is influenced by the perceived ease of use of the system. Both Hypothesis 2 and 3 are therefore supported.

### 6.5.2.3 Information Quality, Perceived Usefulness, Perceived ease of Use and Bank Acceptance

The PLS results for the relationships between Information quality, Perceived usefulness, perceived ease of use and bank acceptance are shown in Table 6.24.

**Table 6.27 Information Quality Path to PEOU, PU, ACC**

Information Quality Path to.	Hypothesis	Path Co-efficient	<i>t</i> -value
Perceived Ease of Uses	4	0.4063	4.9473***
Perceived Usefulness	5	0.4007	6.9728***
Bank Acceptance	6	0.0266	0.786

\*\*\**p*0.01, \*\**p*0.05, \**p*0.10

As depicted in the table above the results indicate that information quality is a necessary factor that influences the perceived ease of use of ECCS ( $\beta= 0.406$ ,  $p<0.01$ ). Hence hypothesis 4 is strongly supported. From the results it can be inferred that Perceived usefulness also possess a strong relationship with information quality of the cheque truncation system in Ghana

( $\beta=0.4007$ ,  $p<0.01$ ). Hypothesis 5 is therefore supported. Users of ECCS perceived that higher quality of information provided the system affects their perception on its usefulness and ease of use.

The hypothesis that information quality has a positive effect on bank acceptance was not supported by the result. The beta co-efficient is very weak and the  $t$ -value is not significant ( $\beta=0.0266$ ,  $p>0.10$ ). Although the direct effect of the relationship between information quality and bank acceptance is not supported the total effect (direct plus indirect effect) was supported. ( $\beta=0.4609$ ,  $p<0.01$ ). This means that information quality has positive effect on bank acceptance through perceived ease of use and perceived usefulness.

#### 6.5.2.4 System Quality, Perceived Usefulness, perceived ease of use and Bank Acceptance

The PLS results for the relationships between system quality, Perceived usefulness, perceived ease of use and bank acceptance are shown in Table 6.25.

**Table 6.28 System Quality Path to PEOU, PU, ACC**

System Quality Path to.	Hypothesis	Path Co-efficient	$t$ -value
Perceived Ease of Uses	7	0.1894	2.4126***
Perceived Usefulness	8	0.3375	7.2566***
Bank Acceptance	9	-0.0166	0.3354

\*\*\* $p0.01$ , \*\* $p0.05$ , \* $p0.10$

The researcher hypothesized that System quality will have a positive effect on perceived ease of use. The results indicates a positive effect on PEOU by SQ and is significant ( $\beta=0.1894$ ,  $p<0.01$ ). This means that users of ECCS in Ghana have the perception that the quality of the systems being used makes the entire clearing system ease to use. Hypothesis 7 is therefore supported although the path co-efficient is relatively low.

In a like manner the hypothesis that system quality will have a positive effect on perceived usefulness was supported ( $\beta=0.3375$ ,  $p<0.01$ ).

However the results as shown above indicates a direct negative effect on bank acceptance by system quality ( $\beta = -0.0166$ ,  $p > 0.1$ ). The total effect on bank acceptance by system quality is however positive and significant ( $\beta = 0.3093$ ,  $p < 0.01$ ).

#### 6.5.2.5 Trust, Perceived Usefulness and Perceived Ease of Use

The relationship between Trust, Perceived Usefulness and Perceived Ease of Use was also tested by the PLS procedure using the bootstrapping technique.

**Table 6.29 Trust Path to PEOU, PU**

Trust Path to.	Hypothesis	Path Co-efficient	<i>t</i> -value
Perceived Ease of Uses	10	0.2489	4.6589***
Perceived Usefulness	11	0.141	6.0546***

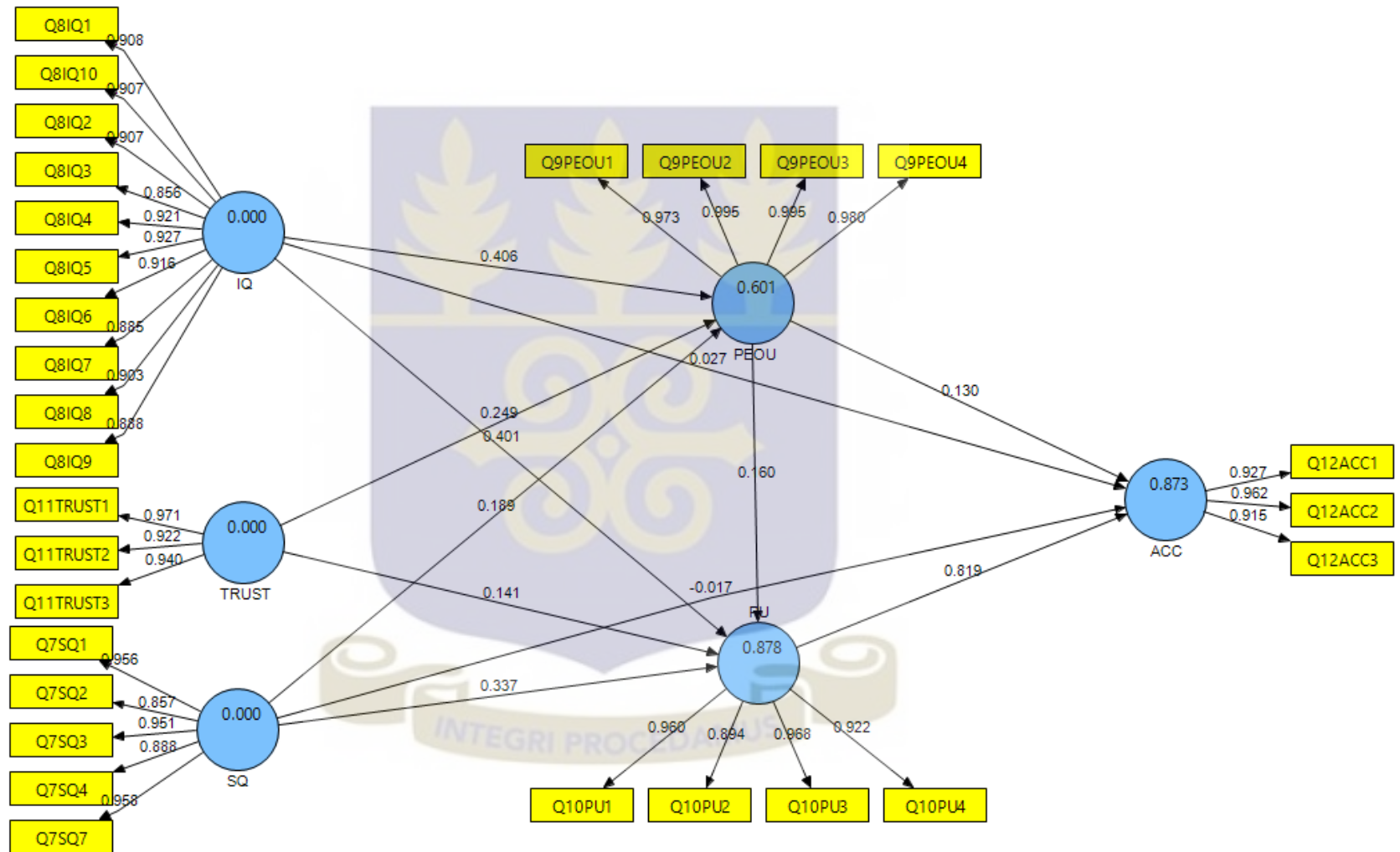
\*\*\* $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.10$

The results support both hypothesis 10 and 11. Hypothesis 10 indicated that the perceived ease of use of ECCS is positively affected by Trust. With a path co-efficient of  $\beta = 0.2489$ , the hypothesis is significant at 99% significance level.

Also banks indicated that the perceived usefulness of ECCS in Ghana is positively influenced by the Trust that the system will work as planned. This is depicted in the results above ( $\beta = 0.3093$ ,  $p < 0.01$ ).

Although the researcher did not hypothesized any relationship between Trust and bank acceptance the result on total effects indicated that Trust positively affects banks' acceptance through the usefulness and the ease of use ( $\beta = 0.1805$ ,  $p < 0.01$ ) with a *t*-value of 6.7115.

Figure 6.4 PLS Graph – Factors affecting Banks’ Acceptance of Electronic Cheque Clearing System in Ghana



## 6.7 Discussion of Findings

The main objective of this research was to understand the factors that influence banks' acceptance of electronic cheque clearing system in Ghana. The researcher further sought to get a chronological understanding of the processes cheques go through before they are cleared. This study was designed to break new ground and explore the determinants that influence the bank acceptance of ECCS. This research tested the hypothesis that that ECCS acceptance is a joint function of system and information quality, Trust, usefulness, and Ease of Use. Earlier studies have not framed acceptance determinants based on the five dimensions collectively. Hence, this study has established the significance of examining banks acceptance by framing determinants according to Trust and the relevant quality dimensions in a collective manner and thus, ensuring that the user acceptance can be better explained in an electronic context such as the ECCS.

In order to achieve the main objective, hypotheses were developed for empirical testing using 290 respondents surveyed by an online platform carried out with a structured questionnaire. Interviews, Observations and physical participation were also used to investigate the process of cheque clearing. Structural equation modelling using PLS was employed to test the hypotheses and accomplish the objectives of the study.

**Table 6.27 Result of Hypothesis Test**

Hypothesis	Effects	Path Coefficient	T Statistics ( O/STERR )	Remarks
H1	PU -> ACC	0.8191	17.6115	Supported
H2	PEOU -> PU	0.1598	5.024	Supported
H3	PEOU -> ACC	0.1302	2.6651	Supported
H4	IQ -> PEOU	0.4063	4.9473	Supported
H5	IQ -> PU	0.4007	6.9728	Supported
H6	IQ -> ACC	0.4609	0.7887(8.1062)	Partially Supported
H7	SQ -> ACC	-0.0166(0.3093)	0.3354(4.5728)	Partially Supported
H8	SQ -> PEOU	0.1894	2.4126	Supported
H9	SQ -> PU	0.3375	7.2566	Supported
H10	TRUST -> PU	0.141	6.0546	Supported

H11	TRUST -> PEOU	0.2489	4.6589	Supported
	TRUST -> ACC	0.1805	6.7115	

Perceived Usefulness is the most significant determinant affecting acceptance of ECCS. The result is consistent with various past studies (Davis *et al.*, 1989; Venkatesh *et al.*, 2003; Pikkarainen *et al.*, 2004; Al Shibly, 2011; Mir *et al.*, 2013). As such, perceived usefulness has a significant effect on ECCS acceptance, suggesting that the Technology Acceptance Model could also extend into e-banking such as the ECCS.

The findings also support previous studies (Mir *et al.*, 2013) and strengthen the area of knowledge that ease of use is a determinant of perceived usefulness. As we knew from previous research, perceived usefulness mediate the influence of perceived ease of use on attitude.

One basic requirement for system design according to Davis *et al.* (1989) is perceived ease of use. The result highlights the need for software developers to pay attention to practical functions and extend key features that are frequently required.

The results showed that perceived ease of use is positively related to ECCS acceptance. This finding was consistent with past studies (Davis *et al.*, 1989; Venkatesh and Davis, 2000 (Al Shibly, 2011; Pikkarainen *et al.*, 2004; Gefen *et al.*, 2003). However the level of significant ( $\beta = 0.1302$ ) for Ease of Use was marginally lower compared to the level of significance for Usefulness ( $\beta=0.8191$ ). The results therefore concurs with Al Shibly's (2011) suggestion that in contexts where effective task execution substantially depends on the system such as the case with ECCS, beliefs about the system usefulness are more dominant in shaping user acceptance than beliefs about Ease of Use.

The direct effect of System quality on ECCS was not significant but the total effect which includes the indirect effects shows that system quality indirectly influence banks' acceptance of ECCS through PU and PEOU. Researchers in the area of conventional IS, have generally

regarded system quality to be a highly important characteristics of the success of all interactive computer systems (DeLone & McLean, 1992; Rai, *et al.*, 2002). Therefore the finding of this research suggests that the greater the perceived system quality of an ECCS, the higher is the ECCS acceptance, agreeing with the literature noted above. This concurs with recent literature by Al Shibly (2011) and Alsoof *et al.* (2011) which highlight the need for users of ECCS to be provided with high quality systems to support their work at the Clearing House.

Studies linking information quality to ECCS acceptance is limited, however like system quality The finding showed that information quality is directly insignificant to ECCS acceptance but related to ECCS acceptance through PEOU and PU. Delone and McLean (2003) put forward information quality as a major dimension for evaluating the success of IS. This research adds to the literatures by confirming recent research (Al Shibly, 2011; Alsoof *et al.*, 2011) that level of ECCS information quality is associated with users' acceptance in the ECCS context.

The research hypothesis indicated that Trust influence Ease of Use and Usefulness. The results confirmed what earlier researchers (Gefen *et al.*, 2003; Wu & Chen, 2005; Egea & González, 2011; Belanchea *et al.*, 2012) have asserted that trust exerts strong direct effects on perceived usefulness, perceived ease of use, and attitude towards the use of systems. In effect the result indicated that through PEOU and PU Trust is an influential determinant of ECCS acceptance with a Path Coefficient ( $\beta$ ) of 0.1805 which is significant at 99% significant level. Literature linking Trust to ECCS acceptance is non-existent, this research therefore extent current knowledge by identifying trust as one of the determinants of ECCS acceptance.

## **6.8 Summary**

The Chapter provides discussion on the analysis and findings from the data analysis. The analysis and discussion was in aid to answer the research questions posed at beginning of the study. The first section provided findings on the interview conducted in order to address the

first research objective of understanding how cheques are cleared in Ghana. The second research objective of investigating critical determinants of Banks' Acceptance of ECCS was undertaken through Partial Least Squares – Structural Equation Modelling.

The discussion on the findings from the analysis in relation to the first research objective indicates that the Conversion, Transaction and Security process of clearing in Ghana is consistent to the processes depicted by other researchers in other jurisdiction. However the storage process was consistent with the practice in India but was different from the practice in Thailand. Both practices have their merits and demerits.

In the Second section of this chapter, descriptive statistics were presented giving an overview of the demographic and business characteristics of respondents. The PLS results for the reliability and validity of the measurement model were presented, and signified that some minor modifications to information quality and system quality were necessary. Following assessment of, and revisions to the measurement model, the results of the PLS tests for the structural model were presented. The findings support all of the initial hypotheses proposed through the conceptual framework in Chapters 3. These were summarised according to the major themes that arose in the literature review, and discussed in detail. The next chapter focuses on the summary of the entire study highlighting the limitations and implications of the study to Theory, Practice and Policy.

## **CHAPTER 7 SUMMARY AND CONCLUSION**

### **7.1 Introduction**

The previous chapter discussed the empirical findings of the study in terms of the research objectives and the literature findings. This concluding chapter presents the summary of the study and the contribution to knowledge. The chapter begins by reviewing the research objectives outlined in chapter one and how they were addressed by the study. Following this, the chapter interprets the study's contribution to knowledge, research and practice. The limitations of the research is also presented. Finally, the chapter offers recommendations for further research.

### **7.2 Review of Purpose and Research Questions**

The primary purpose of the study was to analyse and extend knowledge regarding influential factors that affect banks to accept ECCS, in the light of Technology Acceptance Model (TAM), to develop a model that can be used to analyse organisational acceptance in the context of developing economy such as Ghana, and also understand how Trust affects banks' decision to use ECCS.

In lieu of this, the following questions were asked at beginning of the study;

1. What is the nature of clearing cheques electronically in Ghana?
2. What are the critical determinants of banks' acceptance of Electronic Cheque Clearing System?

To answer these questions, the study added some constructs to the Technology Acceptance Model (TAM) to serve as the underlining framework guiding the research. The TAM framework was selected among other adoption frameworks like DOI, TPB and TRA because the model has been tested as a much superior model compared to TRA and TPB in

understanding e-banking usage behaviour (Yousafzai *et al.*, 2010). To be able to answer both research questions the mixed methodology approach was adopted. The Qualitative approach helped to answer the first question. Interviews, physical observations and review of secondary documents were used to capture the entire process of cheque clearing in Ghana. The quantitative research approach using survey was adopted to answer the second research question. Structural Equation Modelling (SEM) using Partial Least Squares (PLS) was used as the statistical model to analysis the data gathered from the survey.

Clearing cheques in Ghana follows five sets of processes captured as the Pre-Conversion, Conversion, Security, Transaction and Storage. The pre-conversion process differs from bank to bank. Some banks prefer to centralise the conversion process, as such all cheques received from the various branches are dispatched to a centralised location (usually the Clearing Department). Some other banks prefer to decentralise the conversion process, so each branch is responsible for the conversion of the physical cheques into images. The choice of a particular pre-conversion process depends on the bank's focus and objective. The pre-conversion process is followed by the conversions process, where the cheque is passed through a scanner to capture the cheque information and generate an image. The cheque information along with the image is transmitted to the CH for onward transmission to the paying bank. The paying bank, on receiving the image, peruse the customer's account to ensure sufficiency of funds. The transmission of the images is done by applying digital signatures to the images and MICR codeline data using PKI. The depository bank keeps the physical cheque, however the digital image is kept by all parties (CH, paying and depository bank).

Results from the quantitative study indicated that perceived usefulness, perceived ease of use, trust, system quality and information quality are the main influential factors of banks' acceptance of ECCS in Ghana. Trust, information and system quality affects bank acceptance through perceived ease of use and usefulness.

### **7.3 Contribution to research, policy and practice**

This study has three main implications for research, practice and policy.

#### **7.3.1 For Research and Theory**

The study makes significant contribution to acceptance of technology research by conducting the research on a meso level of analysis studying the organisation instead of the individual user which is usually the focus of acceptance research.

Also, the study goes a step above past research in e-banking, investigating a novel system which has seen wide adoption in most continents including Africa. Research in ECCS is low due to the fact that, it is a back end process in the banking system. Researchers are unable to gather adequate data because bank thrive on confidentiality. Most e-banking research focused on customers (Kardas & Papathanasiou, 2001; Sohail & Shanmugham, 2003, Calisir & Gumussoy, 2008, Mishra & Bisht, 2013) and other service providers (Kaur, 2013) who are easily accessible.

One central contribution of the study is the development of a simple model that illustrates the importance of Trust, ECCS quality and TAM variables as criteria for ECCS acceptance. The model provides a useful and pioneering insight into ECCS acceptance. The role of the two IS quality components (system quality and information quality) is not new. However, the developed understanding of the dimensions of each of the two components in the context of ECCS, and in the presence of TAM variables, through theoretical integration, provides new material. The study provides useful insight of the role trust plays in the context of ECCS acceptance.

The use of PLS-SEM provides a new dimension in the level of analysis of ECCS. At the level of the entire community of researchers who study ECCS, the approach illustrates a disciplined

way of creating ECCS measures; the result is an indication of the good explanatory power of the model for organisational acceptance as a research model for further study on IT acceptance.

### **7.3.2 For Practice**

There are clear evidence of the introduction of e-banking systems which have failed to achieve the intended benefits especially in Ghana. For instance E-Zwich was introduced prior to ECCS, but statistical evidence (Bank Of Ghana, 2015) and literature suggest that the patronage has waned drastically since its introduction in 2008 (Agyeiwaah *et al.*, 2014; Antwi *et al.*, 2015). Both Agyeiwaah *et al.* (2014) and Antwi *et al.* (2015) identified some factors that hindered the successful implementation of the technology in the country. Perhaps if these factors were known earlier by practitioners and policy makers, the technology would have been a great success.

It is important for banks to accept technologies that affects their operations system before it can be implemented effectively. This study provided regulators, banks and other service providers within the cheque clearing system with useful insight, informing them that PU, PEOU, trust, SI, IQ are the influential factors that affect banks' acceptance of ECCS. This will assist in the process of software development and upgrades.

### **7.3.3 For Policy**

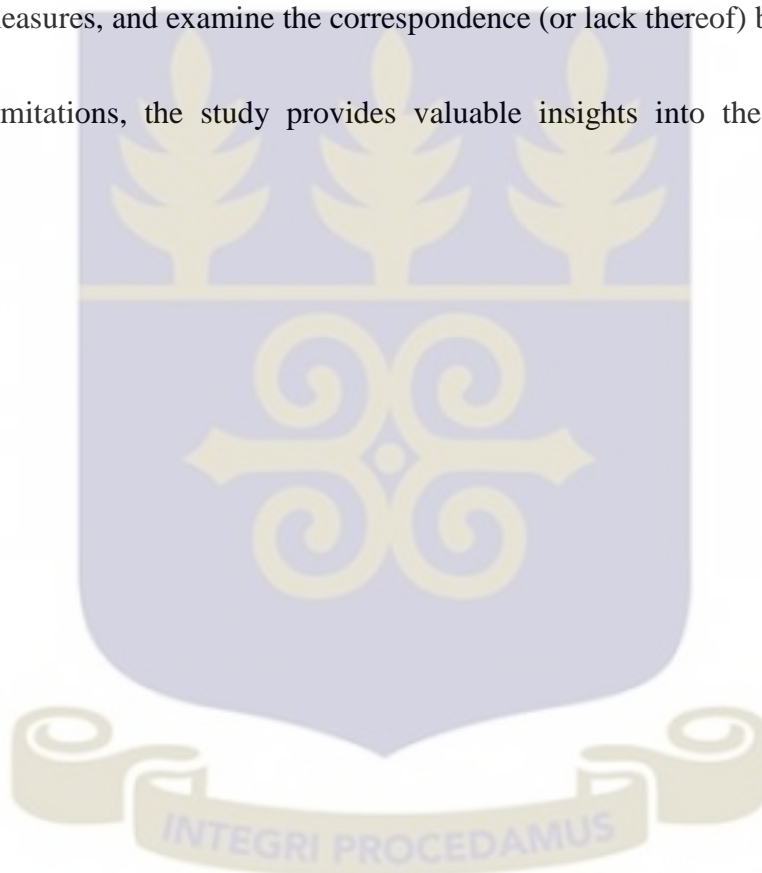
For policy, a better understanding would be gained by policymakers as to what to consider in creating legislations which affect the clearing system within the country. At the firm level, this study hopes to provide findings that could be used as input for organizational policy and strategy in the management of resources.

#### **7.4 Limitations and Future Research Directions**

This study suffers from a number of limitations. First, this study merely developed and validated an ECCS acceptance model using bank perspective as the level of analysis. Future research may develop ECCS acceptance models using other stakeholders and levels of analysis.

Second, the use of self-report scales to measure study variables suggests the possibility of a common method bias for some of the results. Future research should employ both objective and subjective measures, and examine the correspondence (or lack thereof) between them.

Despite these limitations, the study provides valuable insights into the study of ECCS acceptance.



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**APPENDIX A: Research Questionnaire**



**UNIVERSITY OF GHANA BUSINESS SCHOOL  
DEPARTMENT OF OPERATIONS AND MANAGEMENT  
INFORMATION SYSTEMS**

**Dear Respondent,**

The bearer of this questionnaire is a student of the University Of Ghana Business School pursuing **MPhil MIS**. He is conducting a survey on “**Users Acceptance of Electronic Cheque Clearing System in Ghana**”. Please kindly respond to the following questions for the student. Your responses will be duly appreciated and treated with utmost confidentiality.

Please tick [] where appropriate.

**NB: ECCS means Electronic Cheque Clearing System (i.e. the platform used by your organization for clearing)**

**Section A: Demographic characteristics**

**1. No of Employees**

1- 300 Employees []      301 - 600 Employees []      600+ Employees []

**2. Average No. of Cheques Cleared per day**

0 – 50 cheques []      51 – 100 cheques []      150 + cheques []

**3. Sex**

Male [] Female []

**4. Educational Level**

HND []      Bachelor’s Degree []      Master’s Degree []      PHD []  
Professional Qualification [] others please specify.....

**5. Banking Experience?**

Less than 1 Y []      1 Y less than 5 Y []      5 Y less than 10 Y []  
10 Y less than 15 Y []      More than 15 Y []

**6. Cheque Clearing Experience?**

Less than 1 Y []      1 Y less than 5 Y []      5 Y less than 10 Y []  
10 Y less than 15 Y []      More than 15 Y []

**7. ECCS Usage (hrs per day)?**

Less than 2 hrs []      2 hrs less than 4 hrs []      4 hrs less than 6 hrs []  
6 hrs less than 8 hrs []      8 hrs and more []

**Section B: The following questions seek to ascertain respondent's perception about the electronic cheque clearing system.**

**8. Please show how you agree or disagree with the following statements**

1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree

<b>System Quality</b>	1	2	3	4	5
SQ1: ECCS allows information to be readily accessible to you.					
SQ2: ECCS makes information very accessible.					
SQ3: ECCS is easy to use at the first time.					
SQ4: ECCS can be integrated with other banking systems					
SQ5: ECCS can flexibly adjust to new work demands.					
SQ6: ECCS returns answers to my requests quickly.					
SQ7: ECCS is versatile in addressing needs as they arise.					

**9. Please show how you agree or disagree with the following statements**

<b>Information Quality</b>	1	2	3	4	5
IQ1: ECCS provides sufficient information.					
IQ2: Information content provided by ECCS meet my needs					
IQ3: ECCS outputs is presented in a useful format					
IQ4: ECCS provides reports that seem to be just about exactly what I need					
IQ5: ECCS produces comprehensive information.					
IQ6: ECCS provides up-to-date information about cheque clearing process					
IQ7: I get from ECCS the information I need in time					
IQ8: I am satisfied with the accuracy of the ECCS					
IQ9: ECCS' information is clear					
IQ10: ECCS' information is accurate					
IQ11: ECCS provides the precise information					

**10. Please show how you agree or disagree with the following statements**

<b>Perceived Ease of Use</b>	1	2	3	4	5
PEOU1: Learning to operate ECCS is easy for me					
PEOU2: I find it easy to get ECCS to do what I want it to do					
PEOU3: It is easy for me to become skilful at using ECCS					
PEOU4: I find ECCS easy to use					

**11. Please show how you agree or disagree with the following statements**

<b>Perceived Usefulness</b>	1	2	3	4	5
PU1: Using ECCS improves my job performance.					
PU2: Using ECCS in job increases my productivity.					
PU3: Using ECCS enhances my effectiveness on the job.					
PU4: Overall, I find ECCS useful in my job					

**12. Please show how you agree or disagree with the following statements**

<b>Trust</b>	1	2	3	4	5
TRUST1: I trust this ECCS					
TRUST2: This ECCS is reliable					

TRUST3: This e-service is trustworthy					
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**13. Please show how you agree or disagree with the following statements**

<b>Acceptance</b>	1	2	3	4	5
ACC1:I like the idea of using ECCS because it enhances cheque clearing process					
ACC2:I have a generally favorable attitude toward using ECCS					
ACC3:I believe it is a good idea to use ECCS in the cheque clearing process					

**Thank you**



**APPENDIX B: Factor Loadings**

	ACC	IQ	PEOU	PU	SQ	TRUST
Q12ACC1	0.9274	0.7136	0.6931	0.8454	0.7286	0.7114
Q12ACC2	0.962	0.7928	0.6867	0.902	0.7974	0.7533
Q12ACC3	0.9155	0.8601	0.804	0.8619	0.6734	0.7397
Q8IQ1	0.7158	0.9075	0.8573	0.7698	0.7135	0.7285
Q8IQ2	0.8194	0.9069	0.5209	0.8363	0.729	0.6875
Q8IQ3	0.6874	0.8562	0.4837	0.7787	0.7475	0.6175
Q8IQ4	0.7713	0.9212	0.7086	0.8142	0.6667	0.7071
Q8IQ5	0.7644	0.9265	0.7104	0.8181	0.6688	0.6856
Q8IQ6	0.726	0.9161	0.8171	0.7699	0.7164	0.7302
Q8IQ7	0.7116	0.8852	0.6916	0.8155	0.7098	0.6998
Q8IQ8	0.8827	0.9028	0.6281	0.8893	0.7249	0.7756
Q8IQ9	0.7094	0.8881	0.7854	0.7455	0.6882	0.6995
Q8IQ10	0.8194	0.9069	0.5209	0.8363	0.729	0.6875
Q9PEOU1	0.7471	0.7221	0.9735	0.7534	0.6366	0.6567
Q9PEOU2	0.7822	0.7552	0.9954	0.7842	0.6673	0.6895
Q9PEOU3	0.7789	0.7483	0.9945	0.7793	0.6619	0.685
Q9PEOU4	0.7616	0.7281	0.98	0.7612	0.654	0.6671
Q10PU1	0.9089	0.8247	0.6748	0.9597	0.8201	0.7536
Q10PU2	0.8431	0.8511	0.8387	0.8935	0.7377	0.6983
Q10PU3	0.9151	0.8333	0.6717	0.9678	0.8282	0.7556
Q10PU4	0.8137	0.8452	0.7437	0.9215	0.7823	0.689
Q7SQ1	0.8019	0.7582	0.6715	0.8456	0.9561	0.6649
Q7SQ2	0.5909	0.6923	0.5391	0.6897	0.8565	0.436
Q7SQ3	0.7578	0.7338	0.6324	0.8001	0.9514	0.6086
Q7SQ4	0.6804	0.6913	0.5769	0.7385	0.8878	0.5274
Q7SQ7	0.7662	0.7471	0.6345	0.8195	0.9575	0.6272
Q11TRUST1	0.7983	0.7589	0.5711	0.7517	0.6268	0.9705
Q11TRUST2	0.7286	0.7019	0.7625	0.7165	0.5097	0.9215
Q11TRUST3	0.6988	0.7495	0.5901	0.7242	0.6457	0.9401

## APPENDIX C: Introduction Letter for Participants



INTEGRI PROCEDAMUS