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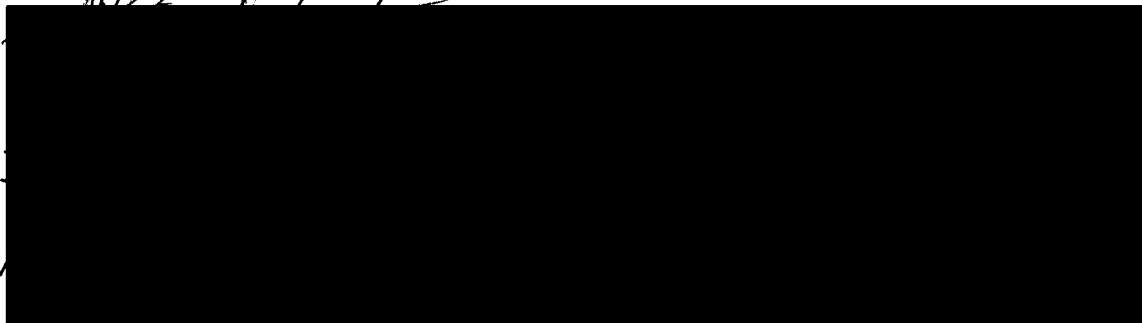
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GHANA'S E-ZWICH SYSTEM AND THE
CHARACTERISTICS OF INNOVATION

(TITLE)

BY

JAMES T. ARTHUR

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

2015

YEAR

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Abstract

In 2008, the Central Bank of Ghana launched the first ever biometric money, e-zwich, in hopes of promoting branchless banking and financial inclusion. Despite being hailed as an innovative policy aimed at transforming the financial industry of the country e-zwich has yet to realize its full potential. A number of studies has been conducted to highlight the many challenges the system faces. This study was also aimed at seeking an explanation to the relative ineffectiveness or failures of e-zwich system but through a theoretical framework. Using Rogers' (2003) framework on the characteristics of innovation, the study seeks to explain why the e-zwich system continues to face significant challenges despite several attempts that have been initiated to help revamp it. Rogers argues that the decision to adopt innovation depends on the innovation's relative advantages, compatibility, complexity, trialability and observability and in essence, the success of the innovation dwells on these characteristics. Therefore, the study attempts to investigate if e-zwich as an innovation exhibited these characteristics prior to it being adopted by the Central Bank.

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CHAPTER ONE: INTRODUCTION

With the advent of computers and electronic communications a large number of alternative electronic payment systems has emerged. An electronic payment system is any system used to settle financial transactions through the transfer of monetary value, and includes the institutions, instruments, people, rules, procedures, standards, and technologies that make such an exchange possible ("Types of E Payment", n.d.). In other words, electronic payment is a form of financial exchange that occurs between the buyer and seller facilitated by means of electronic communication (Kumaga, 2010; See also Vassiliou, 2004). Payment systems are used instead of tendering cash in domestic and international transactions and is an important service provided by banks and other financial institutions in modern banking. There are not many inventions that have transformed the business of banking as quickly as the e-banking revolution (Nitsure, 2003). World over, banks are reorienting their business strategies towards new opportunities offered by e-banking.

E-banking, employing either offline or online technologies, has enabled banks to scale borders, change strategic behavior and thus bring about new possibilities.

Even in countries with less developed banking systems, E-banking has offered many new business opportunities.

Electronic banking has been around for quite some time in the form of automatic teller machines (ATMs) and telephone transactions (Nitsure, 2003). In more recent times, it has been transformed by the internet, enabling both banks and customers to undertake numerous and varied transactions within a short period of time. Thus for customers, the internet offers faster access, is more convenient and available around the clock regardless of the customer's location. For banks, it provides a much more efficient and cost-effective avenue (Nitsure, 2003).

There are varieties of electronic payment. Credit cards, debit cards and prepaid cards currently represent the most common form of electronic payments ("Types of E-Payment", n.d.). For all three types of cards the consumer or the business most often uses a plastic card, commonly with a magnetic stripe. The cardholder gives his or her card or card number to a merchant who swipes the card through a terminal or enters the data to a PC. The terminal transmits data to his or her bank, the appropriator. The appropriator in turn transmits the data through a card association to the card issuer who makes a decision on the transaction and relays it back to the merchant, who gives

goods or services to the cardholder. Funds flow later for settlement with credit cards and are debited immediately for debit or credit cards. Along with magnetic stripe cards, smart cards are and will increasingly be used for payments. Smart cards are at present overwhelmingly plastic credit cards with an embedded computer chip. Hitherto, many smart cards operated using proprietary rather than common standards. A standard set of specifications, Europay-MasterCard-Visa (EMV), has been developed and is being used increasingly so that the chips on smart cards are interoperable. Korea and Japan are among the most advanced countries in Asia for smart card payments, with Malaysia catching up fast due to government mandates for banks to issue smart cards ("Types of E-Payment", n.d.).

Online payments involve the customer transferring money or making a purchase online via the internet. Consumers and businesses can transfer money to third parties from the bank or other account, and they can also use credit, debit and prepaid cards to make purchases online. Current estimates indicate that over 80% of payments for online purchases are undertaken using a credit card or debit card ("Types of E-Payment", n.d.). At present, most online transactions involve payment with a credit card. While other forms of payment such as direct

debits to accounts or pre-paid accounts and cards are on the rise, they currently represent a less developed transaction methodology. ("Types of E-Payment", n.d.). VISA is the most popularly used debit card in Ghana although some of the banks have their own proprietary debit cards (Kumaga, 2010). Debit cards are used to withdraw cash from automated teller machine (ATMs) and to make payment of purchases by using point of sale (POS) outlets. It is important to note that very few departmental stores and restaurants have established POS machines to perform transactions through debit cards.

Another electronic payment that is gradually gaining grounds is mobile payment. Mobile phones are currently used for a limited number of electronic transactions. Consumers can use their mobile phone to pay for transactions in several ways. Consumers may send an SMS message, transmit a PIN number, and use Wireless Application Protocol (WAP) to make online payments, or perform other segments of their transaction with the phone. As phones develop further, consumers are likely to be able to use infrared, Bluetooth and other means more frequently to transmit full account data in order to make payments securely and easily from their phone. Additionally, merchants can obtain an authorization for a credit or debit card transaction by

attaching a device to their mobile phone. A consortium in the US also recently announced PowerSwipe, for example, which physically connects to a Nextel phone, weighs 3.1 ounces, and incorporates a magnetic stripe reader, infrared printing port, and pass-through connector for charging the handset battery ("Types of E-Payment", n.d.). In the developing world, mobile payment is not being lost on them although mobile transactions are not as sophisticated as that indicated above and there are certain challenges.

With the rate of mobile phone subscription increasing by the day, banks in Africa are taking advantage of this opportunity to encourage mobile banking. Bank customers can check their account balance, transfer funds to other accounts among a host of others without having to go to the banks directly. On a continent where mobile phone use is popular even among illiterates, it is a good opportunity to include the uneducated folk into the banking system. As of 2014, it was predicted that internet use on mobile phones in Africa will increase twenty-fold in the next five years. (Smith, 2014). This increase, the researchers claim will be twice the rate of growth in the rest of the world. Thus the future of electronic payment on the continent is promising. As Fredrik Jejdling, sub-Saharan Africa head of Swedish tech company, Ericsson, remarked, "The large number of

people in sub-Saharan Africa who do not have bank accounts suggests that mobile phones may be the only way that many people will be able to access financial services" (Smith, 2014). In Ghana for example, almost all the major telecommunications companies have some sort of mobile money transactions that customers can subscribe to or it can be just a one-time transaction. The biggest telecommunication company in the country, MTN Ghana for instance, has the Mjara Loans in which subscribers can borrow money and repay over a certain period, all through the phone.

In Ghana, people are hesitant to receive payment through electronic medium due to lack of proper education about e-payment. Similarly in Kenya, Google has teamed up with Equity Bank, the largest bank in East Africa, to launch a payment card which lets users pay for their bus fare via Near Field Communications (NFC). This payment system, known as BebaPay (similar to Google Wallet) allows customers to tap or swipe the prepaid card against a card reader when boarding a bus to pay for their journey. The BebaPay service is now available on buses in Nairobi and a free app enables any Android NFC phone to be used as a card reader. Shops, traders and small businesses will be able to use Google's BebaPay in the future to accept payments from customers, without having expensive tills and cash

registers." (Boden, 2013). This system is based on the Google Wallet concept that allows its users to store debit cards, credit cards, loyalty cards, and gift cards among other things, as well as redeeming sales promotions on their mobile phone. Google Wallet is already being used by transit commuters in New Jersey to pay for tickets, but its usage is limited to certain kinds of smartphones.

Thus, albeit cash is yet to disappear from everyday life, the world's largest information technology and financial companies are working on ways to completely replace it with wireless communication payments to be made from smartphones. And some companies such as IBM want to take it a step further and link those wireless payments to biometric signatures to prevent individual accounts from ever being a victim of identity theft (Gomez, 2015)

Biometric payment is the newest form of electronic payment system. It is believed that in the near future, financial services providers might roll out a cashless system based on the digital wallet concept, or one with an additional level of security using biometrics that would extend beyond smartphones (Gomez, 2015). Electronic payments using biometrics are still largely in their infancy. Trials are underway in the United States,

Australia and a limited number of other countries. Most biometric payments involve using fingerprints as the identification and access tool. However, companies like Visa International are piloting more sophisticated techniques such as voice recognition technology and retina scans. Essentially, a biometric identifier such as a fingerprint or voice could replace the plastic card and more securely identify the person performing the transaction. The electronic payment is still charged to a credit card or other account, with the biometric identifier replacing the card, check or other transaction mechanism. IBM believes that in the near future, people will be scanning their eyes to withdraw money from the ATM, for example, and access accounts. And whether we appreciate the idea or not, IBM's research suggests that this is a technological trend that is finally on the move in the United States. Biometric payment system is gradually gaining grounds in the developing world as well. South Africa was the first country in Sub-Saharan Africa to have employed biometric technology. Due to the increasing access and use of the internet, people associate e-banking with only internet banking. It needs to be noted that e-banking and for that matter biometric technology, can apply to both offline, online and internet banking. By the end of 2009,

besides Ghana and Nigeria, the South African firm, Net1 Universal Electronic

Payment System (UEPS) had delivered large biometric payment systems in Namibia, Botswana, Malawi and Iraq (Breckenridge, 2005; 2008). The biometric payment systems in these countries have the advantage of performing both offline and online transactions. In Ghana and Nigeria however, biometric technology was first employed to provide universal identity registration of citizens before later efforts were made to target people who might use the banks. In South Africa, the system was used to transfer social grants. Since the end of the 1990s the founder of Net1 UEPS, Serge Belamant, has been working tirelessly to build an alternative to the Europay-Mastercard-Visa (EMV) standard, geared particularly to the needs of the third-world poor and using a patented biometric system of authentication (Breckenridge, 2010). SmartSwitch Nigeria Limited and Smartswitch Namibia are the Nigerian and Namibian subsidiaries of Net 1 UEPS Technologies Inc. respectively. SmartSwitch was established to deploy the Net1 patented Universal Electronic Payment System (UEPS) technology which provides a secure, universal and affordable e-purse, multi-application, multi-wallet and multi-issuer switching and settlement system, catering for

both the financial and non-financial market sectors. Similar to the Nigerian system is Ghana's e-zwich biometric payment system.

Some of the benefits cited by advocates of this system in both countries were that they are safe and secure, easily accessible, and extremely affordable. In India, the state of Andhra Pradesh initiated the oldest biometric system in the country and like in South Africa, the project's main aim was to provide electronic benefit transfers to rural folks. The first Iraqi UEPS transaction was performed on August 3, 2008, in Baghdad, during the launch of the UEPS smart card technology with two Iraqi state banks, Rafidain Bank and Rasheed Bank ("Smart Card Payment System Launched in Iraq", 2012). Consumers are issued with biometric UEPS smart cards, so that they can have welfare payments and other fund transfers loaded onto their cards. They can then use the cards for purchases at POS terminals, authenticating themselves either with a PIN or at a fingerprint reader. A pilot project involving 100,000 beneficiaries was implemented across selected Iraqi bank branches. The pilot was for the distribution and payment of government grants to war victims and martyrdom beneficiaries, as well as salary and wage distribution and payment to employees of the two state banks.

So electronic payments are well received by policymakers in both developed and developing countries, however in the latter, the initiative is taken up by the state or local governments or a private-public partnership while in the developed world, private firms are leading the way. This reception to electronic payment is necessitated by the benefits that the system brings to both individuals and national governments. Promoting a cashless society is beneficial for so many reasons. The technology being used to usher in a cashless age has the potential to offer security benefits to its users. It is very easy to shut down a digital wallet remotely if it falls into the wrong hands and biometric ID is specific to only one person, and therefore very hard to copy. Some major economic benefits of EPS include mobilizing savings and ensuring most of the cash available in the country are with the banks (Kumaga, 2010). This will in turn make funds available to borrowers (businesses and individuals). A country's payment system facilitates trade and exchange and these transactions generate a derived demand for payment instruments (Humphrey, Kim & Vale, 2001). The cost of making payments can account for 3 percent of Gross Domestic Product; Since an electronic payment often only costs from one-third to one-half as much as a paper-based transaction (a check or

paper giro), significant social benefits can be made by promoting the use of electronic (Humphrey, Kim & Vale, 2001).

Despite the technological advancements in electronic commerce, electronic payment systems via smart cards, credit and debit cards have definite disadvantages (Phelan III. & Phelan, 2007). On a much grander scale, it is difficult, if not impossible, to predict how a cashless financial system would work. Consumers may expose themselves to unnecessary inconvenience and complications, which are more likely in the early stages of any new technology. This problem would be particularly profound in developing countries as witnessed in Ghana, Nigeria, and India among others. In India for instance, Mukhopadhyay, Muralidharan, Niehaus & Sukhtankar (2013) noted that:

delays in the provision of transaction-level authentication data by banks have made it difficult for the government of Andhra Pradesh (GoAP) to monitor the prevalence of manual override-enabled carded payments. The persistence of non-authenticated payments, in combination with the lack of de-duplication protocol, implies that not all loopholes for leakage have been closed.

However, Gelb and Decker (2007) believe that biometric technologies have improved and become ubiquitous enough to allow the confident identification and low cost needed to

implement successful cash-transfer programs in developing countries. Furthermore, the greater sense of security associated with electronic payments as against traditional payment is also doubted by some people. Google, for example swears that the Google Wallet system is more secure than cash and credit cards, but just recently it had to do a temporary shutdown of a feature that allows users to load prepaid card information onto smartphones for spending. The reason for the shutdown was due to a security vulnerability that was exposed by a researcher at a technology convention (Gomez, 2015).

Another potential problem is the failure rate of biometric ID systems. These systems may be convenient, but they are far from perfect. One report states that if you research "failure rate of biometric data systems" via a search engine or academic database, you will find some demoralizing information about the system ("Types of E-Payment", n.d.). For instance, a test by the National Physical Laboratory's Centre for Mathematics and Scientific Computing in the UK, found that the failure to enroll rate of the fingerprint biometric system is 1%. This means some people might not even be able to enroll in a biometric system using their fingerprints. Hence, the greater the population, the higher the failure rate. So even though 1%

may seem like a small figure, it can actually be significant. If there are hundred million individuals wanting to use a biometric system to safeguard their digital wallets, a failure to enroll rate of 1%, means one million people would not be able to even use the system. In Ghana for example, so many individuals complained that they were not able to perform their transactions because the POS terminals were not able to recognize their fingerprints. Issues such as this cast a doubt on whether biometrics are as reliable as their sales and marketing pitches, policymakers and advocates portray them to be.

Practically speaking, debit transaction (which is a feature of biometric payment system) is currently available in the physical world only, not the internet. A number of financial institutions have introduced technology that could advance the development of PIN-based debit processing on the web, including digital certificates, smartcard solutions and compact disc-based systems. But no widely-accepted operating standards have yet to be established ("Online vs. Offline Debit Transactions", 2002). Nevertheless, it is only a matter of time that biometric payment systems as found in these developing countries and elsewhere would incorporate suitable internet technology, taking e-banking to another level.

However, on the basis of United Nations report on e-banking in developed countries, United Nations Conference on Trade and Development (UNCTAD) 2002 report has identified four challenges that developing countries, in general, are expected to overcome to achieve the benefits that e-banking initiatives can bring about (Nitsure, 2003). First, the ability to adopt global technology to local requirements. As the report goes on to say, there has to be an adequate level of infrastructure and human capacity building before developing countries can adopt the global technology for their local requirement. A lot of corporate companies and consumers in some developing countries either do not trust or do not have access to the necessary infrastructure to be able to process e-payment. Second, the capability to strengthen public support for e-finance. Historically, most e-finance initiatives in developing countries have been the result of cooperative partnership between the private and public sectors. As a result, if the public sector does not have the required capacity to initiate and implement the projects, it is important that cooperative efforts between public and private sectors, along with the multilateral agencies like the World Bank, be developed to facilitate public support for e-finance related initiatives.

Third, the ability to create a necessary level of regulatory and institutional frameworks: The lack of regulatory frameworks, trust, security and privacy standards, high trade barriers, customer and investor protections impede progress in implementing e-banking initiatives on a larger scale in many developing countries. Last but not least, the ability to mainstream small and medium scale enterprises (SMEs) towards e-banking: The availability of and access to quality data and banking information is required for SMEs in developing countries to move towards e-banking. Similarly, on-line credit information will enhance SME's ability to secure financing. Aside these challenges, policies initiated in developing countries are often polarized among political lines as the incumbent governments always try to tie the success of any policy to its managerial prowess. As a result, any failure, is quickly attributed to incompetence on the part of the sitting government and its national party by opposition parties. Opposition parties are therefore quick to oppose any initiative implemented by the incumbent government regardless of the benefits of the policy. Even more problematic is the possibility of a new regime abandoning sound projects initiated by the previous regime. This problem obviously affects the sustainability and support of

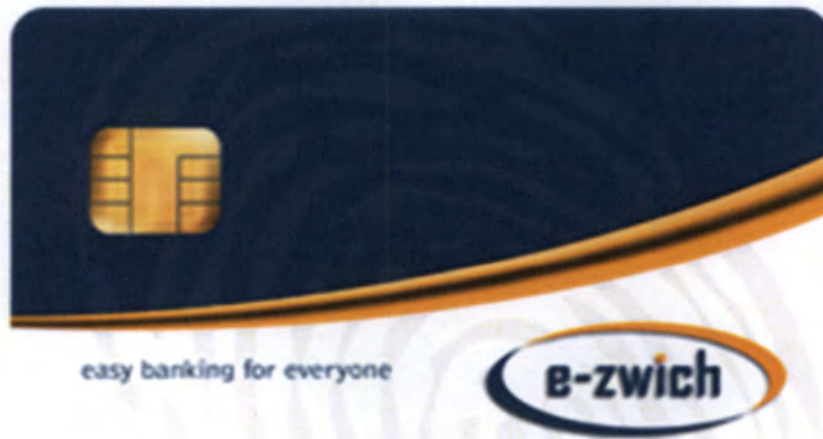
any prior policies initiated by the previous. So many projects are many a time, inadequately funded rendering them ineffective.

The UNCTAD 2002 report could not have been any more accurate. These are real challenges that confront most developing countries in their effort to catch up to the rest of the world with regard to e-banking. As a result, biometric payment systems delivered in the above mentioned countries have faced similar challenges identified in the report. In India (where the poverty ratio is still adverse at 26.1 per cent of total population), it is likely that wealthier people will rapidly migrate to e-banking platforms leaving the poor to bear the cost of the physical infrastructure of branches in the form of transaction fees or non-competitive interest rates on their deposits (Nitsure, 2003). Likewise in Ghana, systems of biometric identification that was initially meant to provide universal identity registration was obscured by the effort to target people who might use the banks (Breckenridge, 2010).

The value of this research therefore is to investigate certain characteristics that favor the adoption of global or foreign policies by local economies. It attempts to do

so by emphasizing Ghana's biometric payment system, the e-zwich and seeks to understand the various reasons that could explain the relative failure or ineffectiveness of the policy. Rogers (2003) argues that innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations. Using Rogers' framework, this study seeks to investigate if the e-zwich policy exhibited these features prior to it been adopted by the Central Bank of Ghana.

Fig 1. The E-zwich card.



CHAPTER TWO: LITERATURE REVIEW ON APPROACHES TO STUDYING POLICY

Rogers' diffusion of innovation theory set the pace for increased scholarly work on policy diffusion. While his emphasis was on the role of 'people' in the adoption of an innovation, recent work has focused on the various processes involved in policy diffusion. This section of the study, aside looking at the various diffusion mechanisms existing in the literature, also discusses other equally important approaches to studying policy adoption or diffusion. Rogers' theory of innovation is also examined without going into its nitty-gritties and an attempt is made to justify why this particular theory was deployed at the expense of other approaches to studying policy adoption and particularly, for the case studies presented here. For brevity purposes the study only looks at a handful of alternative theories on how policies are adopted and implemented by policymakers in a social system. They are pluralism, regime theory, and institutionalism. These theories are examined because they have attracted substantial scholarly work, with authors positing variants of each theory while attracting equally significant criticisms. The study does not thoroughly address every facet of each theory, only looking at its main argument and

its fit with the whole purpose of the study (at the latter part of this section). It is equally important to emphasize that these theories are essentially models of politics but some of them "help in thinking about public policy" (Dye, 1992).

Pluralism

While there are variants of this theory such as classical pluralism, elite pluralism and neo-pluralism, the central theme is that politics and decision making are resided largely in the framework of government, however, there are many non-governmental groups that use their resources to exert influence. Nevertheless, as Robert Dahl explains, the central government is "the most effective institution for coercion" and the principal allocator of state resources (Stone, 1993). In its application to public policymaking, it reasons that power is relatively broadly (though unequally) distributed among many more or less organized interest groups in society that compete with each other to control public policy, with some groups tending to exert control in one or two issue areas while other groups and interests tend to dominate in other issue areas or arenas of struggle ("A Glossary of Political Economy Terms", n.d.).

Regime Theory

Regime theory's (especially, urban regime theory) emphasis on the role of the economy and the private sector in influencing political choices seems to remedy the insufficiency of the pluralist thought. The theory's main argument is that international institutions or regimes affect the behavior of states or other international actors. However, by lending itself to international dynamics, regime theory falls short of the strength of pluralism: the important role of domestic actors in policymaking. Stephen Krasner defines regimes as a set of explicit or implicit "principles, norms, rules, and decision making procedures around which actor expectations converge in a given issue-area" Krasner, (1982). This definition means that regimes need not be states (James, 2007). If this is the case, (of course, in many instances, they are treated as states), it is expected that any individual including private individuals can carry new innovations from international institutions or arenas into their countries especially when such innovations are perceived to maximize their profits. While this is possible, businesses are supposed to seek regulatory permissions from political authorities through executive agencies before they can implement such innovations in the

country which can be far from easy. Nevertheless, liberal regime theorists believe that international institutions at most bring about an environment conducive to the convergence of state interests, which facilitates regime cooperation; and at least, facilitate cooperation that might otherwise not have been able to occur in an anarchic world.

Institutionalism

The contention of which interests to serve; those of the state or private interests as highlighted above causes rational choice institutionalists to argue that the choice of either depends on the 'rules of the game'. That is, the theory posits that institutional rules alter the behavior of intendedly rational individuals motivated by material self-interest (Sabatier, & Weible, 2014). And so Peters (2011) argues that individuals, in an attempt to meet organizational goals, consciously choose to be, to some extent, constrained by being members of the institution whether they were compelled to be members or not. Rational choice institutionalism (RCI) is however only one variant of 'new institutionalism' which generally recognizes that institutions operate in an environment consisting of other institutions, called the institutional environment. Every institution is thus influenced by the

broader environment (or institutional peer pressure). In this environment, the main objective of organizations is to survive. In order to do so, they need to do more than succeed economically, they need to establish legitimacy within the world of institutions. Peters (2011) mentions eight approaches of new institutionalism including RCI highlighted above. Historical institutionalism provides an interesting approach to new institutionalism. Not only does it espouse the importance of history but also how historical antecedents in political processes persist to provide the basis for present and future political actions. And so the adoption of e-payment systems by a political system depends on 'path-dependent' choices that were made in the past, hence, the survival of this new technology would rest on its adaptation or suitability with past decision structures.

The weakness of historical institutionalism as an approach of new institutionalism is made up by normative institutionalism which is guided by the 'logic of appropriateness' and contends that much of the behavior of institutional actors is based on the recognized situation the actors face, the identity of the actors in the situation, and the analysis by the actor of the rules that generally govern behavior for that actor in that particular

situation. That is, political outcomes or actions are no longer 'locked in' the system, but that the logic of appropriateness means that actions are "matched to situations by means of rules organized into identities" (March, 1994).

If normative institutionalism portends chaos in organizations, discursive institutionalism is a greater culprit of this problem. By arguing that 'ideas' shape individuals' behavior which in turn shapes institutions, discursive institutionalism challenges the inherent stasis with other institutionalisms. Therefore, in The Oxford handbook of Political Institutions, Colins Hay states that this approach attempts to "capture, describe and interrogate institutional disequilibrium". This is perhaps born out of the fact that members of an institution do not accept ideas blindly (Peters, 2011). To reduce this problem, Peters (2011) emphasizes the importance of coordinative efforts of members of the institution to create, elaborate and justify the ideas in setting policy agenda. Thus, communication is the key to consensus. However, Peters rightly contends that not all members are equal in policy negotiations, some members have access to the policy arena while others do not. Sociological institutionalism is perhaps the approach that truly

embodies the environmental aspect of new institutionalism even though others argue that it shares similarities with normative institutionalism. This approach argues that institutions mimic certain values of its environment/society for purposes of gaining legitimacy and not necessarily for 'functional' or organizational goals. In other words, institutions adopt certain elements of its environment-cultural or institutional field just because other institutions have those elements even if they are not needed in the organization. Thus, perhaps countries in southern Africa (Malawi, Botswana and Namibia) which adopted the biometric payment system from neighboring South Africa did so out of the intention that they are also seen as 'technological' or 'sophisticated' countries and not necessarily for perceived advantages that the system could bring.

New institutionalism undoubtedly provides a great deal of interest on how institutions, regardless of the type influence individuals' actions or behavior. However, it is important to note that institutions are embedded in the 'state', hence their constraining power would somehow be influenced by the state. It is logical to reason that a democratic or capitalist state would influence institutions differently from how a socialist

state would impact its institutions. Skopcol (1990) is therefore justified when she calls for Bringing the State Back in political analysis. This is where old institutionalism varies from new institutionalism. For the former, public policy is authoritatively determined, implemented, and enforced by governmental institutions (Dye, 1992). Dye contends that governmental institutions offer three distinctive characteristics to public policies; legitimacy, universality and coercion.

Governmental policies are generally seen as legal obligations that command the loyalty of the public. While policies of other groups and organizations such as corporations, churches and a host of others may be seen as important and binding, only governmental policies involve legal obligations. Second, only government policies extend to all people of the society irrespective of social status; the policies of other groups he states, only reach a part of the society. Lastly, government monopolizes coercion in society; that is, only government can legitimately arrest and imprison those individuals who violate its policies. Therefore, an e-payment should carry enough legitimacy that almost all citizens embrace it and deviants are either coerced into suing the system or risk going to jail.

MODELS FOR POLICY ANALYSIS

Although regime theory, pluralism, and institutionalism can be applied to the policymaking process, other theories; punctuated equilibrium, advanced coalition theory, public choice theory and policy diffusion are considered in this study as more suitable.

Punctuated Equilibrium

This theory was originally developed by Baumgartner and Jones (1993), and argues that policymaking is characterized by long periods of incremental change punctuated by brief periods of major policy change (Sabatier, 2014). As a result, rarely observed substantial policy alterations may take place when opponents of extant policy create new perceptions of the issue at stake and search for support for their new policy idea (Donnelly and Hogan, 2012; see also Meijerink, 2005, p. 1064). Therefore, Kleistra and Mayer (2001) indicate what they call "carriers" (motors for change) and "barriers" (hindrances to change) are two sides of the one coin (Donnelly and Hogan, 2012). Specifically, the model states that policy generally goes through incremental changes due to several restraints, namely the 'stickiness' of institutional cultures, vested interests, and the bounded rationality of individual decision-makers. For policy to change therefore,

there will have to be changes in these conditions, especially in party control of government, or changes in public opinion.

This theory would therefore posit that the adoption of an e-payment system is functional due to the need to adapt to changing situations especially if these new situations are born out of change in government or regime (for a progressive one). Such a change however may not be reflective of public opinion and the innovation may not be the right fit for the society.

Advocacy Coalition Network

The advocacy coalition network, attributed to Sabatier and Jenkins-Smith (1988, 1993), deals with the interaction of advocacy coalitions—each comprising actors from a variety of institutions with a set of policy beliefs (Sabatier & Weible, 2014) and form an alliance to mobilize resources to attain greater influence in the policymaking process (Nohrstedt & Weible, 2010, p. 16). This approach seeks to explain how groups, forming over an issue of concern to them, can lead to the development of new ideas for change (Donnelly & Hogan, 2012; Jones & Jenkins-Smith, 2009). On the other hand, Sabatier & Weible, (2007, p. 202) contend that for policy change to occur, an external shock

is required, such as a macroeconomic crisis whereas for the "epistemic approach", policy change may be precipitated by uncertainty over a problem (Meijerink, 2005, p. 1063). Nevertheless, both approaches show the roles of networks, ideas, information and learning processes in policy change (Donnelly & Hogan, 2012; Haas, 2004). This means that this theory has similar weakness as punctuated equilibrium, the only difference is that there is the emphasis on collaboration between groups to deal with the change, exogenous (Sabatier & Weible, 2007) or endogenous (Jones & Jenkins-Smith, 2009).

Public Choice Theory

Public choice theory (PCT) challenges the earlier assertion in political science that individuals act differently in politics than they do in the marketplace (Dye, 1992). PCT posits that all political actors including voters, taxpayers, candidates, legislators, bureaucrats, technocrats, parties, bureaucracies and governments intend to maximize their personal benefits in politics just as in the marketplace (Dye, 1992). Furthermore, government itself arises from social contract among individuals who consent for their mutual interest obey laws and support the government in exchange for protection of their personal well-being such as liberties and security.

Therefore public choice theorists would argue that the biometric payment systems introduced in South Africa and Ghana was an attempt by the Central Bank or the government in these countries to meet their ulterior motive, say awarding of the contract for the system's implementation to relatives and family members so as to share in the profits. However, there were virtually no complaints or allegations of corruption targeted at authorities during the adoption of the biometric payment systems in both countries. This was perhaps due to the joint-partnership venture between the state and the private entity, Net1 UEPS for the implementation of the innovation. Perhaps, if the whole project was left in the hands of the central government, things would have been different

Aside the above theories, there are other theories that could be deployed in explaining the policy process in countries. Rationalism, incrementalism, elite, group, and system theories are all useful in understanding how policies are formulated. However, like the other theories, there is either the overemphasis on individuals or the institutional environment, with little combination of both variables in explaining policy choices. The study therefore posits that these theories do not adequately

demonstrate how political systems adopt innovations from political systems.

Unlike pluralism, this study is concerned with how political systems in general adopt policies from other political systems. Although it can be argued that both governmental and non-governmental groups have ties with international arenas, this is not the focus of the pluralist theory. It places heavy emphasis on domestic political and public processes with little or no regard to its external environment in the shaping of public policies. Even if there is the assumption of the interaction with international policy actors, as Dahl contends, the central government being the crucial decision-maker, does not guarantee that the observability of alternative policy options elsewhere would necessarily be adopted in the host country. The decision to adopt this 'foreign' policy would depend on the peculiar interest of the dominant actors in the policy negotiations which can go either way.

Furthermore, for both institutionalisms, policy is an institutional output as posited. However, both theories do not fully address the role of environmental support, albeit the former attempts to remedy this problem. A greater weakness is its silent or no mention of the

'policy' itself as an important factor of the political process; the heavy emphasis on the actions of policymakers in the decision-making process undermines the importance of the need for the suitability of those actions to the policy. For example, given that new situations may require new solutions, historical institutionalism as an approach does little to address this problem. The requirements of adopting and implementing e-payment systems may require a total overhaul of the financial sector that has been in place for many decades. In this case, the survival of this new technology would have less to do with political decisions made by policymakers in the past and more on relying new techniques that would perhaps require looking elsewhere for policy solutions. However, some historical institutionalists, in an attempt to address this problem rely on punctuated equilibrium theory or 'critical junctures' in the system's development path (this theory is addressed later on this section) that redefines the political process and become the new foundation for future political actions.

Also, the flexibility in policymaking afforded by normative institutionalism by virtue of its 'logic of appropriateness' imply that policymakers in trying to ensure the success of e-payment system may look for new

ways that are suited to it, nevertheless, the institutional bounds are still inherent and may still constrain actors' actions. Thus, new implementation measures may not be optimal in dealing with this new situation. Furthermore, the morality content in normative institutionalism portends differences in opinions as regards how a particular situation should be treated. Also, "it may run counter to democratic principles by implying the substitution of tacit understanding for collective deliberation" (Balsiger, n.d.). Discursive institutionalism also stresses the inequality of access to policy negotiations by members of an organization. This means that the policies adopted by superior members may not necessarily represent the best interest of the institution and perhaps that of the society at large. Therefore, an e-payment system adopted by policymakers may not receive the necessary institutional support for its survival and success.

Old institutionalism on the other hand maintains that the coercive nature of government policies ensures that all residents of a country comply with the rules of those policies. However, in reality this is not the case, almost all public policies, despite its legal force are not accepted by the society. In fact, there are many instances whereby the policy itself excludes other

groups in the society. In other instances too, the organizational and infrastructural base are non-existent to ensure the full utilization of that particular policy.

Regime theory also undermines the political and institutional obstacles to the conception of an idea in the first place. It assumes that there is a thin line between domestic and international interests which is not true in many cases. It therefore appears that the adoption of any foreign innovation would first have to receive the political support in the adopting country before further measures can be taken to bring the innovation into full force. In short, whereas pluralism fosters greater domestic interaction and reinforcement of domestic interests, regime theory undermines domestic interplays and rather relinquishes the fate of the 'state' into the hands of international institutions. Furthermore, punctuated equilibrium theory's overemphasis on exogenous factors in influencing policy outcomes therefore does not address the functionality or otherwise of the new policy in the society. Moreover, the theory implies that extant policies are discarded for new ideas. This is not the case on many occasions, in that existing policies may coexist with new inventions and this could threaten the successful implementation of the new policy. Thus the adoption of

biometric payment system in Ghana may be less effective due to the strong attachment of the society to existing norms. And so Legro (2000) argues that sometimes a society re-embraces the old doctrine of doing things if it fails to agree on a replacement. Therefore, punctuated equilibrium like the other theories highlighted above, does not address the suitability of the new policy to the conditions existing in the social system; it takes 'changes' as givens.

Scholars of advocacy coalition network, Jones & Jenkins-Smith (2009) would argue that the biometric payments systems deployed in Ghana and South Africa must have been a conscious effort on the part of advocacy groups, largely from the financial sectors in both countries to change the financial system. According to them, this is because groups form over an issue of concern to them, and this leads to the development of new ideas for change. This was however not the case in the countries as the deployment of the technology was an initiative by either the Central Bank (Ghana) or the State (South Africa). Also, contrary to Sabatier and Weible, the adoption of these systems were not as a result of any crisis in either society. There were challenges with the existing system, but they were definitely not at a crisis

level. Besides, the advent of this new technology brought with it certain challenges which have lived on to date. Thus the advocacy coalition theory is also inadequate in capturing the effectiveness or otherwise of the biometric payment systems in Ghana and South Africa.

Lastly, Public choice theory over exaggerates the selfish motive of public workers. It assumes that public officials would always engage in corrupt practices just to achieve their material goals. But as far this study is concerned, no corruption allegations were proceeded in court against authorities of who spearheaded the adoption of the innovation in both countries. In South Africa, the technology was actually deployed to reduce corruption and this is enough justification to show the misapplication of the public choice theory to the adoption of biometric payment systems in both Ghana and South Africa.

This study by relying on Rogers' diffusion framework implies that it sees policy diffusion as the best theory in explaining the adoption of policy alternatives in social systems. The theory is particularly useful in this study because it specifically deals with the adoption of technological innovations. Biometric payment system as a technological innovation is therefore best explained by

this theory. Furthermore, it is the most often cited work dealing with diffusion. Moreover, as Rogers' points out, diffusion is not a single, all-encompassing theory (Yates, 2001). As the study explains in the next section, Rogers' framework incorporates various aspects of the adoption of a policy including policy actors, the environment or social structure, the process and the attributes of the innovation itself. Rogers' diffusion of innovation is therefore includes several theoretical perspectives that relate to the overall concept of diffusion; it is a meta-theory. Therefore before elaborating on Rogers' diffusion of innovation particularly his characteristics of innovations theory, it is important to understand the tenets of general diffusion theory.

Policy Diffusion: A More Useful Approach

Policy innovation here means a process whereby a government-a national legislature, state agency, or a city adopts a new policy (Shipan and Volden, 2008; Mintrom 1997a; Walker 1969). While the basis for such adoption can come from within the political system such as from interest groups, policy innovation can also come from outside the polity, with the spread of innovation from one government to another, a process known as policy diffusion (Shipan and Volden, 2008). The latter is the emphasis of this study.

There are generally four processes of policy diffusion that are found in the extant literature: learning, economic competition, imitation, and coercion. Throughout this discussion, for the purpose of simplicity, mention is made of the 'country' or 'state' taking action, that is learning or competing or any of the mechanisms, for example. However, it is worthy to note that individual decision makers are the critical actors in these countries, example, the Governor of Bank of Ghana.

The first mechanism of diffusion that the study examines is learning. By observing the politics of policy adoption and the impact of those policies, policymakers can learn from the experiences of other governments. Thus, for Berry and Baybeck, the main proponents of policy diffusion (Sabatier & Weible, 2014) "when confronted with a problem, decision makers simplify the task of finding a solution by choosing an alternative that has proven successful elsewhere" (2005, pg 505). This is similar to advocacy coalition network theorist, Meijerink, 2005 that policy change may be precipitated by 'uncertainty' over a problem as stated above. However, the difference here is that emphasis is on the 'process' rather than a coalition of actors who may share similar beliefs. With policy diffusion by learning, policymakers of one country need not interact

with actors of the other country from where the particular policy is being adopted. By merely 'observing', the adopting country can learn the experiences of other governments. Rather than adopting policies through coalition networks, it can only take a single representation at a conference by a policymaker to decide adopting the lessons of the conference in his or her country. A case in point is Bolivia's pension privatization which was based on Chile's pension privatization system (Starke, 2013).

The Finance Ministry's budget director, Helga Salinas, attended the annual conference of the business peak association, Confederación de Empresarios Privados de Bolivia (CEPB). The keynote speaker was the architect of Chile's reform, José Piñera (interviewwithCuevas2002). Widely credited with great persuasive powers, Piñera advertised his innovation with missionary zeal. Salinas was so captivated that she took Piñera aside and kept talking to him over lunch. She depicts this encounter as an eye-opening experience, a crucial turning point in her ongoing efforts to combat pension problems, and the starting point of the privatization project, which drew on very extensive advice and consultations with Chilean experts during the following years (interviews with Salinas 2002 and Bonadona 2002).

Thus while it may seem as an advocacy coalition network (consultations between Chilean and Bolivia policy

experts), this was clearly after the main actor, the budget director had 'learnt' of the policy in the first place. So once learning has taken place, it is easy for diffusion to follow. However, learning involves a determination of whether a policy adopted elsewhere has been largely successful as was the case in Chile which led Bolivia adopting the former's pension privatization model. Similarly, an assessment of the ability to implement an innovation is also likely to be a component of the learning process. And so Nicholson-Crotty & Carley (2015) argues that potential adopters are likely to ask not only, "Was the policy effective in other states that adopted it?" but also, "Can we make the policy work for us?"

The second mechanism is economic competition, albeit some scholars raise it in conjunction with learning, (Shipan, & Volden, 2008). However, Boehmke and Witmer (2004) by studying state adoption of Indian gaming 'compacts', argue that both mechanisms are important in explaining initial adoptions, whereas only economic competition explains subsequent compacts because previous experience with one's own compacts removes the need to learn from the experience of others (Shipan, & Volden, 2008). Thus, Ghana may have learned biometric payment system from South Africa, but subsequent alterations in its

system may be attempts to make its system the dominant force or the best in Africa. As Breckenridge (2010) indicated, Ghana's biometric payment system although it was installed by a South African firm, had features that were different from the latter's. However, it can be reasoned that economic competition as a diffusion mechanism is more relevant in the private sector than in the public sector or at least, among unitary states. Berry and Baybeck (2005) for instance, argue that learning can take place across states generally, while economic competition is typically confined to individuals living near state borders (in the US).

The third mechanism, imitation, is grounded in the idea that decision makers may choose policies in order to show that they are behaving in a proper and adequate manner (Braun, & Gilardi, 2006; Meyer and Rowan, 1977, p. 349). In other words, actors copy the actions of another in order to look like that other. So under the learning mechanism, the policy is adopted for functional purposes and policymakers are more interested in whether the policy would be effective or not. That is, there is the focus on the policy itself, whereas with imitation, the focus is on the other government (Shipan, & Volden, 2008). The danger with this mechanism is that countries risk adopting the

same policies of innovative countries without necessarily thinking about the consequences of such adoptions. Thus in South Africa, there was no other country to learn experiences of biometric payment system from so it could not have imitated this innovation. Diffusion by imitation is therefore inspired by sociological institutionalism which also implies that units have to conform to their normative environment (Gilardi, 2014). However, it is hard to dispute that Ghana adopted the biometric payment system with noble intentions-for financial inclusion and to harmonize transactions in the banking system. This is even more so in South Africa, which was the first country to experiment with this innovation where it was deployed to enhance the distribution of social grants.

Last but not least is diffusion by coercion. In the international setting, and as pertaining to this study, countries can coerce one another through trade practices and economic sanctions. They can attempt to coerce others directly, or can do so through international institutions like the United Nations and the International Monetary Fund, which encourage or pressure governments to take actions that meet common expectations (Shipan, & Volden, 2008). Both South Africa and Ghana biometric payment systems were not adopted as a result of international

pressure from donor countries or the Bretton Wood institutions. Where the biometric payment system has benefited from donor support directly and indirectly, no foreign country recommended this policy in the first place and any donation has been appropriated at the discretion of the Central Bank and Ghana Interbank Payment and Settlement Systems, the subsidiary of the former that is charged with the oversight control of the system.

In conclusion, while the study attributes the adoption of the biometric payment system in Ghana to the process of diffusion, it does not subscribe to diffusion by imitation, economic competition and coercion, but specifically to the process of learning. Four justifications are given for this conclusion. The first clear evidence is the fact that South Africa was the first country to adopt this innovation on the continent of Africa, consequently, other neighboring countries adopted it. As a corollary to the above point, no country in West Africa had this payment system in place which could have served as a leaning point to Ghana, hence, it goes to say that the only suitable country to learn from was South Africa. As the saying goes, "If you want to learn, learn from the best". Second, the fact that a South-African firm that was deployed for the implementation of the e-zwich in

Ghana attest to the assumption that the biometric payment ideas was adopted from South Africa.

In showing that "policy effectiveness is inexorably linked to implementation choices", Nicholson-Crotty, & Carley (2015) argue that policymakers work hard to ensure that policies are administered in a way that commensurate with their preferences. As a result, they further contend that they might prefer adoption information from states with which they share demographic and ideological characteristics, lawmakers may place greater weight on effectiveness information from states that share similar implementation capacities or environments. And so the founder of Net1 UEPS, the developer of the biometric payment systems in both Ghana and South Africa, as well as the Governor of the Central Bank of Ghana, asserted that the innovation is most suited to the African rural setting due to its offline feature (Breckenridge, 2010).

This study therefore assumes that Ghana adopted the biometric payment technology from South Africa because it believed that it shared similar characteristics with South Africa that would make the system effective in Ghana as much as it was in South Africa. The logic of this position is that the simple spread of policies from one

jurisdiction to another could be caused by any number of factors, but if we see that jurisdictions are copying successful policies and forgoing those that prove ineffective, then we can assert with greater confidence that policy learning is contributing to diffusion (Nicholson-Crotty, & Carley (2015)). However, the perception of successful policies elsewhere does not guarantee success in other jurisdictions. This obviously has to do with the conditions in place in the adopting nation as well as the innovation itself and the interplay of both factors. As a result, some indicators need to be available to serve as guidelines in measuring the effectiveness of an adopted policy. One way of assessing the effectiveness of an adopted innovation can be found in Rogers' characteristics of innovation framework, which he posits in his book, *Diffusion of Innovations*. The book is examined (only briefly) in the following section.

Diffusion of Innovation

Rogers (2003) *Diffusion of Innovation* is broader than what is captured here, but his main argument was on the role of participants in a social system in the innovation-diffusion process. Rogers argues that diffusion is the process by which an innovation is communicated through certain channels over time among the participants

in a social system. Rogers proposes that four main elements influence the spread of a new idea: the innovation itself, communication channels, time, and a social system. However, his main emphasis was on human capital (adopters). Rogers' emphasis on this crucial role of individuals in influencing the rate of adoption of innovation encouraged him to posit that the key to adoption is that the person must perceive the idea, behavior, or product as new or innovative and that it is through this that diffusion would occur ("Diffusion of Innovation Theory", n.d.). As a result, the characteristics of the target population are the essential ingredients that will help or hinder adoption of the innovation, hence determining its success or failure. He therefore defined five adopter categories of a population in any given country and argues that when promoting an innovation, there are different strategies used to appeal to the different adopter categories. They are Innovators, Early Adopters, Early Majority, Late Majority and Laggards.

Innovators are people who want to be the first to try the innovation. They are adventuresome and willing to experience new ideas. Hence, they should be prepared to deal with 'unprofitable' and 'unsuccessful' innovations, and a certain level of uncertainty about the innovation. These people are very willing to take risks, and are often

the first to develop new ideas. Very little effort, if anything, needs to be done to appeal to this population. Early Adopters are people who represent opinion leaders. They enjoy leadership roles, and embrace change opportunities. With regard to the e-zwich system for example, such an individual would be the governor of the Central Bank of Ghana, Dr. Paul Acquah whose "progressive" inclinations largely influenced the adoption of the biometric system in Ghana. Without his expert approval of the technology, based on the perceived 'relative advantages' that the system would bring to the financial system in Ghana, perhaps the innovation would not have been adopted in the first place. Thus, such individuals are already aware of the need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change. Early Majority on the other hand are rarely leaders, but they do adopt new ideas before the average person (Diffusion of Innovation Theory, n.d.). However, they typically need to see evidence that the innovation works before they are willing to adopt it. Therefore, in appealing to this population, strategies such as success stories and evidence of the innovation's

effectiveness can be deployed. ("Diffusion of Innovation Theory", n.d.). In short, their adoption of an innovation is a more conscious effort comparative to Innovators and Early Adopters.

People who are skeptical of change, and will only adopt an innovation after it has been tried by the majority form the Late Majority category. Strategies to influence the attitude of this population include information on how many other people have tried the innovation and have adopted it successfully. To reduce the uncertainty of the innovation, interpersonal networks of close peers should persuade the late majority to adopt it. Then, "the late majority feel that it is safe to adopt" (Sahin, 2006; Rogers, 2003, p. 284). Lastly, Laggards are those who are strongly attached to tradition and very conservative. They are very doubtful of change and are the most difficult group to bring into the fray. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups. ("Diffusion of Innovation Theory", n.d.).

Despite his five categories of adopters, Rogers (2003) further divided them into two main groups: earlier adopters and later adopters. Earlier adopters comprises

innovators, early adopters, and early majority, while late majority and laggards are the later adopters. Rogers identifies the differences between these two groups on the basis of socioeconomic status, personality variables, and communication behaviors, which usually are positively related to innovativeness (Sahin, 2006). For instance, "the individuals or other units in a system who most need the benefits of a new idea (the less educated, less wealthy, and the like) are generally the last to adopt an innovation" (Rogers, 2003, p. 295). For Rogers, there was no significant difference between the ages of earlier adopters and later adopters, but this categorization and its characteristics are beyond this study. Rogers postulate on this adopter category however portends certain issues.

First, it is not clear whether adopters should be seen as policymakers or all individuals in a social system. It appears that he alternates between these two types of individual. For example, while he describes (to a greater extent) Early Majority as consisting of individuals who hold leadership roles, Later Majority and Laggards are cast as comprising largely of the hoi polloi of the society. The problem with this lack of specification is that, it is rarely disputed that elites, especially ruling elites are the main initiators of policies. The decision to

adopt an innovation or not, rests almost entirely with these individuals even to the extent of ignoring expert advice on the consequences of such policy. While the masses can influence policy choice through public outcry and the like, the decision to consent to it or clamp down on any agitations is determined by the ruling elite. Second, it is far from straightforward to clearly delineate the population of any social system into his five adopter categories. For instance, do the various categories of adopters remain the same for any innovation? Do they remain the same irrespective of the number of years after adoption of the innovation? So many questions can be posed that could challenge this theory of adopters, especially with regard to its generalization to other social systems. Rogers deals with some these challenges by indicating that diffusion manifests itself in different ways in various cultures and fields and is highly consequential to the type of adopters and 'innovation-decision process' which he defined as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (Sahin, 2006; Rogers, p. 172).

To surmise, Rogers proposes five steps involved in the innovation-decision process; (1) knowledge, (2)

persuasion, (3) decision, (4) implementation, and (5) confirmation. The innovation-decision process starts with the knowledge stage. Here, an individual learns about the existence of innovation and seeks information about the innovation. "What?" "how?," and "why?" are the critical questions in the knowledge phase (Sahin, 2006). At this phase, the individual tries to find out "what the innovation is and how and why it works". It is however worthy to note that while knowledge is important in the rate of adoption, individual's attitude also shapes the adoption or rejection of the innovation. With regard to the persuasion step, the individual forms a negative or positive attitude toward the innovation, but "the formation of a favorable or unfavorable attitude toward an innovation does not always lead directly or indirectly to an adoption or rejection" (Rogers, 2003, p. 176). The individual develops the attitude after he or she knows about the innovation, so the persuasion stage occurs after the knowledge stage in the innovation-decision process.

The decision stage in the innovation-decision process where the individual chooses to adopt or reject the innovation. Rogers explains that while adoption refers to the "full use of an innovation as the best course of action available," rejection means "not to adopt an innovation"

(Rogers, 2003, p. 177). If an innovation is tried on a smaller basis prior to full implementation, it is usually adopted more quickly, due to the fact that most individuals would first want to try the innovation in their own situation and then decide whether to adopt it or not (Sahin, 2006). The implementation stage is where the innovation is put into practice. Nevertheless, there is still some level of uncertainty about the innovation with regard to its outcomes. Thus, the implementer may need technical assistance from change agents and others to reduce the degree of uncertainty about the consequences. Moreover, the innovation-decision process will end, since "the innovation loses its distinctive quality as the separate identity of the new idea disappears" (Rogers, 2003, p. 180).

These questions raised above and others are the main reasons why this study choose not to focus on Rogers' framework on innovation adopters, but rather on his framework on the characteristics of innovation. With the latter, the emphasis is not on the 'adopter' per se, but on the inherent attributes of the innovation itself relative to the conditions in place in the adopting nation. By focusing on the characteristics of relative advantage, compatibility, complexity, trialability and observability

of innovations, the 'adopters' are defined specifically as policymakers, and not any individual of the social system. While the success of the innovation may depend on the ordinary people, this issue is only secondary and only comes in after the adoption of the innovation by policymakers in the first place. Furthermore, the issue of the conditions in the adopting country is paramount; since diffusion of innovations occurs in the social system, it is influenced by the social structure of the social system (Sahin, 2006).

For Rogers (2003), structure is "the patterned arrangements of the units in a system" (p. 24). And so he concludes further that the nature of the social system affects individuals' innovativeness, which is the main criterion for categorizing adopters. So clearly, the crux of his theory is the interplay of social structure and the attributes of the innovation itself in the process of diffusion and it is for this reason that the study relies solely on this part (characteristics of innovations) of his theory. In other words, while Rogers places heavy emphasis on the role of actors in the social system, he clearly situates their attitudes as a function of their environment, hence, it makes sense to rather focus the study on these social conditions and their interaction with

the characteristics of the innovation itself to draw more useful conclusions from the theory and its application to biometric payment systems in the case studies. A caveat however is that, actors perception of his or her environment may not be the accurate picture or certain environmental factors are perceived as relatively more important than others, thereby, facilitating the adoption of a particular policy.

CHAPTER THREE: METHODOLOGY

This study employs the case study approach. In doing case study research, the "case" being studied may be an individual, organization, event, or action, existing in a specific time and place. It involves the description of a management situation and is often associated with descriptive or exploratory research, without being limited to these areas (Kumaga, 2010). However, while case study often involves data collection through multiple sources, such as verbal reports, personal interviews and observations as primary data sources (Ghauri, 1983; Bonoma, 1985; Yin, 1994 in Kumaga, 2010), this study relies solely on secondary data in the form of existing literature. In other words, it is a literature-based research case study. The study then situates the e-zwich system in Rogers' framework of diffusion of innovations in an attempt to explain if the author's characteristics of innovation were inherent in the adoption of the e-zwich policy. In other words, did the e-zwich system exhibit the features of innovation necessary for it to be adopted in Ghana?

The study, in an attempt to better understand the author's framework and to highlight the positives and the weaknesses of the e-zwich system, does a comparative case study of South Africa's biometric payment system first

implemented in KwaZulu-Natal and later in neighboring Eastern Cape Province. It was later developed into a national payment system for the distribution of social grants. The KwaZulu payment system is also applied to Rogers' framework to ascertain which features of the system satisfied the author's framework thereby making it relatively successful. In short, the main aim of the study is to assess the effectiveness of the e-zwich system on one hand and to examine if Rogers's characteristics held true in these two countries. If one system was successful, did it exhibit Rogers's characteristics? If not, what are the implications for Rogers's framework?

As an alternative research method, the study could adopt the survey technique. On the one hand, administering questionnaires to both subscribers and non-subscribers alike and assessing their views on the benefits and challenges they face in using the card in general, or administering questionnaires to only users of the system, on the other hand. The former is the technique employed by Agyeiwaah, Anane, Appiah, and Opoku-Ware (2014). The authors, focusing on three selected branches of Ghana Commercial Bank, the country's largest commercial bank in the Kumasi zone, targeted 120 E-Zwich card bearers and 43 non e-zwich card bearers. Similarly, Issahaku (2012), in

examining the challenges associated with the use of e-zwich in retail payments, administered semi-structured questionnaires in Wa municipality (in the northern region of Ghana) to fifty (50) e-zwich card bearers and thirty (30) non e-zwich card bearers. Kumaga (2010) on the other hand employed a mixed approach including deep interviews with the Ghana Interbank Payment and Settlement Systems (GhIPSS) and senior officials of some of the major banks in Ghana and questionnaires distributed to shops and individuals that use e-zwich and other debit cards such as VISA and MasterCard. (Agyeiwaah, Anane, Appiah, and Opoku-Ware (2014). In the most recent study on the e-zwich system, Antwi, Hamza, & Bavoh, (2015) adopts questionnaire administration to ascertain the common types of e-payment systems, the level of adoption of e-zwich, and the factors influencing its effectiveness.

Quansah, Andoh-Baidoo, & Midha, (2010) adopt a different technique; they perform Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis on the implementation of the e-zwich system and map the findings from the SWOT analysis to PPT and GTZ management frameworks models. Similar to this literature-review based case study, Breckenridge (2010) does a review of secondary data, looking into official data and records as well as some

newspaper stories of the implementation of the e-zwich system, stating some challenges but highlighting the potential of the system.

So it is evident that the survey method has been extensively employed to analyze the effectiveness of the e-zwich system. However, survey methods are more appropriate in addressing 'how often something has happened' (Yin, 2012), but this question, the study does not address neither is it examining the initiative's (e-zwich's) effectiveness in producing a particular outcome per se, in which case, Yin suggests that experiments and quasi-experiments would be more appropriate. Rather, the study is interested in finding out if those 'outcomes' that were perceived by policy makers to be produced by the system have already been produced or not. And if it has not, did the e-zwich system portray Rogers's characteristics of innovation before it was adopted or not? Thus, the study looks at post-implementation effects of the e-zwich system, and seeks to analyze its effectiveness through the lens of Rogers' characteristics innovation of characteristics framework.

Therefore, the case study approach was employed for this study because as Yin (2012) contends, case studies

are essential when the research addresses either a descriptive question—"What is happening or has happened?"—or an explanatory question—"How or why did something happen?" (Yin, 2012). More specifically, what is happening to the e-zwich system? Furthermore, as indicated earlier, the study relies heavily on existing literature, mainly, scholarly work on the implementation of the e-zwich system including its challenges as well as reviewing newspaper and website stories that discuss the e-zwich system. The study, by employing the interview method would have required certain sensitive questions, especially with regard to the role of relevant authorities in charge of the e-zwich system (for example, officials of Ghana Interbank Payment Settlement Systems; GhIPSS). Some officials may over exaggerate or under estimate their functions toward effective functioning of the system. Thus, data collection for the study is literature-based as valuable research questions could involve sensitive subjects which would have been unsuitable for primary data collection ("Guide To Undergraduate Dissertations in the Social Sciences", n.d.).

Moreover, while a case study of the e-zwich system within its real-world context, hence favors the collection of data in natural settings, compared with relying on "derived" data (Bromley, 1986, p. 23 in Yin

2012), collecting data through in-depth interviews, participant observation recordings and field notes, non-participant observation, or some combination of these, would require extensive period of time, a luxury that the author does not have given other academic commitments for the semester. Therefore, the literature-based case methodology for this study was chosen out of convenience to the author. Furthermore, the study wanted to avoid the possibility of not receiving responses on time or not all by respondents. In an effort to obtain information on the current number of subscribers of the e-zwich system, I emailed GhIPSS, so many months after the email sent, I am yet to receive a reply to my email. So initially, the study had the intention of sending out questionnaires to relevant officials of the organization as well officials of the Bank of Ghana, however, this setback affirmed my suspicion of employing a mixed method approach. Hence, I decided to rely solely on secondary data.

Justification for the choice of cases;

biometric systems in both Ghana and Nigeria, is straightforward. The founder of Net1 UEPS, a subsidiary of Nekwan Applied Technology Holdings Limited (Aplitec) that installed biometric systems in both countries indicated that the smart card technology was developed with the aim

of initiating banking and providing banking services to the rural poor where existing formal institutions could not reach due to lack of appropriate technology. In other words, the technology was the key to bridging the gap and to forming links between the informal and the formal sectors ('Pension Pay-out Contractors: follow-up briefing", n.d.). Both countries have a significant proportion of their population being poor, therefore, the implementation of the technology would come with some anticipated benefits. Since South Africa was the first country to have implemented this biometric payment system on the continent as well as having a South-African based private firm that delivered this biometric payment in Ghana, making comparisons between the features, successes and challenges between the respective systems in both countries would provide useful insights and understanding to policy diffusion and policy making to scholars, politicians and policy practitioners.

ROGERS' CHARACTERISTICS OF INNOVATION

Rogers (2003) defined the innovation-diffusion process as "an uncertainty reduction process" (p. 232), and he proposes attributes of innovations that help to decrease uncertainty about the innovation (Sahin, 2006). Attributes

of innovations includes five characteristics of innovations: relative advantage, compatibility, complexity, trialability, and observability. Rogers (2003) stated that how individuals perceive these characteristics influences the rate of adoption of innovations. Sahin (2006) provides a comprehensive review of Rogers' five characteristics of innovation as described below.

RELATIVE ADVANTAGE

Rogers (2003) defined relative advantage as "the degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229). The cost and social status motivation aspects of innovations are elements of relative advantage. Thus some policy makers may be more status-motivated for adopting innovations, while for others, it may be less significant. Moreover, Rogers classified innovations into two types: preventive and incremental (non-preventive) innovations. "A preventive innovation is a new idea that an individual adopts now in order to lower the probability of some unwanted future event" (Rogers, 2003, p. 233). Preventive innovations usually have a slow rate of adoption so their relative advantage is highly uncertain.

However, he contends that incremental innovations provide beneficial outcomes in a short period. And so if any nation reckons that adopting biometric payment system in the allocation of social welfare benefits or as a means of financial inclusion has value, it is most likely to adopt this technology. To increase the rate of adopting innovations and to make relative advantage more effective, direct or indirect monetary payment incentives may be used to support the individuals of a social system in adopting an innovation. Incentives are part of support and motivation factors. Another motivation factor in the diffusion process is the compatibility attribute.

COMPATIBILITY

Rogers (2003) stated that "compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). A lack of compatibility in IT with individual needs may negatively affect the individual's IT use (McKenzie, 2001; Sherry, 1997; in Sahin, 2006). Hoerup (2001) "describes that each innovation influences teachers' opinions, beliefs, values, and views about teaching" (Sahin, 2006). If an innovation matches with an individual's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase.

And so the name of the innovation is an important part of compatibility. What the innovation is called should be meaningful to the potential adopter. The meaning of the innovation should also be clear. This is also part of the complexity attribute.

COMPLEXITY

Rogers (2003) defined complexity as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 15). Contrary to the other attributes, complexity is negatively correlated with the rate of adoption. Too much complexity of an innovation is an important impediment in its adoption. A technological innovation might confront faculty members with the challenge of changing their teaching methodology to integrate the technological innovation into their instruction (Parisot, 1995 in Sahin 2006), so it might have different levels of complexity. If hardware and software are user-friendly, then they might be adopted successfully for the delivery of course materials (Martin, 2003 in Sahin 2006). Likewise, a biometric technology that frustrates customers due to technical hitches renders its accessibility limited even after the adoption of the technology.

TRIALABILITY

With regard to trialability, Rogers (2003) defined it as the "degree to which an innovation may be experimented with on a limited basis" (p. 16). Also, trialability is positively correlated with the rate of adoption. The more an innovation is tried, the faster its adoption. One advantage of this is that reinvention may occur during the trial of the innovation, especially at the implementation stage. As a result, the innovation may be changed or modified by the potential adopter. Increased reinvention may create faster adoption of the innovation. For the adoption of an innovation, another important factor is the secondhand or indirect trial, which is especially helpful for later adopters. However, Rogers indicated that Earlier Adopters see the trialability attribute of innovations as more important than Later Adopters. Thus, a biometric payment system that is piloted before launching it on a wider scale has greater chance of achieving its aims for which it was set up. And the more it is tried, the better those results.

OBSERVABILITY

The last characteristic of innovations that Rogers highlights is observability. He defined observability as "the degree to which the results of an

innovation are visible to others" (p. 16). Role modeling (or peer observation) is the key motivational factor in the adoption and diffusion of technology (Parisot, 1997). Similar to relative advantage, compatibility, and trialability, observability also is positively correlated with the rate of adoption of an innovation. And so where the successes of the innovation in one country are obvious to surrounding nations and to even more distant ones, the greater the likelihood that those nations would adopt the particular innovation. It is therefore no wonder that countries closer to South Africa (Namibia, Botswana and Malawi), which was the first nation in Sub-Saharan Africa to have adopted the biometric technology. Not surprisingly, these biometric payment systems were installed in these countries by the same firm, Net1 UEPS.

MEASUREMENT OF ROGERS' VARIABLES IN GHANA AND SOUTH AFRICA

Measurement here does not imply any statistical or mathematical definitions of Rogers' variables, but rather, some suggestions of indicators based on which these variables can be identified in both countries. By implication, these characteristics of innovation must have been existent before the adoption of the biometric payment technology in both South Africa and Ghana. Thus, once the technology has been implemented, there must be clear

evidence to show that indeed, Rogers' characteristics were perceived to be existing prior to implementation and were actually existent based on the 'success' of the system. Rogers' framework implies that where any innovation is going through critical difficulties it invariably means that the characteristics of innovation were not present prior to adoption and implementation and neither has there been any current attempt to put those prerequisites in place or the attempts are simply not enough. And so as long as they are absent, the true potential of the innovation will not be realized. In short, where the innovation is struggling in the adopted country, it means that the characteristics of relative advantage, trialability, compatibility, complexity, and observability were absent prior to implementation and still absent.

Therefore, there has to be certain indicators in the adopted country that show the existence or otherwise of these characteristics of innovation. In other words, these characteristics must be evident even after implementation of the innovation: the following suggests some indicators that should be observed with Ghana and South Africa's biometric payment systems to validate or invalidate Rogers' framework for policy adoption as well as

assessing the effectiveness or success of both systems in the respective countries.

Relative Advantage: With regard to relative advantage, the main question to be asked is, "would a biometric payment system provide certain advantages that existing payment platforms do not provide?" In other words, the biometric payment system should be perceived to afford potential security than existing universal payment system in the country mainly VISA and MasterCard. Also, does it afford greater affordability and most importantly, accessibility than existing payment forms? In short, any perceived advantages that the new biometric payment system is believed to provide must be existent prior to the adoption of the technology. Where such relative advantages are non-existent or existing payment forms perform similar functions, then it can be concluded that the advent of the new biometric payment system would not serve any extra purposes in the economy. And so in effect, it must be shown that in both Ghana and South Africa, these advantages have been clearly achieved and visible to all. The system must have brought with it, increased income, reduced cost, and included more rural people in the banking sector (the main goal of the policy in both countries) or other factors that

may make adopting this practice advantageous over other alternatives, including doing nothing.

Compatibility: In both countries, not only must there be a favorable infrastructure to support the biometric technology, there must also be favorable cultural norms in support of it. Hence, the higher the similarity with existing norms, the better the chances of adoption. Thus, ideas that miss the Compatibility factor are often described as "ahead of their time." (Burkus, n.d.). Therefore, both countries must have certain cultural norms that do not defeat the perceived advantages that the technology is likely to bring and perhaps most importantly, the needed physical infrastructure must be present to facilitate implementation. Religious beliefs, in both countries for example, should not discourage the use of the biometric payment system. As typical of most developing countries especially in Sub-Saharan Africa, where superstition reigns supreme, new policies are often given certain religious and cultural interpretations. Therefore, Compatibility issues in Ghana and South Africa can be something as simple as not having the right resources (communication facilities or infrastructure) to implement the practice or could involve more philosophical concepts such as concern over taking people's fingerprints for

identification purposes which is an essential feature of the biometric technology. Communication problems could be manifested through constant breakdown of the system inhibiting customer registration as well as transactions. Where these problems abound in the countries, it is expected to have adverse impact on the system's acceptance by the public, hence, affects its usage.

Complexity: Here, residents in both countries must find the biometric payment system an easy-to-use product. If it is seen as highly complex or difficult to grasp, people will shy away from engaging with the system. If this is the case, complaints of the system will be rife and sign-ups for the system's smartcard should remain low or start declining if numbers initially rose. It therefore follows that any attempts to reduce the complexity of the system would increase usage of the system by card-bearing members as well as encouraging others to sign-up for the smartcards. Hence, not only would transaction volume increase, the value of the transaction would increase as well. Therefore, particularly in Ghana, the e-zwich system should record greater number of subscribers and revenue over time.

Trialability: This feature means that there must have been at least one pilot-based implementation of the biometric payment system prior to a large-scale implementation. The experiment on a smaller, less intensive scale could have been undertaken on a regional level or in a particular town or city in both countries. As the framework suggests, the ability to experiment the innovation on a smaller basis and the number of experimentations determine the rate of adoption. Consequently, the more the innovation is tried on a small basis, the greater its success. And so, there must be evidence in both countries to the effect that some form of trials were initiated before broad-scale implementation.

Observability: Since Ghana's e-zwich system was largely borrowed from South Africa, although with some improvements or novelty features, and South Africa being the first country to have implemented biometric technology on the continent, it suffices to say that observability will be higher in the former. The results of South Africa's biometric system must have been very noticeable for Ghana to have adopted similar technology. It should also be continually learning from the experiences of the former. This means that Ghana's biometric payment system must have been an improvement over that of South Africa, entailing

fewer challenges than what the latter faced. One way of measuring this characteristic is to assess whether there were any policy negotiations between actors (whether private or public) of both countries concerning the adoption and implementation of the system, with possible exchanges between them. South Africa on the other hand, is the first country in the world to employ biometric technology in the distribution of social grants. Therefore, observability is by all standards going to be low. It is therefore expected that the biometric payment in place should be fraught with major challenges, thereby, rendering it ineffective. Any contrary evidence to this expectation would be analyzed as a limitation to the generalizability of Rogers' framework.

To surmise, , Rogers (2003) argued that innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations lacking these attributes. Rogers does caution, "getting a new idea adopted, even when it has obvious advantages, is difficult" (p. 1), so the availability of all of these variables of innovations speed up the innovation-diffusion process. However, for Rogers, relative advantage is the strongest predictor of the rate of adoption of an innovation.

Nevertheless, it needs to be noted that this study is not concerned with the 'rate' of adoption innovation or why Ghana adopted the biometric system later than earlier. Whether an innovation is adopted faster or slower, it still needs to exhibit the characteristics that Rogers talk about and this study emphasizes them as more crucial than the speed with it the innovation is adopted.

Therefore the effectiveness of the e-zwich system depends on the presence of these features in Ghana as well as in South Africa. Effectiveness here means the achievement of the goals of the system as purported or perceived of the system by the Central Bank of Ghana which are: for branchless banking, for financial inclusion and lastly, for debit facilitation (Antwi, Hamza & Bavoh, 2015). Where all, not some, of these features are present, the study concludes that it satisfied Rogers' framework, hence all other things being equal, the e-zwich system should achieve its objectives. On the other hand, the absence of these characteristics casts a gloomy picture on the system's effectiveness and its potential.

CASE STUDIES

Ghana's Biometric Money

E-zwich, introduced in 2008 by the Central Bank of Ghana is the world's first biometric money (Breckenridge, 2010). It is a national switch payment infrastructure for switching and clearing electronic payments initiated at payment terminals owned by different financial institutions with various types of payment cards issued by these financial institutions. (Breckenridge, 2010; Quansah, A., Andoh-Baidoo, F. K., & Midha, V., 2010; Haruna, 2012). In other words, it is a centralized mechanism for the settlement of transactions between the Ghanaian banks as well as a biometric smartcard for secure payment of goods and services.

This interbank switch was purchased from and managed by the South African company Net 1 UEPS, and it had a unique central organizing principle (Breckenridge, 2010). The switch was indexed biometrically, using a key derived from all ten fingerprints of account holders (Breckenridge, 2010). This new interbank switch and a smartcard encoded in the same way afforded Ghana with the enviable position of being the first country to supply biometric money supply. However, the main aim of this study is not to focus on this

novelty but to emphasize its functions which are basically similar to other electronic payment systems in many parts of the world, such as the MasterCard and Visa.

In 2006, Dr Paul Acquah, the then Governor of the Central Bank, issued a tender for a national interbank switch (a networked central database system that allows all banking transactions to be settled) which was won by the South African firm, Net1 UEPS. The Ghanaian tender had several features that distinguish it from similar interbank settlement systems such as MasterCard and Visa. According to the Governor, one of the key conditions, is for the system to 'meet the requirements of the banked and the unbanked' and provide a 'smartcard (based on biometric identification payment system) which is compatible with the national switch'—the national identity card. (Breckenridge, 2010). It needs to be noted that there had been an earlier attempt to develop a biometric national identity card, which was locked in parliamentary discussions at the time that the e-zwich idea was put forth by the Governor. The owner of the firm, Serge Belamont, developed the SASwitch in South Africa in the early 1980s, one of the largest and earliest settlement systems in the world. The system developed by UEPS as Belamant remarked so many times, is aimed at the very poor, illiterate people who 'are not

going to remember the pin number on the card' (Breckenridge, 2010). This was also echoed by the Central Bank governor, when he said that Net1's biometric smartcard would mean that 'even in the remotest parts of the country where electricity and telecommunication facilities are unavailable' electronic banking had 'come to the doorstep of all Ghanaians' (Breckenridge, 2010). In other words, the intention behind the policy was geared to the fact that networked communications infrastructure, and electricity, are largely absent in much of the African continent. Hence, a central payment system should have features that would allow transactions to be performed offline. Thus the e-zwich system and its ability to perform offline transactions is suited to the Ghanaian social fabric.

By the end of 2009, besides Ghana and Nigeria, Net1 UEPS had delivered large biometrically delivered payment systems in place in South Africa, Namibia, Botswana, Malawi and Iraq (Breckenridge 2005; 2008). However, the UEPS system, is quite different from the network-dependent settlement systems used by the EMV (Europay, MasterCard and Visa), and most other banks. In that, it stores the transaction data on the card itself. Meaning, each card carries its own running balance, and a history of up to eight-hundred transactions, that can be

updated periodically through a networked machine (Breckenridge, 2008). The e-zwich card also bears the details of the issuing bank but unlike credit or debit cards, they carry no individually identifying names and no number. Furthermore, they are blank. This is a deliberate design to discourage the incentive to steal the cards because only the fingerprints of the owner can provide the encryption key to access the bank account information. The cards use a proprietary system of biometric encryption, where the data is encoded using a template derived from the user's fingerprint impressions (Breckenridge 2010).

However, the e-zwich cards are of little importance to the tiny number of Ghanaians interested in online shopping (Breckenridge, 2008. See also Ajao 2008) as compared to the MasterCard and Visa cards used in developed countries. Individuals can own more than one card just like debit and credit cards. In order to make payments or switch funds between the cards, users must find a working e-zwich point-of-sale (POS) machine. The machines look like conventional credit card authorization terminals, except that they have fingerprint readers and a slot in the base of the machine for the e-zwich card. The Ghanaian banks issue the POS machines to merchant account holders, and merchants

earn a small fee on transfers between card accounts paid directly in their own accounts.

The Net1 smartcard had been tried in South Africa where the company gave out social grants to some 5 million people in the period after 2002 (Breckenridge, 2008; see also du Toit 2008; Belamant 2006). The e-zwich system that was however delivered to Ghana by Net1 and which won the tender in June 2007 differed in some key features from the one that was implemented in South Africa. The Ghana Interbank Payment and Settlement System (GhIPSS) was, in the first place, owned and authorized by the Bank of Ghana, providing it with a legal protected monopoly of all bank transactions. Unlike the Aplitec social grants system, the Ghanaian contract had a full Automated Fingerprint Identification System (AFIS) designed to store and match the fingerprints of the entire population of card holders or users. These novel features would have profound effects on the modus operandi of the GhIPSS system, especially with regard to the fact that the income from transactions on the cards was under the aegis of the Central Bank (Breckenridge, 2010).

The e-zwich project was hailed as having the potential of accruing so many benefits despite so many

difficulties that it faced. Even at its early implementation stage, there were individuals that were quite confident of the potential of the policy, in that the expansion of the biometric banking card system was touted as having some advantages over the national identification programs that were even more catastrophic than the former. A number of advantages of the e-zwich system over the national identification system was put out there as reasons for the potential success of the former. First, the state has real influence over the provision of banking facilities. Unlike the identity card systems, the Ghanaian biometric banking system is a policed monopoly. "An immediate result of the issuing of the GhIPSS tender to Net1 was that the older bank settlement systems were simply prohibited" (Breckenridge 2008). Towards the end of the year in which the e-zwich system was launched, these companies and other advocates of a free market in banking systems, began to complain that the companies that had previously 'provided switches and ATMs for various banks in the country, have had their services declared illegal with immediate effect (Breckenridge, 2010). Second, and perhaps an even more important advantage, as argued by advocates of the policy, is the state's control over many of the key points at which paper money enters the economy. The crucial advantage of

the e-zwich system per the proponents of the system, irrespective of the difficulties in using the cards for daily transactions is that it automates and controls the state's payroll (Breckenridge 2010). At the launching of the project the government promised that all salaried employees and almost all the other sites of cash transactions- 'pensioners, churches, Controller and Accountant General's Department (CAGD), Customs Excise and Preventive Service (CEPS), Electricity Company of Ghana (ECG), rural banks, Savings and Loans Companies and banks would become part of the e-zwich system' (GNA 2008a). Years after the implementation of the project, it is only recently that there is a serious attempt by the central government to see this initiative through.

It was recently announced that the Controller and Accountant- General's Department is expected to commence the payment of all civil servants by a biometric e-zwich platform in 2015. Again, the National Service Scheme (NSS), which oversees graduates of all tertiary institutions serving compulsory national voluntary service, recently took delivery of two-hundred and thirty point-of-sale-terminal (POS) e-zwich with which 2014-2015 service personnel were paid. In reviewing the literature, Breckenridge (2010) stated that the new government elected

in 2008 under the presidency of John Atta Mills, also decided to carry out the promise of the former regime, anticipating 'the day when its employees will be paid through the e-zwich as a means of minimizing the existence of ghost workers in government's department payrolls". The new administration persuaded the listed companies of the Association of Ghana Industries (AGI) to use the cards, arguing that they are more efficient in financial transactions. Similarly, the Central Bank, in 2009, had a lot of consultations with the key organizations of recipients of cash payments-coffee growers, vegetable farmers, schools-to persuade them to move their members over to the smartcard system (most of the time inviting banks to attend the meetings in order to sign up users on the spot).

Furthermore, it was quite easy for the Central Bank to coerce the banks to adopt the system as it instituted a regulation that required all banks to issue the biometric cards at their own expense (Breckenridge 2010). They were even required to use them for all transactions, including electronic payments and cheque clearing; even prepaid cellular call time had to be compliant with the e-zwich (Breckenridge, 2010). Moreover, officials also encourage small rural lenders to use the e-

zwich cards to mobilize cash deposits for their banks. In collaboration with each other, the banks and the officials assigned to e-zwich embarked upon intense training programs for merchants. Thus, the arrival of the e-zwich system provided the potential for so many advantages for the financial sector and for the economy at large.

Thus the potential of the system was quite rife initially, especially heralded was the opportunity for financial inclusion of rural folks which was emphasized by the then president, John Kufuor's when he said that the e-zwich cards had the potential to 'transform the financial services industry and link it with every aspect of the nation's economy' and his main concern was the inclusion of the 'informal sector' (Breckenridge, 2010). The Central Bank governor, Paul Acquah also added that the e-zwich cards provided a technological solution for the fact that after five decades of independence some 80 percent of the population still remained outside the banking system of the country (Breckenridge, 2010). It is therefore imperative to assess if the key objectives of the project, especially with regard to financial inclusion of rural folks have been largely realized or not.

The Challenges of the E-Zwich System

The introduction of the e-zwich led to mass registration of potential users and distribution of the e-zwich smart card (Breckenridge, 2010; Boateng, Tetteh and Boateng, 2015). However, as time went by and the euphoria waned off despite intensive advertisement, the number increased at a decreasing rate (Boateng, Tetteh and Boateng, 2015). This raises the question as to why after more than seven years after the introduction of the E-zwich payment system, it has not been able to drastically reduce if not eliminate cash transactions in the Ghanaian economy. A year after the system had been introduced, a little over two-thousand shop owners possessed these machines. The cards usability, with regard to performing debit transactions efficiently and effectively while maintaining high satisfaction was brought into question by many subscribers. That is, the cards were still far away from transforming the economy into a cash-free one as initially touted as a key benefit of the system. In June 2009, for example, a reporter in Accra described how, after loading money onto his e-zwich card, he 'had to roam the city looking for a fuel station which accepts the card, so he could refuel his car' (Breckenridge 2008; See also Thompson

2008; Robertson 2008; Dogbevi 2009; GNA 2009b; Nonor 2009; Staff Writer 2009b; Yeboah 2009a).

Furthermore, using and maintaining the merchants' e-zwich machines were also difficult. There were so many reports of angry e-zwich account holders struggling fruitlessly to get the cooperation of shop attendants and bank tellers. And for the shopkeepers, the machine, due to its novel nature also portended chaos at the workplace as card holders began to hold them responsible for their unexpectedly depleted bank accounts. 'Some of the customers come to us with the belief that they have money in their cards only to be disappointed by the point of sale device', one attendant complained; 'It's a lot of hell.'

(Breckenridge, 2010). Similarly, some shopkeepers reported angry incidents with card holders who had been rejected because the machine claimed that they were not the rightful custodians of the card (Abdul-Rahman, Attah and Boafo 2009 in Breckenridge, 2010). The biometric encoding of the cards also presented another problem as users frequently battled to get the machines to read their fingerprints successfully.

As Breckenridge argued, the most common problems underlined the weakness of the communications

infrastructure in Ghana. Although the e-zwich has been designed to support offline transactions between smartcards, merchant owners of the POS machines were required to reconcile their transactions with the central server at the end of every working day or after eight-hundred transactions (Breckenridge, 2010). This connection was delivered through the unstable cellular network, which meant that merchants had to have on hand, a regular supply of electricity, sufficient prepaid airtime to complete the connection and a reliable cellular signal; These difficulties with the system among others, prompted IMANI, the think tank, to state that the e-zwich system is bedeviled with so many failures (Breckenridge 2010).

Moreover, all bank accounts in the e-zwich system are also linked to the national identity number (which, in turn, is linked to the biometric patterns in the AFIS), giving the Central Bank the power to record all the transactions of all the individuals using the system. Meaning in reality, the e-zwich records the biographical details, the times, places, and amounts of all transactions on the system. As it is currently set up all of this information is controlled by Net1 and instances of obvious fraud are reported to the Central Bank. It is no surprise that these extra features of the system have not been

publicized; this central government regulation of the money supply is contrary to arrangements that have existed in West Africa for a very long time, and this presented an augury for many Ghanaians to avoid the cards (Breckenridge, 2010).

Last but not least, in a largely superstitious society, it came as little surprise that some individuals attached religious interpretations to this project. There were some Ghanaians who believed that e-zwich is one of the many attempts in the 'global movement' towards the period prophesied in Revelations whereby individuals could not perform any financial transaction without having the mark of the beast: popularly referred to as '666'. As Osei (2008) stated, the constant publicity of the card on radio and TV represented in the minds of some as the deliberate attempt to promote Ghana as the pioneer in anti-Christian activities in Africa.

South Africa's Biometric Payment System

South Africa holds the enviable position as the country to have deployed biometric technology on the continent. Breckenridge (2005) gives a useful account of the development of biometric payment system in South Africa; this study therefore draws heavily on the author's

work. The earliest forms of computerized biometrics in South Africa were aimed at regulating the movement and work of laborers on the South African gold mines. Since then, the technology has moved very rapidly beyond the world of industrial work to the payment of social welfare benefits. The first large-scale application of fingerprint-based digital biometrics was in the delivery of pension benefits in the former KwaZulu homeland in 1990. Faced with the task of providing pensions to rural areas without anything resembling infrastructure and no banking facilities of any kind, the KwaZulu government accepted a tender from a joint venture of First National Bank and Datakor, a locally owned IT firm. The new company was called Cash Payment Services (CPS), and it organized the distribution of pensions using biometric identification that was, per international standards quite mature, even though it was still at an early stage of implementation; In 1996, CPS won the Computerworld Smithsonian Institution's financial services innovation award for its biometric identification software (Breckenridge, 2005). By the middle of the 1990s, CPS was using four-wheel drive vehicles to distribute pensions in the KwaZulu and Kangwane homelands to some 400,000 individuals. The system initially involved the digital registration of fingerprints which were then stored on a

magnetic strip card and on a central database. Pensioners received their cash from the truck mounted dispenser after pressing their forefinger onto a CPS scanner attached to a computer.

As Breckenridge goes on to state, CPS provided an adequate solution to the provincial states' administrative and infrastructural incapacity, especially in the risky distribution of cash pension payments in the rural side. By the end of the 1990s, they were providing pensions and unemployment benefits to over a million people from some 5,000 fixed and mobile sites in six South African provinces as well as in neighboring Namibia (Breckenridge, 2005). In KwaZulu-Natal, the company equipped post offices with its fingerprint scanners to channel payments to pensioners in the towns and cities. Later on however, this single-purpose smartcard was to change. In 1999, CPS was bought from First National Bank by Aplitec (its holding company is Net1 UEPS), an innovative South African IT company that specializes in the development and manufacture of smartcards. Henceforth, the fingerprint pension distribution scheme was transformed into a much more powerful multi-functional smartcard. Contrary to a direct cash payment after presenting their fingerprints, pensioners now received a credit directly onto their

Aplitec smartcard, which can then be used immediately to draw cash from an adjacent cash dispenser. But aside the cards performing an identification tool, they were primarily intended for the financial inclusion of the cash economy of the rural pensioners like Ghana's e-zwich system. In other words, to make the pensioners 'bankable'.

Ever since Aplitec took over the pension distribution system, it has been able to reach so many pensioners by providing a variety of services. Aplitec began to offer automatic deduction facilities to a small group of companies providing services including family funeral policies and insurance policies. For example, Cornestone, a life assurance company provided assurance policies to 230,000 pensioners in KwaZulu-Natal and Mpumalanga, using Aplitec's risk-free deduction facilities provided by the smartcards (Breckenridge, 2005).

Challenges of the Kwazulu Biometric Payment System

Despite the successes of Aplitec's biometric payment system in KwaZulu, it had certain drawbacks with regard to attempts to make the system provide other new services. In 1999, as Breckenridge (2005) writes, the company partnered with the South African Local and Long Distance Taxi and Bus Organization (SALLDTBO) to install

smartcard readers on 20,000 taxis operating from the organization's 200 ranks. By the end of that year they had installed readers on about 2,000 taxis, but the taxi installations have not been a success. The smartcard was also originally intended to displace the use of cash altogether in the payment of retail goods, and utility bills. This effort to reorganize the cash economy around the Aplitec smartcard seems, to date at least, to have failed (Breckenridge, 2005).

Furthermore, the Black Sash, a non-violent white women's resistance organization in South Africa chastised Aplitec that its policy of automated deductions, in which the most important choices of service provider and payment are left in the control of Aplitec was at a financial disadvantage to pensioners. The organization reasoned that since Aplitec faces a significant decreased risk in the provision of short-term loans to grant-holders, hence a guaranteed regular repayments to its investors, the company needs to provide discounts to the recipients of the loans.

Challenges of the Kwazulu Biometric Payment System

Despite these challenges, the company's hold on the distribution of pensions in South Africa strengthened to the effect that in 2002, it was awarded part of Eastern Cape's pension grant distribution, giving them control of more than 70 percent of the welfare and social grant system in South Africa. Breckenridge stated that at the start of 2004, some 2.5 million recipients used Aplitec's biometric smartcard at 7, 500 payout outlets to receive state pension and child support grants. Due to its unprecedented success, Aplitec installed smaller smartcard welfare schemes in six other African countries. Furthermore, Aplitec was the only IT company on the Johannesburg stock market whose share price rose during the three years that followed the collapse of the world IT bubble after March 2000 (Breckenridge, 2005). Breckenridge also notes that given the high incidence of 'subsistence crime' in South Africa, it was remarkable that technicians responsible for delivery of these biometric systems in KwaZulu-Natal had never experienced an attempt at biometric impersonation. That is, they could not remember a particular instance where an individual attempted to withdraw cash from a payout using someone else's card. This, Breckenridge attests to the 'disciplinary success of CPS's biometric pension scheme'.

The former Chief Minister of KwaZulu and then national minister of Home Affairs, Mangosutho Buthelezi was so impressed with the fingerprint-identified pensions scheme that he first implemented that he resolved that a similar scheme would serve as the basis of a new national identity document.

Currently, CPS distributes social welfare grants on a monthly basis to over nine million beneficiaries in South Africa. These social welfare grants are distributed on behalf of South African Social Security Agency (SASSA). The card has evolved over the years with the holder having access to all of the U.E.P.S. functionality, which includes the ability to have the smart card funded with pension or welfare payments, make retail purchases, enjoy the convenience of pre-paid facilities and qualify for a range of affordable financial services, including insurance and short-term loans as well as standard EMV transactional capabilities to operate wherever MasterCard is accepted ('Cash Paymaster Services', 2015). The smart card also offers the card holder the ability to make debit order payments to a variety of third parties, including utility companies, schools and retail merchants, with which the holder maintains an account. The card holder can also use the same smart card as a savings account. Thus

it performs basically the same functions as Ghana's e-zwich card except that in the latter, it is not used for the payment of pension and other welfare grants.

However, while CPS, under the aegis of Net1 UEPS manages the South African pension scheme, the e-zwich is purely managed by the Central Bank of Ghana's subsidiary, GhIPSS. In March 2012, the South African government engaged in a massive effort of citizen registration that continued for more than a year. Much more recently, nearly 19 million social welfare beneficiaries enrolled in a novel biometric identification scheme that uses fingerprints and voice recognition to authenticate social grant recipients (Donovan, 2013). However, the purpose of this paper does not incorporate this new biometric identification effort but rather dwells on that biometric technology that employed the use of fingerprints only.

CHAPTER FOUR: FINDINGS/DISCUSSIONS

The E-zwich and Rogers' Characteristics of Innovation

As Rogers argues, for any innovation to be adopted in a host country, it needs to offer some advantage that the existing innovation does not, must be compatible with existing values, past experiences, and needs of potential adopter, must be easy to understand and use and last but not least, it must be able to be tried or piloted for a number of times. But as the author contends, the 'cost or the social motivation status' that the innovation provides relative to the existing one, is the most important factor that should influence the rate of adoption. The critical question here therefore is, did Ghana's e-zwich policy exhibit these features (without proffering any particular measurement) to warrant its adoption?

Relative Advantage: With regard to relative advantage, the e-zwich system and for that matter, most biometric technologies bring with it certain advantages to a financial or banking system of any country. Prior to the e-zwich, there was no technology that performed the multi-varied functions that the e-zwich affords to customers. The system performs three broad banking transactions-savings,

cash withdrawal and cash deposit, aside debit transactions. The e-zwich card currently has four wallets activated. These are; Primary, Savings, Transport and Secondary. Funds maintained in the savings wallet may attract interest based on the rate payable by the issuer bank. Interest is calculated daily by the switch and credited at the end of the month to the client card's host balance. A 10-digit code is then created for the card to load either manually on the POS using the code and amount (offline) or automatically through a communication network (Online). Cash withdrawal involves the reduction of the electronic value stored on an e-zwich card in exchange for cash. This can be done by a bank Teller or at by a retail merchant. The process involves the verification of the cardholder and the update of the funds on a client's card by the e-zwich device (POS or ATM). Cash withdrawal transactions are also offline transactions and do not require communications with a third party server. It can therefore be completed anywhere in the country.

There is currently no limit to how much can be withdrawn from an e-zwich card except where the client has placed a limit during enrolment. For merchants, (bank Tellers and Retail) cash paid-out to e-zwich clients are credited to their bank accounts the day after settlement of

their POS devices. The e-zwich card can hold cash deposits for its cardholders in the same way that money can be deposited into bank accounts. The funds deposited on a card remains on it until it is used at a POS or e-zwich ATM. Cash deposits can be done from any e-zwich bank regardless of the bank that issued the client card. Thus a card issued at bank A can deposit funds at bank B. Keeping money on an e-zwich card is therefore the same as keeping it in a bank account. The added advantage of an e-zwich card is that when needed, the funds can be accessed from multiple institutions including other banks and retail merchants.

There is also no limit to the amount of money that can be deposited on the card. There is also no fee charged for this transaction. Cash deposit is typically done by a bank Teller. Retail merchants can however add this to their sleuth of transactions as long as they allocate funds to be converted to e-money to through their banks. A retail merchant that performs cash deposit is referred to as a merchant agent. Money deposited on an e-zwich card is protected by the biometric data (fingerprints) of the cardholder. The e-zwich card is also easy to obtain as it is issued for free by the banks as compared to ATM cards. Moreover, purchases or payments made by individuals using the e-zwich smartcard will not attract

any fees even though you will be charged a small fee for money transfers, cash withdrawals and some other transactions. However, as Agyeiwaa, Anane, Appiah, & Opoku-Ware (2014) stated in their findings on the challenges with the e-zwich faced by both users and non-user customers of Ghana Commercial Bank, some respondents did not consider the affordability of e-zwich as a challenge as more than half of the respondents disagreed (70%) to this statement. Conversely, using VISA ATM cards issued by one bank on another bank's ATM attracts a charge ranging from 3 to 5 cedis depending on the bank which is relatively costly. And so in this regard, the e-zwich system trumps the VISA ATM card in terms of affordability.

Security-wise, the e-zwich card is deemed as highly secure as typical of smartcards. The most common method of securing e-payments is using cryptographic based technologies such as encryption and digital signatures (Taddesse & Kidan, 2005 in Kumaga, 2010). Data stored on a smart card is encrypted and cannot be assessed without password/PIN and thus provide strong security. To this end, Taddesse & Kidan (2005) argue that magnetic strip cards i.e. debit cards, credit cards etc are being replaced by smart cards. Thus, the e-zwich card provides a greater

form of security that 'existing' technology such as the VISA and MasterCard.

On a more policy level, the e-zwich has aided in the eradication of some ghost names in the country's payroll system. Recently, the acting Executive Director of the National Service Scheme (NSS), Dr Michael Kpessa-Whyte, told the Daily Graphic in an exclusive interview that control measures activated by the new management of the Secretariat have prevented about 75,000 ghost names from entering the service payroll in the 2014/2015 service year ("75,000 Ghost Names Removed From NSS Payroll; Saving GH¢26.5m", 2015). Most importantly, the e-zwich card presents an opportunity for financial inclusion of the rural poor, thereby helping to transform the economy into a cashless economy.

Compatibility: Compatibility is the extent to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. In the case of the e-zwich, it means that bank officials who would be responsible for the maintenance of the finger print readers in the ATMs and the merchants who would operate the POS must have the needed skills for success in their duties as well as the infrastructural base

to support this new technology. Breckenridge (2010) noted that within a month of the project's launch, only a 'handful' of local banks had achieved the networking threshold required of them by the Central Bank. Furthermore, the installation of hole-in-the wall ATMs, a new feature, which according to Breckenridge (2010) had never formed part of Net1's infrastructure in South Africa, proved difficult and costly. Moreover, it was only in December, after the project was launched in April 2008 that the Britain-based De La Rue managed to deliver a handful of the machines. Breckenridge, further noted that the commercial banks in the country were more interested in providing ATMs for the local and foreign customers who wanted to use offshore EMV-compatible VISA cards than servicing the e-zwich account holders. Thus the financial interest in VISA cards far exceeded that of e-zwich smartcards even though the banks were mandated to roll out the project as soon as possible.

Taddesse & Kidan, (2005) note that infrastructure is necessary for the successful implementation of electronic payments. Although, the e-zwich system was hailed as being compatible with rural settings due to its offline feature, infrastructural issues hampered the use of e-zwich (Kumaga, 2010 and Agyeiwaa,

Anane, Appiah, & Opoku-Ware, 2014). For example, Agyeiwaa, Anane, Appiah, & Opoku-Ware (2014) indicated that statements like "ICT accessibility is a challenge for e-zwich usage" recorded as much as 90.3% of agreement by respondents. With the country plagued with energy crisis for over three years now, respondent highlighted the severity of this problem with regard to the usage of the e-zwich card; as many as 98.8% of the respondents agreed to this statement. Compatibility is not only assessed by the availability of electricity but also by telecommunication and the internet. Electronic payments communication infrastructure includes computer network such as the internet and mobile network used for mobile phone. In addition, banking activities and operations need to be automated. Mobile network and internet are readily available in the developed world and users usually do rarely have problems with communication infrastructure. This is however not the situation in Africa as mobile networks and internet are not easily accessible.

"Poor communication infrastructure is one of the reasons that hinder the e-payment system in Africa" (Kumaga, 2010. See also Taddesse & Kidan, 2005). Kumaga noted that although e-zwich works offline, an online connection is needed for POS devices at the end of each day

to perform settlements. This is normally enabled and facilitated by any of the local mobile telecommunication companies. This connection is sometimes not successful thereby frustrating the users. The success of data transfer is dependent on bandwidth availability and signal strength in the area which is usually low in that part of the world. This is usually worst beyond the major cities of Accra and Kumasi, the two biggest towns in the country (Boateng, Tetteh and Boateng, 2015). The issue of infrastructure is evidenced when the German government provided 8 million euros as a soft loan for the development of the e-zwich infrastructure ("GhIPSS Secures 8 Million Euros German Soft Loan For E-Zwich Infrastructure", n.d.). In fact, Kwame Ansah, Head of Payment System at the Central Bank remarked:

"Unfortunately, the e-zwich has not done well mainly because at the time that BoG was advertising and getting people to be interested in the system, the necessary infrastructure like the point of sale terminals (POSS) and ATMs had not been adequately put in place." ("Expert Explains E-zwich Glitch", 2012).

Kumaga (2010) further stated that there are network connectivity problems when issuing new cards. Issuing e-zwich cards is an online activity hence requires connectivity which is sometimes an issue and depends on signal strength and bandwidth availability of the mobile

telecommunication company at the time of connection. GhIPSS, prior to the implementation of the system, anticipated that accessibility and usability through efficient operations of the telecommunication systems and managerial and operational issues as the number one challenge of the system. Yet, years after the implementation of the project, this problem still persists. Extending this definition, Ram (1987) states that 'compatibility represents not only consistency with the existing values of the consumer, but also with traditional and cultural values, and with current lifestyles of the consumer'. Hence, as Breckenridge (2010) noted, some Ghanaians interpreted the e-zwich system as a sign of the biblical 'end-times'. This opposition is consistent with their religious beliefs, therefore forming a hesitant stance on the system.

Complexity: Here, Rogers describe as "the degree to which an innovation is perceived as relatively difficult to understand and use" is an important obstacle to the adoption of an innovation. Ghana for so long is used to hearing that only 20% of its population is banked and with greater percentage of its population uneducated, it is quite straightforward to perceive the usability of the system by residents especially, those in the rural areas.

You would expect policy makers to anticipate that only few people would be able to perform transactions with the system, considering the self-use requirement for certain transactions such as money transfer. Kumaga (2010) offers some interesting findings based on his interview with some users of e-zwich. First, he observes that most users do not understand and appreciate the benefits of electronic banking to individuals and the society as a whole. He therefore argues that this has therefore made them hesitant and slow to adapt to 'new economic reality leading to poor patronage, lost opportunities and diminished competitiveness' in the financial sector. The few individuals who are willing to use electronic cards have difficulty in finding avenues to use electronic cards. They sometimes get frustrated and convert their money to cash in buying items instead of using their cards. Second, the few Ghanaians who 'understand' electronic transactions are still into traditional banking and cash transactions. As people form habit of doing one activity over and over again, they become comfortable with it, hence reducing their inclination to try out new things. Ram (1987) therefore contends that the vast majority of people who have no a priori desire to change may be more typical and even more rational than a small minority of individuals who

seek change for its own sake rather than or in addition to the intrinsic value of the innovations. In sum, Kumaga (2010) states that e-products are highly patronized by literates (which form a small percentage of the population relative to illiterates) since they have the requisite skill for its use. This problem, aside accessibility issues therefore undermines the motive of the Central bank to make those in the rural areas bankable.

GhIPSS, the institution charged with managing the system, also acknowledged that lack of knowledge and skills in basic computing identified was a significant factor affecting electronic payment systems in Ghana (Boateng, Tetteh and Boateng, 2015). Not only lack of technical knowledge of how to use the system or card (basic computing), but lack of knowledge by individuals on the benefits and what the system provides is also a problem (Boateng, Tetteh & Boateng, 2015). This affects both the merchants and the consumers alike.

Trialability: The ability of an innovation to be tried on a small basis prior to its launch on a grand scale is also cited by Rogers (2003) as contributory to the rate of adoption of the innovation, and for the purposes of this study, to its success. The e-zwich was not at any

level or at any point in time implemented on a smaller scale before a national project was launched. Surprisingly however, none of the extant literature identified above mentions this problem as one of the reasons for the observed ineffectiveness of the system. Ram (1987) reasons that:

If, for instance, a product based on an entirely new technology cannot be tried by the consumer prior to purchase, then the consumer is likely to perceive a high level of risk in purchasing the product. If on the other hand, the consumer has a successful trial with the product, the risk associated with the product is likely to decrease.

Merchants were taught how to use the point-of-sale devices through mass training program organized by the Central Bank in conjunction with the commercial banks, but only after the project had been launched. For the e-zwich card holder, no such training was available; the individual has to rely on his or her basic computing knowledge. Only when such individual faced difficulty is he compelled to seek help from a bank official, that is, if the ATM machine is on the premises of the bank. In locations where the machines were detached from banks, it means the individual cannot use his or her card. How to use the card was advertised on TV as well as individual banks providing

flyers for customers who pass through the banks, nevertheless, people struggled to comprehend the use of the cards. Ram (1987), further reasons that the concept of divisibility of innovation is related to trialability. Divisibility measures whether an innovation can be attempted in stages. The lower the trialability of an innovation, the higher the innovation of resistance. The lower the divisibility of an innovation, the higher the innovation resistance. By all means, the e-zwich system was not developed and implemented in phases. Commercial banks were hastily rushed into the implementation of the system with the Central Bank of Ghana instituting regulations to force them to abide by the rules.

Observability: The degree to which the results of biometric payment systems elsewhere could be said to have been visible to Ghana especially that of South Africa who had been implementing biometric payment for a considerable number of years before the former decided to adopt the technology. Furthermore, besides South Africa, Net1 UEPS had delivered payment system in Namibia and Botswana, hence, opportunities for drawing contrasting lessons from these countries were there. Moreover, it was a South-African company that had installed the technology in Ghana and as Breckenridge (2010) indicated, the e-zwich

system albeit sharing some features with the South African biometric payment system, had features that were an improvement over the latter. Therefore, *ceteris paribus*, the e-zwich system was supposed to achieve significant positive results based on policy learning. It is a fact that the-the KwaZulu biometric payment system had also faced certain challenges and positive results at its initial stages that Ghana's e-zwich could have learnt from; poor service delivery, specifically, long queues at pay points which was also identified by Antwi, Hamza, Bavoh (2015) as one of the problems facing the e-zwich system. In short, the e-zwich clearly satisfied this characteristic of innovation.

South Africa's Biometric Payment System and the Characteristics of Innovation

Relative Advantage: South Africa's biometric system implemented in Kwazulu like the e-zwich system in Ghana, afforded the country some relative advantages. By virtue of it being the first country in Sub-Saharan Africa to adopt this technology, it is almost certain that the country was bound to enjoy certain benefits, especially with regard to the social status or prestige that the technology presents. South Africa therefore became the pioneer in the implementation of biometric technology and served as the point of reference especially for fellow countries in Southern Africa. As it turned out, Net1 UEPS, a wholly-owned South African company, installed biometric technologies not only in neighboring Malawi, Botswana and Namibia, but in West African countries of Ghana and West Africa as well as in Iraq. The company is private-owned, nevertheless, it represents the country wherever it goes and for this reason, it could be said that it rubs on the status of the country.

Most importantly, the biometric payment system was implemented in KwaZulu (also known as Zululand), a rural setting, hence, the system was able to include those beneficiaries into the financial sector. This was even more

so when Aplitec added other financial services like provision of short-term credit to grant holders in the system. This service has given millions of unbanked South Africans access to banking services and improved the banking culture of the rural population. Thus, 'they will now be able to utilize their smart cards as a fully operational bank account protected by their biometric profile' ('Smart(er) KZN pension cards', 2003). The biometric system was also implemented with the aim of reducing fraud and corruption in the distribution of the pension benefits. As Breckenridge (2014) stated, the adoption of the 'expensive' biometric payment system was downplayed by the 'elimination of invisible pilferage of millions of rands a year'. Thus while the system itself was expensive, the potential of it reducing fraud necessitated the adoption of the technology.

Compatibility: With regard to compatibility (in technical terms), one of the intentions to adopt biometric technology was its ability to work in a limited infrastructural capacity especially inherent in rural areas. Relative to Ghana, however, the biometric system has been successful in this regard; "South Africa's approach provides a useful alternative for a sparse country with limited internet and cell network coverage" (Gelb, &

Decker, 2011). Much of the problem faced by the system has more to do with logistics than infrastructural issues, however, Breckenridge (2005) does not totally equate out this problem. For example, in responding to grant-holders waiting for many hours before receiving their benefits, Aplitec blamed it on the poor electronic record-keeping in the region of Kwazulu by government officials. Breckenridge also notes that the problem, to some extent, highlighted the conflict between private companies and elected officials in the dispensation of most state transactions.

Thus, in South Africa, it appears that the problem of infrastructure and thus compatibility issues were at least, minimal. However, it has to be noted that the KwaZulu biometric payment system did not initially employ the use of biometric smartcards as was the case in Ghana, therefore explaining the relative less reliance on computing skills on the part of users. This was probably because, while in Ghana, a user basically conducts the transactions by him or herself (unless in retail transactions where all that the card-holder does is swipe his or her in the POS device), the biometric system in place in KwaZulu was taken to grant-holders (via four-wheel drive vehicles) and all that they have to do is press their forefinger onto a specially designed scanner attached to a

computer. In Ghana, on the other hand, users have to know basic computing skills to be able to perform transaction with the biometrically-enabled ATMs. Thus, the South African system required less of computational skills than the e-zwich system, hence accessibility was greatly enhanced in the former.

Furthermore, Cash Payment System (CPS), the first company charged with the distribution installed fingerprint scanners in post offices to channel payments to pensioners in the towns and cities also. And so as Breckenridge (2005) indicated, the biometric technology provided a 'compelling remedy to the provincial states administrative and infrastructural incapacity. It has to be noted that the KwaZulu system did not have multi-functionality as was the case in Ghana, hence, explains users less reliance on basic computing skills. However, since 2003, KwaZulu-Natal pensioners have been using their smart cards to buy goods at certain stores where they can also draw cash (Vecchiatto, 2003).

Complexity: Tied to accessibility is complexity or usability which is determined by the "degree to which an innovation is perceived as relatively difficult to understand and use". Like Ghana, the expected action of

policy makers would have been to not conceive the thought of employing this technology in view of the predominantly rural setting of the KwaZulu region. However, due to the simplicity of the technology, it was largely user-friendly; as indicated above, all that grant-holders had to do was press their thumbprint onto a scanner attached to a computer to receive payment. Even with the advent of additional services such as retail payment and cash withdrawal, transactions are facilitated by the merchants who only ask for the fingerprint of the users. In other words, "Beneficiaries will also be able to purchase goods and withdraw cash, in an offline environment, from the merchants participating in the payment system (Vecchiatto, 2003). Thus, in South Africa, the issue of complexity is virtually nonexistent or less marked relative to the situation in Ghana.

Trialability: Like the e-zwich system, the KwaZulu biometric payment was not tried on a smaller scale before it was launched on the regional level even though the system itself later on became the foundation for a national payment system. And so by Rogers (2003) reasoning, such innovation's ability to survive in the long run is highly limited. However, despite its inability to try the system on a smaller scale, it has fared better than the e-

zwich. As of now, the e-zwich, since it was introduced into the country in 2008 has enrolled a little above 1 million but the volume of transactions of the card is dwindling, which has been so for the past three years ("E-Zwich Spending Swells", 2003). Presently, Net1 Cash Payment Systems in South Africa on the other hand, distributes social welfare grants on a monthly basis to over nine million beneficiaries in South Africa ('Cash Paymaster Services', n.d.). In another report, Gelb (2012) indicated that the system was extended, across the entire country, in some cases with changes, and distributed grants to over 15 million beneficiaries. After four years of negotiations to provide smartcards to pensioners, the KwaZulu-Natal government finally awarded the contract to Aplitec in 2004 and in that same year, some 2.5 million recipients used the card at 7,500 payout points to receive state pension funds and child grants (Breckenridge, 2005). In Ghana, however, it was later in December (after the launch in April) that a 'handful' of ATMs with fingerprints readers were installed (Breckenridge, 2010) and the number of enrollment was nowhere near that of the former. After a year of implementation, only "2,500 merchants had installed the biometric point-of-sale machines, and just over 300,000

people had been issued with the cards" (Breckenridge, 2010).

Observability: By being the first country to have deployed biometric payment technology on the African continent and in the world (Breckenridge, 2014) and indeed as the pioneer in biometrically-delivered direct cash transfer, the observability characteristic advocated by Rogers as necessary in influencing the adoption of an innovation was clearly nonexistent in the policy decision. There was little to virtually no results elsewhere to compare its biometric payment system to and learn from. This is compounded by the fact that no trials of the system were performed to assess its feasibility before it was wholly adopted. Thus, the biometric payment technology employed in South Africa was an original idea that was liable to high level of risk as compared to the situation in Ghana's e-zwich system. However, rather than drawing back the system, the 'success' of Net1 system in South Africa is not in contention. As of 2008, 4 million people in South Africa were receiving state welfare or pension payments through the system ("Tackling The Security Challenge", 2008) and as indicated earlier, the number has risen significantly over the years.

The final section of the study assesses the effectiveness of the e-zwich system relative to South Africa's biometric payment system on one hand, and examines the applicability of Rogers' characteristics of innovation in the implementation of the biometric payment systems in the two countries on the other hand. The study then provides some suggestions as regards the way forward for the e-zwich system.

CHAPTER FIVE: CONCLUSION

The main aim of this study was two-fold; to assess the effectiveness of the e-zwich system in Ghana through Rogers' (2003) framework on the characteristics of innovation and in consequence, testing the validity of the framework. He contends that for any innovation to be successfully adopted in any country, it has to have exhibit his characteristics of innovation including relative advantages, compatibility, complexity, observability and trialability. The higher the evidence of these characteristics (with the exception of complexity which has an inverse relation with the rate of adoption) in the adopting country, the higher the likelihood of the innovation to be successful upon implementation. By this account, the study sought to find out whether the e-zwich system was adopted in Ghana because these characteristics were existing prior to implementation as well as existing currently. If they were, then *ceteris paribus*, this biometric payment system should demonstrate high success and an even greater potential in the future. Where the system is deemed or found to be highly ineffective, it is logical to conclude that the biometric payment technology or innovation adopted lacked Rogers' characteristics. Conversely, where most of the characteristics of

innovations were absent, yet the innovation has achieved relative success, it makes sense to say that Rogers' framework is not a sufficient condition for the adoption of innovation by a particular country and neither does it adequately predict the success of the innovation in the country.

The e-zwich policy is still being touted as having immense potential after seven years of its implementation and the recent loan provided by the German government to help improve the technology of the system further raises some hope for the future success of the system. Furthermore, the e-zwich seems to have met Rogers' characteristics of innovation, especially with regard to the 'perceived' relative advantages that the system was supposed to bring. However, plenty challenges still abound. Definitely, any technology that is being considered by a state would be perceived to bring with it some advantages and Rogers' indicate that is the most important factor in influencing adoption decisions of decision-makers. However, it is not difficult to argue that the real problems in adopting an innovation especially with regard to the success of its implementation would depend on that particular environment in which it is being adopted. Issues of compatibility and complexity can be considered as more

crucial in this regard than the issue of relative advantages, especially in developing countries where the level of literacy in general and financial literacy for such financial innovation employed in both South Africa and Ghana could be vital to the success of that innovation. But the case of South Africa's biometric payment system seems to belittle these two characteristics of innovation as the technology has been relatively successful with major challenges of the system attributed to logistical problems such as inadequate and inaccurate data maintained by the local government in maintaining the records of the citizens (Breckenridge, 2005). This problem can easily be remedied but severe structural problems such as communication problems causing delays in the registration of potential subscribers of the e-zwich system as well as lack of understanding on the usage of the e-zwich card is a call for concern.

As has been shown, the potential relative advantages and observability of the innovation were obvious prior to adoption. It was supposed to bring in the non-illiterate population to the financial sector, facilitate transactions and interbank payments between the commercial banks and a host of other advantages that the technology could bring. What was particularly hailed about the system

was its potential to reduce the problem of carrying large sums of cash around that created inconveniences (Asante, Boahene, Boakye, & Hagan, 2011). However, the success of the system has not gone down so well and this can be attributed to non-existent support systems in compatibility, complexity and to some extent trialability. Even though the system is designed to alleviate certain communication problems.

One worthy point to be noted in the success of South Africa's biometric payment is the role of the government in accelerating the patronage of the system. While the system is being managed by Cash Payment System (CPS) on behalf of the South-African government, the option of either signing up for the card or risk losing your social benefits has largely contributed in large numbers of beneficiaries being rolled up into the scheme. And so IMANI Ghana reckons that the problem with the e-zwich system is largely "strategic" rather than "technical" ("IMANI Alert: E-Zwich Becoming a Colossal Waste of Resources?" 2010). On the basis of the scope of its ambition it was always expected that some technical difficulties would be encountered, and that these will be assuaged as time goes on and with increasing patronage. Even the most proven systems require a period of time to attain stability.

However, as the think-tank explains, right from the beginning, the policymakers and the managers of the e-zwich program made "systemic strategic mistakes that considerably weakened its prospects at the get-go". The biggest of these mistakes, it continues, was the failure to "separate the electronic switch and supporting gateways, the biometric identification backbone, and the consumer smartcard and POS terminal services from one another". IMANI reasons that:

The electronic switch could have been the province of the Bank of Ghana, which could have also managed the biometric backbone on behalf of the public until the NIA (National Identification Authority) was ready to assume that function. A whole range of services could have then relied on the biometric backbone - NHIS (National Health Insurance Scheme), Electoral Commission, DVLA (Drivers & Vehicles Licensing Authority), Ghana Passport Office, and e-zwich itself. The result would have been a more efficient, a more ready-to-go, harmonized, and integrated national identification system, instead of the haphazard, fragmented, and frankly ridiculous system we have now, in which several agencies are falling over themselves to implement their own biometric databases, leading to great delays and outrageous cost overruns.

Another strategic problem is the prolonged inability of the Central Bank of Ghana initial promise that all public servants would have their monthly salaries paid onto their e-zwich cards. It is only recently that serious attempts have been made to actually implement this policy on a wide scale. This problem, according to Asante et al, 2011 can be attributed to government's lack of commitment to this initiative since most of the implementation of the project has been left in the hands of GhIPSS.

In their literature review, Asante, Boahene, Boakye & Hagan (2011) indicate that "implementation of electronic payment system is as a result of the behavior adopted by customers during transactions" And so Rogers' was right to state that one of the characteristics necessary for the successful adoption of innovations is complexity; that is, "how difficult it is for adopters to learn to use an innovation" (Yocco, 2015). E-zwich transactions have truly validated Cobb's assertion, but on a negative note as citizens on many occasions have struggled to get their fingerprints read by the POS machines and sometimes being turned away by merchants when machine indicated that they were not the rightful owners of the e-zwich cards. Years after the implementation of the policy, some individuals still experience this difficulty.

Thus it is evident that the seemingly coercive strategy adopted by the South-African government as compared to the soft-stance (on citizens especially) of the Government of Ghana over the years has largely been instrumental in rolling more individuals into its biometric payment system. Ironically however, the role of the privately-run CPS can be hardly disputed to have contributed in boosting the effective running of the system. Does the success of the South Africa's system which is managed by a private-firm serve as useful lesson to Ghana to award the management of the e-zwich system to (which is controlled by the Bank of Ghana through GhIPSS) to a tried and tested private-firm like CPS? IMANI for example believes that the consumer smartcard part of the e-zwich program, which is represented by the smartcards themselves and the point of sales terminals, should definitely have been left in the hands of the many private-sector developers of electronic payment solutions already working in Ghana. The competition would have mitigated disastrous decisions such as were taken by GhIPPS at the start of the initiative to require merchants to purchase the terminals. This seriously slowed adoption and attenuated the initial drive of the program. This it contends was a huge marketing mistake as money was thrown

into adverts and yet potential customers could not see the terminals anywhere. In a society with predominantly impulse-driven market behavior it is quite difficult to ascertain the effect of advertising on consumer choices.

Although observability was evident in the innovation of the e-zwich system by virtue of the country having an advantage from the opportunity in learning from the results of the KwaZulu payment system, this did not and has still not helped in the implementation of the system. This reinforces the above point that perhaps in the case of the e-zwich system, the problem has to do more with strategic decisions made by officials at the Central Bank as well as GhIPSS rather than technicalities such as compatibility and complexity issues that Rogers state as important in the adoption process. Rogers does not address the importance of the ability of the innovation to be divided into smaller phases or stages during the trial process. Ram (1987) filled this gap by stating that the more an innovation is tried in smaller doses prior to full-scale implementation, the better for the innovation to succeed in the long run. According to the Central Bank of Ghana, the e-zwich program was supposed to be carried out in three stages; the first phase included the installation of the switch host, establishment of networks and issuing

of biometric smartcards by banks to clients as well as deployment of POS terminals by banks at specific acquired merchants and in bank branches (Asante et al, 2011). This phase, according to the Central Bank was completed and led to the launch of the e-zwich system on April 28, 2008.

Phases two and three are unfortunately yet to be materialized and the future of them coming into fruition is quite bleak to say the least. According to the Bank's 2008 annual report, phase two involved the introduction of new ATMs into the system and modifying existing ones to accept both biometric smartcards and Personal Identification Numbers (PIN) based magnetic stripe cards and the inclusion of mobile banking onto the switch (Asante et al). But this phase has not been fully incorporated as planned. ATMs are located in few designated places throughout the country. In some places such as Western, Central, Upper West and Upper East regions there is ATM in only one location. Interestingly, these regions, especially the last two, represent the two most rural areas in the country. This reality therefore questions the real intention of policymakers to make the e-zwich system a means for financial inclusion of people in these regions. The last phase of the program was to incorporate e-zwich with the card systems of major international card

associations such as VISA and MasterCard so that these different cards can be accepted at the same payment outlets in Ghana (Asante et al, 2011). This phase has been implemented but with mixed results. The Gh-Link Point of Sale, which was introduced four years in 2012, after the launch of the program ("GhIPPS Introduces GH-Link Card", 2012) accepts both e-zwich and ATM cards for payment but only available at selected shops and supermarkets, about eighteen in total. This paltry amount of these POS also limits access to the system and undoubtedly defeats the financial inclusion of rural folks as the Gh-Link POS is in place at large urban centers than in rural areas. It is therefore little wonder that the greater chunk of e-zwich card issues made so far, the distribution is overwhelmingly urban and peri-urban. And so the e-zwich appears to have been implemented in phases, but the haphazard nature of its implementation provides allows room to suggest that it was rarely carried out in stages or to reason that it was 'planned' to be but not actually implemented as such. Besides, Ram's argument has to do with divisibility at the trial stage but not after the broad-scale launch of the program. Thus even if we agree that the e-zwich was implemented in stages, it was not undertaken during any try-out process of the program.

Furthermore, by virtue of its ad hoc implementation, it can also be argued that the implementation of the various phases was necessitated by lack of adequate resources to make the program fully operational, rather than a conscious attempt to do so. This perhaps explains why even though GhIPPS purchased a whopping 3 million of the biometric smartcards in advance they were only able to issue out a paltry 10% as of 2012, four years after the launch of the system ("IMANI Alert: E-Zwich Becoming A Colossal Waste of Resources", 2012.). This led NET 1, in various calls with analysts and in regulatory announcements to create the impression that there was a deliberate slowdown in card issuance by the Ghanaian authorities in order to allow infrastructure to catch up with mass marketing drive by authorities to accelerate the adoption of e-zwich cards. Seven years down the line, authorities are still trying to boost the needed infrastructure to support the system as evident in the recent loan promised to GhIPSS by the German government to help in this effort.

So from all indications, the e-zwich system has fallen short of its expectations when gauged against Rogers' characteristics of innovation. The expectations lie in its relative advantages, but the success and

sustainability of the program lie in its compatibility (infrastructural and cultural support) and complexity (access and usage) and these two have not helped in this regard. The KwaZulu biometric payment on the other hand, has not only survived, but has increased its number of enrollment and usage since its implementation in 1999 and there are no signs of slowing down. Albeit the system lacked in key prerequisites of innovation adoption per Rogers' postulate, it has achieved success that would have been expected of an innovation that was new to the country and continent at large. The KwaZulu system lacked clearly in observability, trialability and to some extent compatibility (logistical problems). However, the ease and usage (complexity) of the system, although some challenges were noted, (long waiting times for trucks carrying the system) did not hinder its adoption in neighboring provinces and the system has indeed gone national.

Does the success of the South African system therefore offer credence to Rogers' assertion that the most important characteristic among the other characteristics of innovation is relative advantages that the innovation brings? Yes and no. Yes because the inadequacies of an existing innovation in the face of new or increased demands lead to calls for an improved innovation or system

especially where there is clear evidence of the positive outcomes of an alternative system elsewhere. In the 1980s and early '90s, computer word-processing programs WordStar and WordPerfect demonstrated relative advantage over existing products. And even before the advent of computers in that era, most offices relied on typewriters, which took up a lot of space, performed only one function and required servicing, supplies (type ribbons, whiteout, etc.) and parts on a regular basis (they were also pretty loud). As computers became more prevalent, WordStar and WordPerfect freed users from typewriters. The relative advantage was thus obvious.

The word-processing programs did not require any additional physical space other than the personal computer, which already performed a number of other office tasks such as reducing the need for ink and correction tape; documents could be easily edited prior to printing; and files could be saved and transported for editing on other computers using floppy disks. Soon, typewriters were being phased out of offices and replaced with these computer word-processing programs. Therefore, as long as the problems of an existing innovation persist, policymakers would make several necessary attempts to get rid of it even if it is going to take extreme costs and a

long period of time because, they perceive the alternative to be worth it in light of its advantages that it is expected to bring once it has been fully incorporated into the system.

However, how much cost and how long such eventual realization of the new system can be born depends on the adopting environment or policy home. The prolonged experimentation of the new alternative can come at extreme opportunity cost that could mean abandoning certain vital policies in the short run whose consequences can be far-reaching into the future. Should an impoverished country focus all of its resources on a given technology at the expense of meeting a more immediate need such as the provision of necessities as rural water and electricity, food and shelter? In developing countries such as Ghana, the need for an advanced technology may not be necessary now in view of its gross illiteracy rate. It is hard to argue that making desperate attempts to bring the rural folk into the financial system is more important than making sure that they assured of three meals per day or that they are not living on less than a dollar day.

As indicated already, these individuals do not have the education necessary to comprehend the modus

operandi of the e-zwich system. Furthermore, most rural homes do not even have televisions and radio sets to listen to any commercials about the program due to the fact that they do not have electricity at their homes. This unfavorable environment perhaps explains why as of 2012, estimates suggested that monthly transactions (a more useful measure) never exceeded 10,000 as compared to the success of a private consumer smartcard company in post-communist Hungary, GBC, which having launched in an environment only "mildly" favorable than Ghana's, managed to deploy 17,000 POSs and process 8 million transactions per month during the first phase of their operational strategy ("IMANI Alert: E-Zwich Becoming A Colossal Waste of Resources?", 2012).

The success of South Africa's system therefore appears to have buttressed Rogers' argument that relative advantage is the most important characteristic of innovation, if it is argued that by clearly anticipating the positive outcomes of an alternative innovation, authorities are more than willing to see its success even in the face of challenges. On the other hand, the relative lack of environmental support for Ghana's e-zwich system seems to undermine Rogers' theory. The relative 'failure' (to be generous) of the e-zwich system, per its primary aim

of financial inclusion raises three questions. First, does the failure of the e-zwich system relative to the success of the South Africa system imply that the success of the adoption of biometric payment system depends on the 'type' of service for which the technology is deployed? Second, was the primary aim of the e-zwich system wrong in the first place? And third, should the e-zwich system be run by a private firm?

For the first question, the answer would be in the affirmative as judged by the deployment of biometric payment technology in social welfare schemes of both South Africa and India. Much has already been discussed about South Africa's system whereby enrollment has increased to over nine million. An even more remarkable feat has been achieved with the biometric payment system (Smartcard program) in Andhra Pradesh (AP), India. The Government of Andhra Pradesh (GoAP), which deployed the technology to two welfare schemes: the Mahatma Gandhi National Rural Employment Scheme (MGNREGS) and the state-sponsored social security pension (SSP) program, has been able to "overcome sizeable operational barriers to initiate payments in approximately 76 % (MGNREGS) and 82% (SSP) of study district gram panchayats (GPs) as of March 2012" (Mukhopadhyay,

Muralidharan, Niehaus & Sukhtankar, 2013). As was the situation in South Africa, this "impressive success" would not have taken place had it not been the role of government functionaries. Mukhopadhyay et al (2013), note that a "key enabling factor has been the commitment of top-ranking government officials to develop, monitor, and improve the Smartcard program on an on-going basis". And so it is evident that the compelling nature of the social welfare schemes in place in both South Africa has contributed to the success of the payment systems. The extent of the success with Andhra Pradesh's biometric payment is so remarkable that "over 90% of beneficiaries report that they prefer the biometric payment system to the previous system of having to travel to the post office to collect payments" (Mukhopadhyay et al, 2013).

The second question, the study recommends the expert advice of IMANI. The reputable think-tank, based on their analysis suggests that the aim of e-zwich should have been "branchless banking" instead of "financial inclusion". It contends that even though authorities assert that 20% of the population is unbanked, this statistic can be misleading, in that, the figure does not commensurate with the more critical indicator: funds outside the banking

system, which the Bank of Ghana closely monitors. Per their argument, the currency ratio indices have consistently shown that the bulk of Ghana's money still passes through the banks. Therefore, the middle and upper classes control the country's wealth and they are generally well-banked. Thus the real challenge of the e-zwich system per this objective is that, do poor, illiterate, rural dwellers have cash hoarded up that can be "deposit-mobilized" into the banking system? IMANI's analysis suggests that this is not the case.

The answer to the issue of whether the e-zwich system should be privatized or not can also be found in the successful implementation of the social welfare schemes in both South Africa and India. Although the state apparatus has been crucial in the success of the biometric payments systems in both countries, the role of the private-sector cannot be downplayed. As indicated earlier, South Africa's system is managed by Net 1's Cash Payment System and most of the company's national switch and smartcard implementations in other African countries had been on joint venture basis with the government, and card issuance per capita appears to have been more successful in many of these places ("IMANI Alert: E-Zwich Becoming A Colossal Waste of Resources?", 2012). The same situation prevails in

NET 1's Latin American operations too. In India, The AP Smartcard program has been implemented through a bank-led, business correspondent (BC) approach, within the structure of "one-district-one-bank" model (however, in three districts, the Post Office has been contracted by the GoAP to issue biometric payments). The payment delivery system relies upon customer service providers (CSPs) to transact last-mile payments at the behest of contracted banks, using POS devices for authentication. The success of the systems in place in the above countries therefore questions the decision taken by the Bank of Ghana to be the sole owner and sole carrier of risks in Ghana's case.

To reinstate, the Andrah Prakesh case shows governmental actors' role in the successful delivery of biometric technology. And so Muller (2010), states that the potential adoption of biometric ID cards tend to boost "dominant contemporary discourse and logics of rule and governance and generally focus on issues associated with the implementation of biometric ID cards". Therefore he explains that in Canada, the Office of the Privacy Commissioner of Ontario and Citizenship and Immigration Canada (CIC) are regularly involved in the evaluation of biometric technologies, biometric encryption and the

relationship between security and privacy and the role that biometrics can influence that relationship. Furthermore, after adoption of the biometric technology, the lack of any trade organization-based regulatory mechanism may ultimately result in more "draconian" governmental restrictions if consumer harm is enough (Langenderfer & Linnhoff, 2005). If governments are influential in the adoption of biometric technologies then it reasons that government workers' attitude to these new technology is key to ensuring successful adoption.

Thus it can be investigated whether workers at GhIPSS have had a lukewarm attitude towards the e-zwich system which may be contributing to the relative ineffectiveness of the system. An exploratory study of government employees' perceptions of the introduction of biometrics at the workplace in the Kingdom of Saudi Arabia indicated that a significant digital and cultural gap between the technological awareness of employees and the preferred authentication solutions promoted by management (Alhussain, & Drew, 2009). A lack of trust in technology, its potential for misuse and public management motives reflect public managers' need to consider their responsibilities for narrowing these gaps. In view of this it is evident that overcoming public workers' resistance,

especially those who have a direct impact, is an essential issue facing biometric implementation. And so in Andhra Pradesh, Mukhopadhyay et al, 2013 underscores the critical role of government employees in the state's implementation of the biometric payment system:

In general, the high degree of engagement maintained by top government officials has had the following important implications: 1) it has signalled to major stake-holders that GoAP considers the Smartcard program to be a priority, 2) it has allowed GoAP to develop relationships with the main agents of implementation, the banks and TSPs, and 3) it has helped to establish a regular discourse on how to resolve programmatic and operational challenges.

Therefore where government actors lack the right attitude to ensure the implementation of biometric technologies it is perhaps necessary to establish and enforce a legal framework to support it. However, in the developing countries including Ghana and South Africa, the adoption of new technologies is rarely preceded by the adoption and implementation of robust regulatory frameworks¹. In Ghana, the government's role in the implementation of the e-zwich at the early stages was the

coercion of private banks to adopt the system through directives by the Central Bank of Ghana, but these directives had no legal basis. That is, no law was specifically created to help back the implementation of the system, except those existing laws that gave the Central Bank the power to initiate policies based on its discretion.

However, the Ghana Interbank Payment and Settlement Systems Limited (GhIPSS), a wholly owned subsidiary of the Bank of Ghana, was incorporated in May 2007 (a year before the launch of e-zwich) with a mandate to implement and manage interoperable payment system infrastructures for banks and non-bank financial institutions in Ghana. In a more proactive role, the government has recently stepped up its effort to enroll public sectors workers in the system. The Controller and Accountant- General Department is expected to commence the payment of all civil servants by a biometric E-zwich platform in 2015. This follows an on-going pilot program to gradually ensure public sector workers are paid via the E-zwich payment system². The roll out plan was initially to start with the finance department of the Controller and Accountant Department, then to all staff members in Accra. This follows the payment of all National Service personnel

on their e-zwich cards, which began much earlier in December last year. The department therefore hopes to learn the experiences of the latter to inform how to proceed with its objective.

Also, the government, in financing the Ghana School Feeding Program, has started paying caterers through e-zwich. President Mahama made the promise in 2014 and a little less than a year after that promise, the school feeding caterers are being paid electronically using the e-zwich biometric smart card as well as mobile money platforms ("Paying School Feeding Caterers On E-Zwich Begins", 2015). The government also secures loan for the improvement of the system. In 2011, despite the opposition from the Minority caucus, parliament approved 70 million Euro loan facility that is meant to finance the e-zwich rural branchless banking ("Parliament Approves 70 Million Euros For E-Zwich Project", 2011). This is where the role of the Ghana government stops; it seeks to encourage patronage of the system by enrolling more public workers onto the scheme as well as seeking funds for the improvement of the system. Thus the GhIPSS by being a subsidiary of the Bank of Ghana which is solely owned by the state, receives substantial support from the government and its initiatives are therefore expected to be in line

with those of the government or at least, needs governmental approval before implementation.

In South Africa while the distribution of the grants is solely the responsibility of the private firm Cash Payment Services (CPS), the social grant system is wholly administered by the South African Social Security Agency (SASSA). Even though the leadership team includes some cabinet ministers (Minister and Deputy Minister of Social Development), its standing as an independent agency rather than a government department means it has a number of discretionary powers. This gives it greater flexibility in addressing the problem of acute skill shortages that so bedevils government departments. That is, government's role in the country's biometric payment is relatively minimal, but this does not prevent it from intervening in the scheme when it deems necessary. Even before the KwaZulu biometric payment was transformed into a national social grant scheme, there was some interference from members of the national government. For instance, in response to grant-holders in Eastern Cape having died while waiting for payment and other complaints by beneficiaries of having to wait for hours for CPS trucks to arrive, Minister of Welfare, Zola Skweyiya, denounced the CPS contract. He accused the company of 'gross and flagrant violations' of

the terms of the contract and the 'human and constitutional rights of our people', he called for an end to the contract (Breckinridge, 2005). Recently, the company has faced significant criticisms especially with the Black Sash and its partners collecting documentation from thousands of grant recipients about deductions being made without their permission against their accounts ("Net1 - The Company That Runs The Social Grant Payment System"). In consequence to these complaints, the Minister of Social Development, Bathabile Dlamini, set up a task team to examine the issue and in September last year announced, among other things:

that Sassa and her department would ensure that CPS complied with all relevant legislation; -that payment systems would be designed in such a manner that social grant beneficiaries' bank accounts are off limits to creditors; and -that all debit deductions for Umoya Manje services (a Net1 subsidiary that facilitates purchasing of cellphone time on credit), loans and any other financial service providers other than legal deductions would be reversed.

Thus while both SASSA and CPS have a high degree of independence to execute its mandates, the interest of the public is paramount, hence, the government will step in to ensure that any problems associated with the biometric payment system are resolved. Besides, as long as SASSA remains a state institution, government

interference in its operations are inevitable even if it means the government overstepping its boundaries especially when it is funding the operations of the system. Thus although it may seem the government is breaching the law by interfering, it can be seen as 'moral' not only to SASSA, but also to the many beneficiaries of the scheme.

Just as government and its officials are important in the successful delivery of biometric payment systems, it is equally important for relevant stakeholders in the private sector to show commitment to the innovation. The financial institutions in Ghana did not demonstrate gross resentment towards the e-zwich system (at least in the public eye), however, their support was lukewarm. This is because of the overall "policed monopoly" of the Central Bank in the implementation of the system, even though there was some level of collaboration with the banks. Commercial banks were more interested in serving their customers who demanded international debit cards such as VISA and MasterCard at the expense of the e-zwich cards. Even though they were generally interested in the new system, their actions showed otherwise and this adversely affected wide scale enrollment of customers onto the scheme. In short, it is not enough for an innovation to exhibit Rogers' relative

advantages, more has to be done to bring relevant actors in the implementation of the innovation.

Therefore, is there any indication that Ghana's e-zwich is bound to start realizing significant benefits anytime soon? It is justified to believe that without urgent reform, e-zwich would end up as a colossal white elephant. This does not have to be the case, since as per the analysis above, e-zwich can become a productive national asset if managed well. Like human beings, policies are not an 'island'; they need the right incentives and support systems to become and remain successful.

REFERENCES

A Glossary of Political Economy Terms. (n.d.). Retrieved November 11, 2015, from https://www.auburn.edu/~johnspm/gloss/pluralist_theory.

Agyeiwaah, E., Anane, G. A. S., Appiah, K. O., & Opoku-Ware, J. 2015. Challenges of E-Zwisch at Ghana Commercial Bank: Do The Views of Users Differ to Those of Non-Users?

Alhussain, T., & Drew, S. (2009). Towards user acceptance of biometric technology in E-Government: A survey study in the Kingdom of Saudi Arabia. In *Software Services for e-Business and e-Society* (pp. 26-38). Springer Berlin Heidelberg.

Antwi, S. K., Hamza, K., & Bavoh, S. W. 2015. Examining the Effectiveness of Electronic Payment System in Ghana: The Case of e-ZWICH in the Tamale Metropolis. *Research Journal of Finance and Accounting*, 6(2), 163-177.

Asante, R.B., Boahene, A. N. A., Boakye, A.P., & Hagan, C. 2011. Influence of the Implementation of E-ZWICH on the Ghanaian Economy:

Balsiger, J. n.d. Logic of appropriateness. Retrieved November 12, 2015, from <http://www.britannica.com/topic/logic-of-appropriateness>.

- Berry, W. D., & Baybeck, B. (2005). Using geographic information systems to study interstate competition. *American Political Science Review*, 99(04), 505-519.
- Boateng, J. K., Tetteh, I., & Boateng, J. 2015. Managerial And Usage Challenges Associated With The E-Zwich Payment System In Ghana.
- Boden, R. 2013. Google and Equity Bank Launch NFC Payments In Kenya. Retrieved from <http://www.nfcworld.com/2013/05/01/323793/google-and-equity-bank-launch-nfc-payments-in-kenya/>
- Braun, D., & Gilardi, F. (2006). Taking 'Galton's problem' seriously towards a theory of policy diffusion. *Journal of theoretical politics*, 18(3), 298-322.
- Breckenridge, K. 2010. The world's first biometric money: Ghana's e-Zwich and the contemporary influence of South African biometrics. *Africa*, 80(04), 642-662.
- Breckenridge, K. (2014). *Biometric State*. Cambridge University Press.
- Breckenridge, K. (2005). The biometric state: The promise and peril of digital government in the new South Africa. *Journal of Southern African Studies*, 31(2), 267-282.

Bromley, D. B. (1986). *The case-study method in psychology and related disciplines*. John Wiley & Sons.

Burkus, D. (n.d.). *The 5 Common Characteristics of Ideas That Spread*. Retrieved from <http://99u.com/articles/19306/the-5-common-characteristics-of-ideas-that-spread>

Cash Paymaster Services (CPS). (n.d.). Retrieved from [http://www.net1.com/business-structure/transactional-solutions-cluster/cash-paymaster-services-\(cps\)/](http://www.net1.com/business-structure/transactional-solutions-cluster/cash-paymaster-services-(cps)/).

Devereux, S., & Vincent, K. (2010). Using technology to deliver social protection: exploring opportunities and risks. *Development in Practice*, 20(3), 367-379.

Diffusion of Innovation Theory. n.d. Retrieved at <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/SB721-Models/SB721-Models4.html>

Domfeh, K.A. 2012. *E-zwich Usage In Ghana Increases In Quality, But Not In Quantity*. Retrieved at <http://www.modernghana.com/news/380311/1/e-zwich-usage-in-ghana-increases-in-quality-but-no.html>.

Donnelly, P., & Hogan, J. (2012). *Understanding Policy Change Using A Critical Junctures Theory In Comparative*

Context: The Cases Of Ireland And Sweden. Policy Studies Journal, 40(2), 324-350.

Dye, T. R. (1992). Understanding public policy. Englewood Cliffs, NJ: Prentice Hall.

E-Zwich Spending Swells. (n.d.). Retrieved from <http://www.myjoyonline.com/business/2015/August-26th/e-zwich-spending-swells.php>.

Gelb, A., & Decker, C. (2011). Cash at Your Fingertips: Biometric technology for transfers in developing and resource-rich countries. Center for Global Development Working Paper, (253).

Ghauri, P. N. (1983). Negotiating international package deals: Swedish firms and developing countries.

GhIPPS Introduces GH-Link Card. 2012. Retrieved at <http://www.ghanaweb.com/GhanaHomePage/NewsArchive/GhIPPS-Introduces-GH-Link-Card-257185>

Gilardi, F. (2014). Four Ways We Can Improve Policy Diffusion Research. New Frontiers in Policy Diffusion.

Gomez, D. 2015. Pros & Cons of Biometrics and a Cashless Society. Retrieved from <http://www.moneycrashers.com/biometrics-cashless-society/>

Guide To Undergraduate Dissertations In The Social Sciences. (n.d.). Retrieved from <http://www.socscidiss.bham.ac.uk/methodologies.html> .

Haruna, I. (2012). Challenges of Electronic Payment Systems in Ghana: The Case of e-ZWICH. *American Journal of Business and Management*, 1(3), 87-95.

IMANI Alert: E-Zwich Becoming A Colossal Waste of Resources? 2012. Retrieved at: <http://www.modernghana.com/news/262642/1/imani-alert-e-zwich-becoming-a-colossal-waste-of-r.html>

Humphrey, D. B., Kim, M., & Vale, B. (2001). Realizing the gains from electronic payments: Costs, pricing, and payment choice. *Journal of money, credit and banking*, 216-234.

James, P. (2007). *Globalization and economy*. London: Sage publications.

Jones, M. D., & Jenkins-Smith, H. C. (2009). Trans-Subsystem Dynamics: Policy Topography, Mass Opinion, and Policy Change. *Policy Studies Journal*, 37(1), 37-58.

Kleistra, Y., & Mayer, I. (2001). Stability and Flux in Foreign Affairs Modelling Policy and Organizational Change. *Cooperation and Conflict*, 36(4), 381-414.

- Krasner, S. D. (1982). Structural causes and regime consequences: regimes as intervening variables. *International organization*, 36(02), 185-205.
- Kumaga, D. (2010). The challenges of implementing electronic payment systems-The case of Ghana's E-zwich payment system. Retrieved July, 19, 2012.
- Langenderfer, J., & Linnhoff, S. (2005). The emergence of biometrics and its effect on consumers. *Journal of Consumer Affairs*, 39(2), 314-338.
- Legro, J. W. (2000). The transformation of policy ideas. *American Journal of Political Science*, 419-432.
- March, J. G. (1994). *Primer on decision making: How decisions happen*. Simon and Schuster.
- Martin, M. H. (2003). Factors influencing faculty adoption of web-based courses in teacher education programs within the State University of New York.
- Meijerink, S. (2005). Understanding policy stability and change. The interplay of advocacy coalitions and epistemic communities, windows of opportunity, and Dutch coastal flooding policy 1945-2003 1. *Journal of European Public Policy*, 12(6), 1060-1077.

Mintrom, M. (1997). Policy entrepreneurs and the diffusion of innovation. *American journal of political science*, 738-770

Mukhopadhyay, P., Muralidharan, K., Niehaus, P., & Sukhtankar, S. (2013). Implementing a biometric payment system: The Andhra Pradesh experience. Technical Report, University of California, San Diego

Muller, B. J. (2010). Security, risk and the biometric state: governing borders and bodies. Routledge.

Net1 - the company that runs the social grant payment system. 2015. Retrieved at <http://mg.co.za/article/2015-10-14-net1-the-company-that-runs-the-social-grant-payment-system>

Nicholson-Crotty, S., & Carley, S. (2015). Effectiveness, Implementation, and Policy Diffusion Or "Can We Make That Work for Us?" *State Politics & Policy Quarterly*, 1532440015588764.

Nitsure, R. R. (2003). E-banking: Challenges and Opportunities. *Economic and Political Weekly*, 5377-5381.

Nohrstedt, D., & Weible, C. M. (2010). The logic of policy change after crisis: Proximity and subsystem interaction. *Risk, Hazards & Crisis in Public Policy*, 1(2), 1-32.

Online vs. Offline Debit Transactions. (2012). Retrieved from <http://www.entrepreneur.com/article/56216>.

Parliament approves 70 million Euros for e-zwich project. 2011. Retrieved at

<http://members.ghanaweb.info/GhanaHomePage/business/Parliament-approves-70-million-Euros-for-e-zwich-project-217030>

Parisot, A. H. (1997). Distance education as a catalyst for changing teaching in the community college: Implications for institutional policy. *New Directions for Community Colleges*, 1997(99), 5-13.

Paying School Feeding Caterers On E-Zwich Begins. 2015. Retrieved at

<http://www.ghanaweb.com/GhanaHomePage/NewsArchive/Paying-school-feeding-caterers-on-e-zwich-begins-388160>

Pension Pay-out Contractors: Follow-up briefing. (n.d.). Retrieved from <https://pmg.org.za/committee-meeting/792/>.

Peters, B. G. (2011). *Institutional theory in political science: the new institutionalism*. Bloomsbury Publishing USA.

Phelan III, F., & Phelan, P. (2007). U.S. Patent No. 7,280,984. Washington, DC: U.S. Patent and Trademark Office.

Quansah, A., Andoh-Baidoo, F. K., & Midha, V. 2010. Towards standardisation of E-zwisch implementation: mapping SWOT analysis to management framework models approach.

International Journal of Services and Standards, 6(3-4), 195-220.

Rhodes, R. A., Binder, S. A., & Rockman, B. A. (2008). The Oxford handbook of political institutions. Oxford University Press.

Rogers, E. M. (2010). Diffusion of innovations. Simon and Schuster.

Sabatier, P. A., & Weible, C. (Eds.). (2014). Theories of the policy process. Westview Press.

Sahin, I. (2006). Detailed Review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based on Rogers' Theory. Online Submission, 5(2).

Shipan, C. R., & Volden, C. (2008). The mechanisms of policy diffusion. American journal of political science, 52(4), 840-857.

Skocpol, T., Evans, P., & Rueschemeyer, D. (1999). Bringing the state back in. Cambridge.

Smart Card Payment System Launched in Iraq. 2012. Retrieved from <http://www.theiqdteamconnection.com/iraq-news/smart-card-payment-system-launched-in-iraq>

Smith, D. (2014). Internet Use On Mobile Phones In Africa Predicted To Increase 20-Fold. Retrieved from <http://www.theguardian.com/world/2014/jun/05/internet-use-mobile-phones-africa-predicted-increase-20-fold>.

Stone, C. N. (1993). Urban regimes and the capacity to govern: A political economy approach. *Journal of urban affairs*, 15(1), 1-28.

Starke, P. (2013). Qualitative methods for the study of policy diffusion: Challenges and available solutions. *Policy Studies Journal*, 41(4), 561-582.

Tackling The Security Challenge. 2008. Retrieved from <http://www.electronicpaymentsinternational.com/News/tackling-the-security-challenge>.

Taddesse, W., & Kidan, T. G. (2005). e-Payment: Challenges and Opportunities in Ethiopia. *Journal of Internet Banking & Commerce*, 12(2).

Thompson, J. (2008). Ghana: The E-zwich Monopoly - Is Ghipps A Referee Or A Competitive Player? Retrieved at <http://allafrica.com/stories/200810271721.html>

- Types of E-Payment. (n.d). Retrieved from <http://www1.american.edu/initeb/sm4801a/epayment3.htm>
- Vecchiatto, P. (2003). Smart(er) KZN pension cards http://www.itweb.co.za/index.php?option=com_content&view=article&id=80252.
- Walker, J. L. (1969). The diffusion of innovations among the American states. *American political science review*, 63(03), 880-899.
- Yates, B. L. (2001). *Applying Diffusion Theory: Adoption of Media Literacy Programs in Schools*.
- Yin, R. K. (2012). *Applications of case study research (3rd ed.)*. Washington DC: SAGE Publications, Inc.
- Yin, R.K. (1994). *Case study research: Design and Methods*. Beverly Hills.
- Yocco, V. 2015. Five Characteristics Of An Innovation. Retrieved at <http://www.smashingmagazine.com/2015/01/five-characteristics-of-innovations/>
- 75,000 Ghost Names Removed From NSS Payroll; Saving GH¢26.5m. (n.d.). Retrieved September 18, 2015.
- ¹https://www.privacyinternational.org/sites/default/files/Biometrics_Friend_or_foe.pdf

² <http://www.ghipss.net/?pg=newseventsdetail&t=n&x=6>