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Development of an Information and Communication Technology (ICT)-Driven Business Model for the Utility Sector

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ABSTRACT

Innovations in Information and Communication technologies (ICT) have created the convergence phenomenon, under which new mobile services are emerging and changing the way people live. It is now possible for people to enjoy mobile services anywhere and anytime. Electricity Company of Ghana (ECG) as a distributing electricity company has its mandate to ensure quality, reliable and efficient supply of electricity to its numerous customers. In order to meet this target the company must be financially sound. This is achieved through efficient and effective billing and revenue collection system. Currently, the company is plagued with deficiencies in bills distribution and revenue collection. In order to solve this problem, this paper aims and seeks to analyze a framework to develop an appropriate ICT-Driven Business Model for Revenue Collection showing how the various stakeholders involved can be organized in a multi-sided platform to reduce transaction cost for collection of revenue for the utility sector (ECG). Through literature review, qualitative and data collection research methodologies, the results of the study proposed a recommended Content Aggregator-Centric Mobile Operator Business Model after critical analysis.

Keywords: *ICT, ECG, Business Model(s), National Communications Authority (NCA), Mobile Networks, Mobile Technologies, Revenue Collection*

1. INTRODUCTION

The ICT revolution is radically changing people's life style and the way of business operation. ICT plays a pivotal role in globalization and this brings leverage in the two essential commodities of time and distance, which in business terms translate into efficiency and cost. The impact of ICT is most visible in service sector where the efficiency levels have gone very high. New business like "Business Process Out-sourcing (BPOs)", Revenue mobilization, Banking and Insurance and organizations, are taking maximum advantage of the ICT revolution.

With the introduction of mobile network data services such as General packet radio service *(*GPRS*),* Enhanced Data rates for GSM Evolution (*EDGE*) and Third Generation (3G) in particular, innovative applications and services are gradually becoming popular. A mobile device is no longer considered being luxury item; rather it is considered being necessity item in Ghana and worldwide. According to National Communication Authority (NCA), Ghana - Reports, the mobile subscription has grown to approximately 20 million representing approximately 83.38% of the total population of Ghana as at October 2011. This is depicted in figure 1 below.
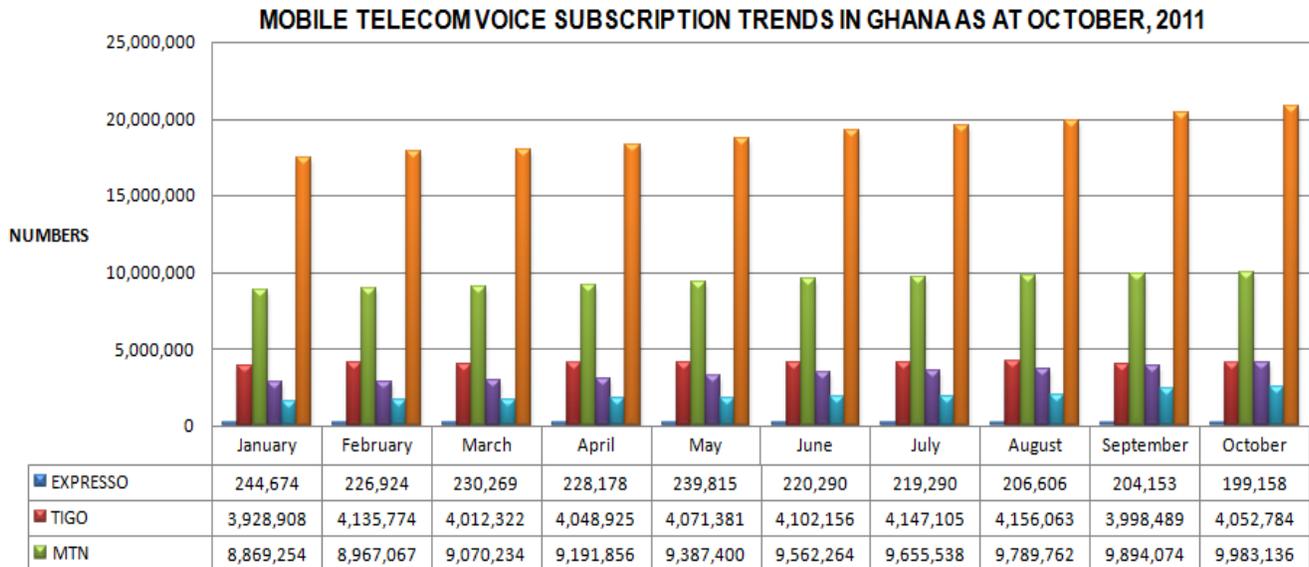
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MOBILE TELECOM VOICE SUBSCRIPTION TRENDS IN GHANA AS AT OCTOBER, 2011

NUMBERS	January	February	March	April	May	June	July	August	September	October
■ EXPRESSO	244,674	226,924	230,269	228,178	239,815	220,290	219,290	206,606	204,153	199,158
■ TIGO	3,928,908	4,135,774	4,012,322	4,048,925	4,071,381	4,102,156	4,147,105	4,156,063	3,998,489	4,052,784
■ MTN	8,869,254	8,967,067	9,070,234	9,191,856	9,387,400	9,562,264	9,655,538	9,789,762	9,894,074	9,983,136

Figure 1: Mobile Voice Subscription Trends in Ghana as at October 2011

Source:*http://nca.org.gh/downloads/subscriber_base_October_2011_web_version.pdf*

An increase in mobile subscriptions means the mobile service usage is also growing. Revenue is the life blood of any Utility Sector and using ICT can play an important role in revenue collection and also give rise to the fundamental transformation of the economy. As a result of this Utility Sectors are gearing up to make optimal use of the new Information and Communication Technologies (ICTs).

Electricity Company of Ghana (ECG) Limited is in the business of distributing electricity in Ghana. It has the mandate to provide quality electricity service to support economic growth and development in Ghana. ECG purchases electricity energy in bulk from Volta River Authority (VRA) for distribution. Its responsibility as a distributor is to give its customers quality and reliable service delivery.

In order to boost its revenue collection, ECG has taken a number of important initiatives to provide connectivity to all the regional centers involved in revenue collection. The relevance of mobile phone to increase revenue collection in ECG is extremely high in Ghana. The major sources of reaching out to ECG customers are radios, television and human agents. In these systems, there are plenty of time gaps in reaching to customers and also paying bills. The introduction of online real time system is to complement and also take care of the inadequacies and inefficiency of the existing system.

2. RESEARCH OBJECTIVES

The main objective of this research paper is to analyze a framework to develop an appropriate ICT business model for collection of revenue for ECG, showing how the various stakeholders involved can be organized in a multi-sided platform to reduce transaction cost, maximize value creation and gain sustainable revenue for all stakeholders. In order to achieve this goal, the research focuses on the following issues:

- The analysis of the relevant technologies and relationship between them.
- The establishment of ECG's position in the value network.
- Construction of suitable ICT-driven business model for revenue collection in order to maximize value creation for customers and gain sustainable benefit for all stakeholders.

3. PROBLEM DEFINITION

Electricity Company of Ghana (ECG) operates two types of metering systems: *Post Paid Metering* (Credit Metering) and *Prepaid Metering*. In the Postpaid Metering System bills are produced and sent to the customers through agents before payments are made. The customers make

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payments through agents, ECG pay points or Banks. In Prepaid Metering System customers purchase power before consumption. In order to ensure that the process of paying bills is easy, efficient and effective different bill payment methods and processes have been adopted over the last few years by ECG. The introduction of the prepaid meters at the customer locations is to ensure that they pay ahead of consumption and this also has aided the billing process and revenue collection. All the measures adopted by the company have certain degrees of success but these have not been entirely successful in eliminating the challenges encountered by both the company and customers in paying electricity bills.

As mentioned above this research paper aims at answering the main research question: how to develop an appropriate business model for collection of revenue for a ECG by showing how the various stakeholders involved can be organized in a multi-sided platform to reduce transaction cost, maximize value creation and gain sustainable revenue for all stakeholders. In order to solve this problem the following research questions will be addressed:

- What are the existing methods of revenue collection and associated challenges?
- How to identify stakeholders in a multi-sided platform and their functions?
- What impact will the new technologies have on the revenue collection?
- What type of business model should be developed in order to meet the above challenges and maximize value creation?

4. RESEARCH METHODOLOGY

The researchers adopted three procedures (methods) involving data and information gathering – literature review, interviews and historical data sources for revenue collection. Existing literature reviews were explored to get an overall understanding of the mobile technology industry. Various definitions of mobile networks, mobile services, business models and value chains were reviewed. The literature review includes both the technical and business backgrounds.

Interviews were conducted with key personnel in the Revenue and Billing Division, the Customer Service Directorate in Electricity Company of Ghana (ECG) and customers of ECG. This gave the interviewer/researchers an opportunity to ask series of practical questions face to face with the interviewees. Published and historical data from Electricity Company of Ghana (ECG), National Communication Authority (NCA), Energy Commission and other sources were collected and used as references.

5. LITERATURE REVIEW

In this section, we explore the existing business model literature. A lot of authors have written about business models and their approaches are sometimes highly abstract, very rigorous and also sometimes they are purely descriptive and of low conceptual contribution. The goal of this literature review is to understand what a business model could be and what elements it should be composed of.

According to [1] a business model is the method of doing business by which a firm can sustain itself by generating revenue. He provided taxonomy of business model rather than an explanation of what elements such a model contains. For him a business model spells-out how a company makes money by specifying where it is positioned in the value chain.

Another view of business model which is best known is the definition by (Timmers, 1998) [2]. According to [2], a business model is an architecture for the product, service and information flows, and a description of the various business actors and of their roles, as well as a description of the potential benefits of these actors and finally a description of the sources of revenue. In addition [2] acknowledged the necessity of providing a marketing strategy, in order to accomplish a business mission. In (Chesbrough and Rosenbloom, 2002) [3] an in-depth analysis for business model which is widely adopted by market researchers is discussed. The authors thought the analysis of business model for a given firm should closely reflect with its strategies. They divided business model into six components, the identification of value proposition, the partition of market segments, the analysis of value chain structure, the description of revenue generation and margin, the position of value network and the competitive strategy analysis.

In (Amit and Zott, 2001) [4] a highly network-centered approach to business model is given. They describe a business model as the architectural configuration of the components of transactions designed to exploit business opportunities. Their framework depicts the ways in which transactions are enabled by a network of firms, suppliers and customers.

Afuah and Tucci (2001) [5] also gave another approach to business models that is value centered and takes in account the creation of value through several actors. In this methodology one can find a list of business model components, from scope over pricing and revenue source to connect activities and capabilities. But it is less clear how the value is delivered to the customer; i.e. classical marketing problems such as channel design or conflict are not in the centre of this approach.

The business model concept based by (Hamel, 2000) [6] also describes the elements of a business model. These are customer interface, core strategy, strategic resources and value

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network. Following this definition the business model actually describe the value network from the firm's perspective.

From the above mentioned definitions, one could easily find out that the authors have different views or opinions when they were researching into business models. Figure 2 below summarizes the evolution of business model concept.
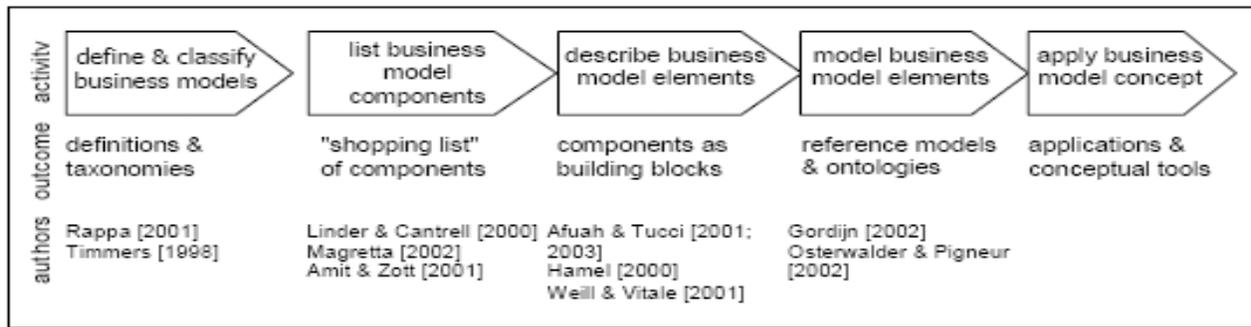

Figure 2: Evolution of Business Model Concept

From the above figure, it was found that [1, 2] only discussed the classifications and the definitions of business model while authors like [3, 4] divided the business model into components. [5, 6] provided the details by elaborating on the components listed.

All these concepts described above focus much on a single company thereby providing a limited perspective on cross company collaboration in value networks. It is in this regard (Faber et al, 2003) [7] see business model as the way a network of companies intends to create and capture value from the employment of technological opportunities. Instead of following the concept in classic business model described above. In (Faber et al, 2003) [7] an introduction is provided on a new angle of view which presents a business model in four different domains. Service Design, Organization Design, Technology design and Finance Design. The four domains interrelate with each other as shown in the figure 3 below.
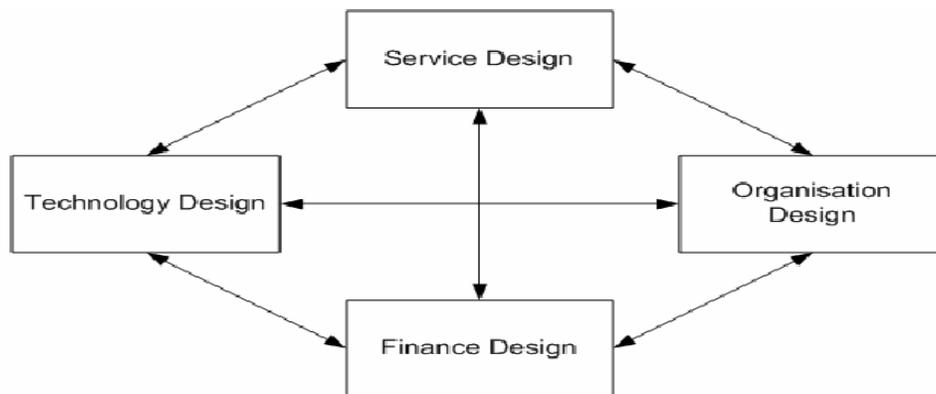

Figure 3: The Four Design Domain of a Business Model

5.1 Service Design

Service Design, as one domain of a business model, describes the service which is offered by a group of companies to target users. Service design solves the problem of how to present value to customers by implementing a certain service. One important issue of service design is innovation. New services can be categorized into two types: new version service which is an enhanced version of existing service, and

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completely new service which is a revolutionary new service in all aspects.

5.2 Technology Design

Technology Design represents the fundamental organization of the systems and the technical architecture which is needed to deliver the service. Technical resources and capabilities are the basic components of the technical architecture. More importantly, the technical resources of the stakeholders in the value chain impose requirements on the technical architecture and it has to work with those resources. The architecture also includes the delivery of services and the linkages between different stakeholders.

5.3 Organization Design

Organization Design solves the issues on how different stakeholders, each of which has certain resources or capabilities, co-operate to deliver valuable service to customers and what roles each participant having their own strategies and goals play in the process of service realization. There are different types of partners in terms of their resources and capabilities, structural partner, contributing partner, and supporting partner, in the value network. Meanwhile, company's internal organization design describes flow of routines inside the firm in delivering services to customers. Structural partners who provide vital and non-substitutable assets play the leading role in the business model operation.

5.4 Finance Design

Finance Design is about the description of how the actors in the value network share profit, investment, cost, risk and revenue. It shows how the value network intends to capture monetary value. The tariff and tariff structure are the most visible part of the arrangement of end user. Briefly, any financial transaction among the members of the value network belongs to the finance design domain of specific business model. The structure of financial exchange, the way they are charged, and the amount of charges are all important considerations for stakeholders. In addition to revenue, investments and costs are more related to the technology design and license fees. Other contributions of the finance design may come from government allowances. The finance domain is considered as the bottom line of the business model where decisions made in the other domains will affect the finance domain and its revenue streams and cost structures. Faber et al. (2003) [7] business model would be used to design the business model for ICT driven revenue collection because it is suitable for value network.

6. EXISTING INFRASTRUCTURE OF ECG

6.1 Electric Power System

Organizations that generate, transmit or distribute electricity are called Power Utilities due to the fact that they have the capacity to satisfy essential human needs which lead to enhancement of the quality of life. The three entities namely generation, transmission and distribution as shown in figure 4 can be integrated and performed by one organization. In Ghana, these three entities are managed by different organizations. The Volta River Authority (VRA) which is a government owned utility is largely responsible for the electricity generation. Ghana Grid Company (GRIDco) is also responsible for the transmission of the electricity. Two nationally owned utilities are also responsible for electric power distribution in Ghana. These are the Electricity Company of Ghana (ECG) and the Northern Electricity Department (NED), the latter being a directorate of the VRA. The electric power market consists of wholesale and retail sections. Volta River Authority (VRA) and Ghana Grid Company (GRIDco) dominate the wholesale market, while the Electricity Company of Ghana and Northern Electricity Department dominate the retail market [8].
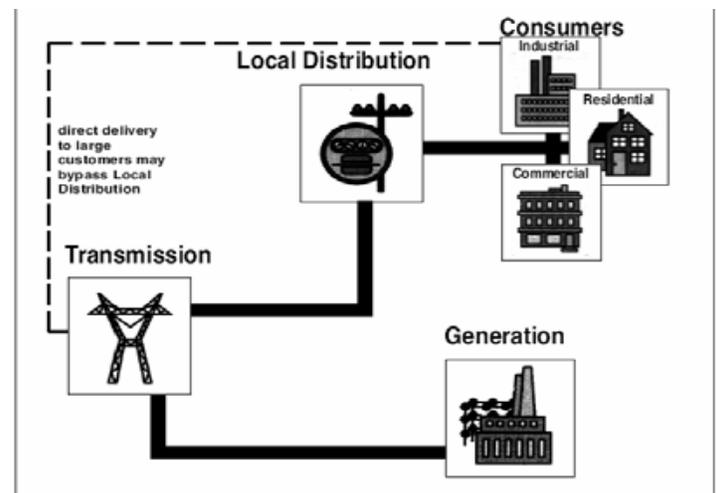

Figure 4: Basic Electric Power Systems

6.2 Generation

Ghana's supply of electric power is obtained primarily from hydroelectric Power Plant and Thermal Power Plant [8].

6.2.1 Hydroelectric Power Plant

Hydroelectric power is produced from the potential energy of the elevation of water. This method of energy

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generation is viewed as very environmentally friendly, since no waste occurs during energy generation. Hydroelectric power has the economic advantage because the cost of fuel is eliminated making the electricity produced cheap, despite high building costs [9].

Ghana has two hydroelectric power plants operating and the new (third) one is currently under construction. The Akosombo Dam which is the first hydroelectric power to be built in Ghana is situated in the south eastern part of the country. VRA operates the hydropower plant, ensure the integrity of the Volta Dam which is the largest man-made lake in the world and stand sentry in respect of all activities in and within the Volta River Basin. The original output was 912 MW and it was later upgraded to 1,038 MW in a retrofit project that was completed in 2006 [9].

Besides the Akosombo hydroelectric power plant, VRA operates a second hydro generating station at Kpong. The Kpong hydroelectric power plant was constructed downstream the Akosombo Dam. The Kpong head pond has minimal storage capacity and is therefore operated in tandem with Akosombo as a run-of-the river plant to optimize water use from the Volta Lake. The Kpong generating station which was completed in 1982 and has a total installed capacity of 160 MW [9].

6.2.2 The Thermal Power Plant

Thermal power plant converts the energy stored in fossil fuels such as coal, gas and oil successively into thermal energy, mechanical energy and electric energy. In 1999 the Volta River Authority developed the thermal power plant at Aboadze, 17 kilometers east of Sekondi-Takoradi in the Western Region [9]. The total installed capacities of the Ghana's generation plants are shown below:

Table 1: Capacity of the Generation Plants in Ghana

Plant	Installed Capacity (MW)
Akosombo hydropower	1,038
Kpong hydropower	160
TAPCO T1 Thermal	330
TICO T2 Thermal	220
Others	155

6.3 Transmission

Ghana Grid Company owns and operates the high voltage transmission grid, which consists of 3,670 circuit-km of 161 kV lines, 133 circuit-km of 69 kV lines and 35 associated high voltage substations, Bulk Supply Points (BSP). These BSPs are the sales points of electricity to ECG and NED [9].

6.4 Distribution

As stated earlier, ECG and NED are the two organizations mandated to distribute electricity in the country. Electricity Company of Ghana limited (ECG) is the premier national distributor and retailer of the electric power in the country. It has the mandate to provide quality electricity service to support economic growth and development of Ghana. Its responsibility as a distributor is to give its customers quality and reliable service delivery. In 1987 ECG transferred the Northern part of the country to the Northern Electricity Department (NED) which is subsidiary of VRA for the supply of power. The Northern part of the country consists of Brong Ahafo, Northern, Upper West and Upper East Regions. Electricity Company of Ghana (ECG) currently, delivers power to customers in the southern part of the country consisting of Ashanti, Western, Central, Greater Accra, Eastern and Volta Regions. The map below (figure 5) shows the regions of Ghana.

Figure 5: Map of Ghana

7. ORGANIZATIONAL STRUCTURE OF ECG

ECG is organized into Head Office, Regions and Districts. In the Head Office, there are eight Directorates whose heads together with the Managing Director form the top management that sees to the day-to-day administration of key functional areas. These are Engineering, Operations, Finance, Legal, Audit, Human Resources, Customer Services and Material & Transport. ECG operates in six administrative

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regions of Ghana as stated above. Within ECG, these have been divided into operational regions as shown in table 2 below [10].

Table 2: ECG Administrative and Operational Regions

Administrative Regions	ECG Operational Regions
Greater Accra	Accra East, Accra West, Tema
Eastern	Eastern
Central	Central
Western	Western
Ashanti	Ashanti East, Ashanti West
Volta	Volta

In each operational region there is a regional office and in each District a district office. In total, there are seventy-seven (77) district offices scattered over the ECG Operational Regions.

7.1 Customer Service Directorate

The Customer Service Directorate is responsible for commercial operations in the company. It is responsible for power sales, production and distribution of customer bills, revenue collection and customer care as well as service delivery. The directorate has adapted a lot of strategies and policies to improve the revenue base of ECG. However, the success of these strategies is critically dependent on the effectiveness of the Districts which are the custodians of the ECG's customers. They sell the power to the customers and must therefore collect the money while projecting a positive corporate image and ensuring that the customer is satisfied and happy to do business with ECG.

8. BILLING PROCESS METHOD FOR REVENUE COLLECTION OF ECG

8.1 Billing Process

ECG started operating postpaid metering system where the meters are read, captured and bills are produced. In fact billing is an extremely important task as far as revenue collection is concerned. Attentions are always focused on the billing process to ensure that customers bills are true reflection of the energy consumed. After the production of the bills they are delivered to the customer's residence and offices through human agents. Billing distribution is one of the critical components of a Utility Sector because it has an immediate impact on the revenue stream. The customer bills are produced and distributed every month.

8.2 Revenue Collection

Effective revenue collection system is a critical component for ensuring the viability of the company. It also ensures financial sustainability and achieves cost recovery. After distribution of bills, it is the responsibility of the revenue officers to collect payment bills. The methods adopted to collect payment bills take different forms which will be discussed later. ECG has taken a lot of initiatives to improve revenue collection system which has immediate impact on the revenue streams of the company. In order for the company to collect what has been sold, targets are set for each ECG operational region. Incentives are given to the staffs belonging to a region who achieve set targets.

8.3 Method of Payments

Revenue collection has been a bane of utility companies. In trying to ensure that the process of paying bills is easy, efficient and effective different bill payment methods and processes have been adopted by ECG. The following are methods adopted by ECG for paying bills:

8.3.1 ECG Cash Office or Pay Points

ECG has set up cash offices and pay points where customers go to pay their bills. Either the payments are collected by the cashier using manual system where receipts are issued or cash machine called cash registers. In the manual system the duplicated receipts are sent to the data centers for capturing and verification before updating customer database. With regard to the cash registers the information are downloaded to laptops and sent to data centers for updating customer's database. All ECG cash offices use both the cash registers and manuals in collecting bill payments. In the urban areas ECG has set up many pay points to help customers to pay their bills whereas in the rural areas the pay point is only at the ECG Office.

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8.3.2 The Revenue Collectors

The Revenue Collectors which ECG refer to as 'Bonded cashiers' are private individuals collecting payments on behalf of ECG. These private individuals operate in the rural and semi rural areas where ECG has no pay points or cash offices to collect payments. The areas are zoned out and assigned to each revenue collector. They are responsible for bill collection within their assigned zones. These individuals either adopt a house to house payment collection method or set up temporary offices in the villages to collect payments. ECG enters into contract with these private individuals and pay commission on the amount collected. This channel has helped ECG to improve its revenue collection the rural and semi rural areas.

8.3.3 Third Parties

The third parties are private companies operating in the cities. In order to make payment of bills very easy, ECG enter into contract with private companies to open more pay points in the cities. Customers can also go to these pay points to pay bills. The third parties operate only at the areas ECG has not set up pay points or cash offices.

8.3.4 Banks

ECG enters into agreement with the Banks to collect payments. Customers who go to the Banks to transact business could pay their bills there or purchase power. The Banks have set up many branches in the cities and district capitals. This also helps to make payment of bills easy and convenient.

8.3.5 Industrial Customers (SLT)

A special program for collecting revenue is designed for large industrial and commercial customers. ECG has special officers who after billing deliver the bills to such customers at their offices and Bank Cheques are issued immediately for payment. Direct debit System has been introduced for such customers whose bills are sent to the Banks for payment. Arising from such strategies and techniques a high level of collection is achieved but need some improvement.

8.3.6 Prepayment Metering System

In order for ECG to improve its revenue collection, the company has introduced prepaid meters at the customer premises. Prepaid metering system ensures that the customer pays ahead of consumption of energy. The prepaid metering system has improved revenue collection significantly but only constitutes about 10% of total customer population of ECG.

In all the methods of payment, either customers visit any of the channels described above to either make payments or ECG officers visit the customer to collect revenue. Unfortunately, ECG has not been able to recover all the debts own by the customers especially Non SLT customers. Current challenges to ECG are enumerated below.

9. PAYMENT CHALLENGES

Whilst the strategies and techniques adopted by ECG to collect the revenue, have had certain degrees of success, they have not been entirely successful in payments evasion and revenue leakages by the Non SLT customers. ECG in an effort to collect all its revenue faces a big challenge while the customers also have their challenges in paying the bills. The challenges of both the customer and ECG are enumerated below.

9.1 Customers Challenges

The following are some of the challenges the customers face:

- The bills are not delivered on time which causes delay in payment. In this case the customer may be disconnected from using power and this brings embarrassment to the customers.
- The bills may sometimes be delivered to a wrong customer and in this case payment will not be made.
- Customers encounter the inconvenience of have to travel to specific sales offices and points when they want to purchase power or make payments.
- Some of the customers especially the working groups are unable to purchase power or pay bills on time as expected due to working hour restrictions.
- Long queues are also formed at the Cash Office or Pay Points and this creates inconveniences for the customers thereby refusing to settle the payment on time.
- Customers may make payments all right but ECG will not credit the customer on time before the next bill is produced. In this case the customer is reluctant to make payment until the previous payment has been credited.

9.2 Company Challenges

The challenges Electricity Company of Ghana also face are:

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- There is pressure on the company to set up many cash offices or pay points in both developing urban and rural. Customers are reluctant to pay bills in the available areas thereby creating debts for ECG.
- Embezzlement of revenue collected by some of the ECG cashiers is a big issue as far as revenue collection is concerned. Some of the cashiers fail to account for the revenue collected and also customers may pay the bills but the cashier would not record it and this causes embarrassment to the company.
- The company has to provide securities in all the cash offices or pay points to protect the customers.
- More cashiers need to be employed to manage the new cash offices or pay points set up.
- ECG has to contract more agents to distribute bills to the customers.

From the above discussion it is clear that the distribution of bills and revenue collection process has a high number of human interventions and this poses a big challenge to revenue collection. In view of this, ECG has more work to do in order to improve revenue collection using ICT. A well defined and efficient way is needed to create the enabling environment to help in the delivery of high quality of service so as to improve revenue collection.

10. EXISTING ICT INFRASTRUCTURE OF ECG

ECG had seen a major improvement in terms of ICT infrastructure for the past few years, as a result of massive investments. ECG has developed ICT strategies and utilizes resources more efficiently to improve its operations. The idea of setting up ICT Directorate to manage ICT supporting facilities shows the level of improvement. All these had been done in order to improve revenue and also give maximum satisfaction to customers.

ECG currently has Wide Area Network (WAN) connectivity which links/connects the Head Office and all the Regional Offices. Some of the District offices and customer service centers are also connected to the WAN as shown in figure 6. The extension of networks to the district as well as the customer service centers are all aiming at the improving revenue collection and also maximize customer satisfaction. The vending stations and some of the customer service centers where payment of bills can be made have microwave radio communication links to the district offices. The microwave links are using 2.4 GHz and 5.4 GHz frequency bands. The frequencies in 2.4 GHz band are non-allocated and interference has caused performance problems [11].
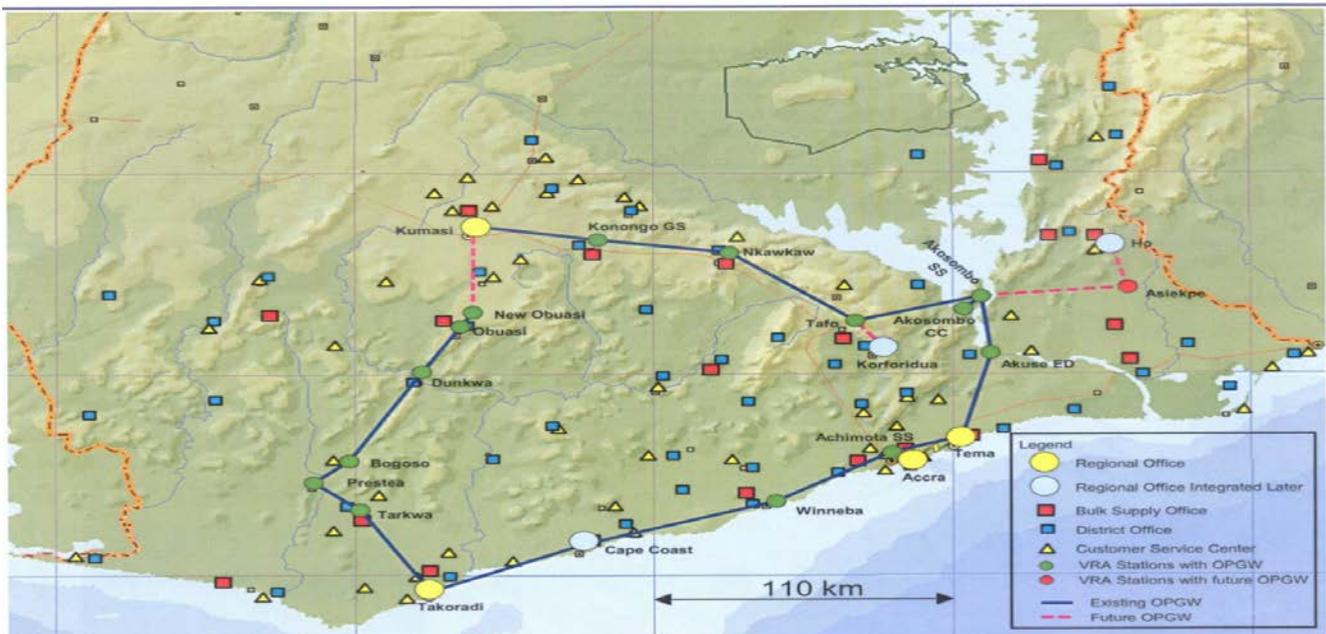

Figure 6: ECG Regional Offices, District Offices connected to Wireless Area Network (WAN)

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11. MOBILE WIRELESS NETWORK TECHNOLOGIES AND PAYMENT SYSTEMS

11.1 Mobile Wireless Network Technologies

Mobile wireless technology is any wireless technology that uses radio frequency spectrum in any band to facilitate transmission of text, data, voice and video (multimedia) services to mobile devices at anytime and anywhere. The number of mobile users is rapidly increasing all over the world. The average penetration rate of mobile subscriptions was 50.7% of the global population at the end of 2007. Total subscriptions are expected to rise to 5.32 billion by 2013 from 3.42 billion at the end of 2007 [12].

A wireless mobile communication network enables users equipped with mobile terminals to initiate and receive phone calls. This capability is referred to as cellular telephony. The cellular telephony has evolved to include many services that are based on the transmission of data and multimedia services but not just voice. Cellular telephony derives its name from the partition of a geographic area into small cells. Each cell site is covered by antennas, radio transmitters and receivers to create a radio coverage area in the mobile network. The set of cells forms the radio access network and the radio frequencies used for the transmission of calls and data can be reused between cells.

Communication from the mobile terminal to the cell site is referred to as uplink transmission while communication from the cell site to the mobile terminal is called downlink. Voice and data exchanged between a mobile terminal and regular phone networks or internet are transmitted via the mobile network which consists of the mobile operator's radio access network and core network as shown in figure 7. The spectrum of radio frequencies available for communication is limited and a benefit of a mobile network is its ability to reuse radio frequencies in different cells, provided that radio interference does not affect the calls. This reuse provides for an increased network capacity as more mobile subscribers can be supported in a given geographic area. As the number of mobile subscribers increase, more cells can be added or existing cells can be split into smaller ones.
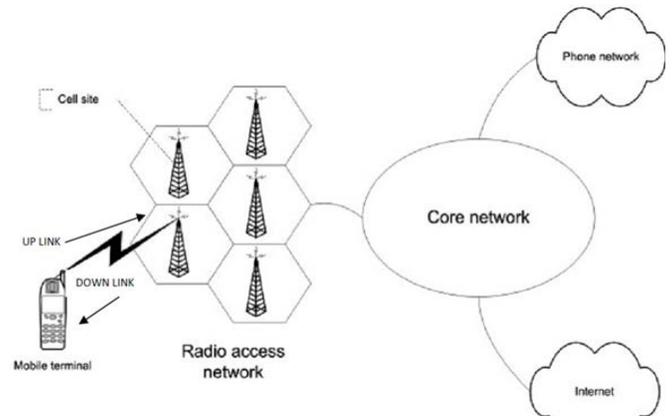

Figure 7: Mobile Wireless Technology and Network Connectivity

11.2 Mobile Services

Services are activities or benefits offered for sale that are essentially intangible. In economics and marketing, services are generally referred to as the non-material equivalent of a good or product. There are two types of services: core services and support services. A mobile service is the service that an end-user receives on the mobile terminal from the mobile network operator. The mobile service has undergone tremendous changes since the inception of mobile wireless technologies. The evolution of the mobile technologies is mainly driven by the demand of new services as shown in figure 8.
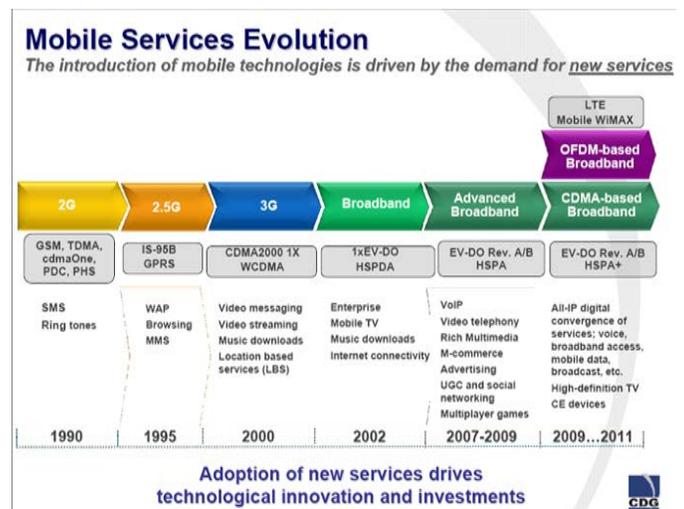

Figure 8: Mobile services Evolution
Source: Samra, S. (2009) "CDMA2000 Path to LTE" CDMA Development Group [19]

From a voice centric system that enables users to place phone calls over the air mobile technology has evolved to support many data services. The following services below could be used for communication among stakeholders of the revenue collection platform.

11.2.1 Text Messaging

Text messaging is the ability to send and receive short messages on a mobile terminal. These messages are referred to as Short Message Service (SMS). This was created as part of Global System for Mobile Communications (GSM) networks. SMS is said to be smart service because it can store messages in the network when the target mobile device is switched off and forwards the message when the mobile device is switched on.

11.2.2 Instant Messaging (IM)

Instant messages (IM) are short text messages exchanged between users that want to chat in real time. After a user signs on to IM from a mobile device, a list of friends (referred to as a buddy list) appears on the mobile subscriber's screen using familiar screen names. The mobile subscriber can send a message to the IM service requesting to see, with the help of special icons, who is online and available to chat. IM messages can be sent only to users that are online.

11.2.3 Unstructured Supplementary Service Delivery (USSD)

Unstructured Supplementary Service Delivery (USSD) is a mechanism of transmitting information via a GSM network. It is a capability built into the GSM standard. USSD is similar to SMS, but it is only basically a store and forward service. USSD offers a real-time connection during session. Its main use will be for mobile financial services, shopping and payment.

12.   MOBILE PAYMENT SYSTEM

A mobile payment for the purpose of the study is any payment where a mobile device is used to initiate, authorize, authenticate and confirm an exchange of financial value in return for goods and services. A mobile payment system has various roles to perform; customer authentication, payment authorization and payment settlement. In a general sense these roles can be assigned to various actors of the payment system; the customer, the content provider, payment service provider etc. The customer is the person owning the mobile device and is willing to use it to pay for a service or product. The mobile user's roles may involve initializing the request for service, registering with the payment service provider/content aggregator and authorizing the payment.
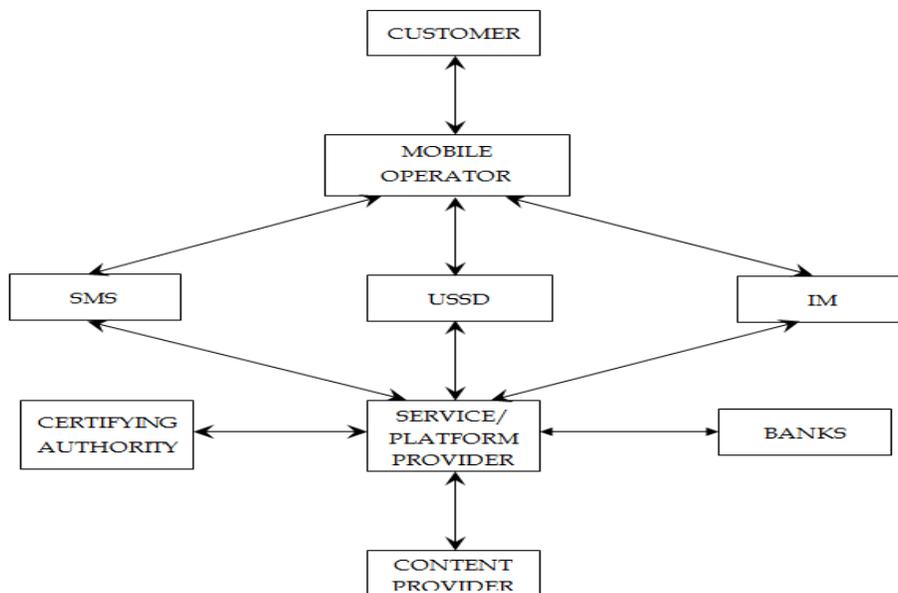

Figure 9: A Generic Model of Mobile Payment System

The content aggregator forwards service requests to the payment service provider, relaying authorization requests back to the consumer and delivering the content. The payment service providers are the Banks responsible for the payment process. They control the flow of transaction between the mobile user, the content provider and the content aggregator. Figure 9 above, shows a generic model of mobile payment system [13].

12.1 Mobile Payment System Potentials

Financial institutions in Ghana are already seeing the opportunity for using mobile phones as a personal secure payment terminal. Different payment schemes exist where a Bank will deduct payment from a mobile user's account to pay for a service or virtual product. Various methods are used to authenticate the payment transaction, such as using a dual slot phone for credit card payments, Private Identification Number (PIN) authentication via a SIM toolkit application and also with the use of digital signature based on a Public Key Infrastructure (PKI) mechanism. The adoption of a PKI system requires at least 2.5G technology, so therefore this type of system has been slow to reach the markets. At the moment, there are schemes where the security is based on the mobile user being in possession of a registered mobile device and authentication is obtained via a PIN. The mobile user is   required to register his/her mobile phone with the payment service provider, allowing the payment transaction to be authenticated using a variety of technologies.

12.2 Mobile Payment System Challenges

There are challenges in mobile payment system which have been elaborated and grouped in table 3.

Table 3: Challenges in Mobile Payment System

Technical	Organizational	Regulatory
Limited mobile device battery life. Limited data transmission rate. Limited coverage area.	Conflict exists between the stakeholders in sharing of revenue.	Regulation for financial industry different from those governing the mobile industry

13. STAKEHOLDERS ANALYSIS IN ICT REVENUE COLLECTION VALUE CHAIN

13.1 Value Chain Overview

In this section, the fundamental concept of value chain and the reasons for using horizontal value chain as well as its application in ICT driven revenue collection are discussed. Stakeholders involved in ICT driven revenue collection, their roles in the value network, the strength and weakness of each stakeholder are also analyzed.

13.1.1 The concept of value chain

A value chain is a collection of activities that are performed to design, produce, market, support, and deliver a product or a service. According to (Porter, 2001) [14], the value chain is the set of activities through which a product or service is created and delivered to customer. The value chain analysis mostly describes those activities a business organization performs and relates them to the company's competitive position. It reflects the firm's history, the strategy and approach to all involved activities as well as underlying economics. Industry-wide value chain plans and designs use its resources, market campaigns, strategies and distribution networks by smooth cooperation of industry-wide interested bodies. The ability to perform specific activities and to manage the linkage amongst these activities determines the competitive advantage. The organization's margin depends on its ability to manage the linkages between activities in the value chain. Within Porter's definitions the value chain refers to the activities within a single company, as shown in the figure 10 (Porter, 2001) [14].
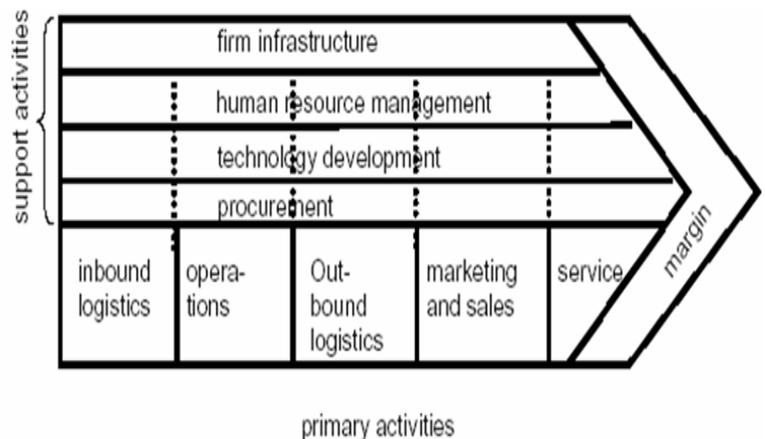

Figure 10: The Generic Value Chain by Porter

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However, some products are not created and delivered to the end user by a single company. To accommodate this, [14] created the concept of the "value system", which includes the individual value chains of all the separate companies or players who are co-operating within an industry to deliver a final product. It is important to note that the value chain concept does not in any way attempt to represent the flow of revenue back through the chain from the exploitation of the product. It is only concerned with value addition during production and distribution. Generally, [14] describes the value added activities that occur within a firm and is referred to as vertical value chain whereas the horizontal value chain, which is also referred to as "value system" are all those activities between different firms. The latter also refers to as an industry-wide or sector-wide value chain.

13.1.2 Vertical value chain

Vertical Value Chain (VVC), also the traditional term of value chain, is basically a set of a firm's linked with value-creating activities, ranging from basic raw materials to the ultimate delivery of products and services. Value is services or products which attract a group of users or buyers willing to pay for them. Value can be measured by revenue.

13.1.3 Horizontal value chain

Horizontal Value Chain (HVC) consists of a string of companies working together to satisfy market demands. The value chain typically consists of one or a few primary values (product or service) suppliers and many other support suppliers that add on to the value that is ultimately presented to the buying public. Comparing to the classic VVC, HVC is just like a linkage between firms which play different roles in the chain. The relationship between each other is not fixed. The firms in the network value have relationships with each other and they perform different transactions with each other to achieve their own goals or those of the network. In the modern business world there are numerous different organizational structures which contain a varying number of business relationships and all firms are somehow part of a value network [15]. This is because producing value to customers with fast changing needs requires flexibility and fast response that business networks can provide. A firm can improve its capability to create value by collaborating with other firms. Horizontal value chain bring positive feedback and learning effects for the members and are therefore a good source of creating new value. To conclude, the value network is formed from actors and their relationships. It is formed to create value for customers and for the participating firms.

14. REASONS FOR CHOOSING AND USING HORIZONTAL VALUE CHAIN (HVC)

Since the ICT-Driven Revenue Collection service does not describe value-adding activities and the production process within a single organization, but instead consists of all different stakeholders with their individual vertical value creating (VVC) activities cooperating to deliver services to customers, the Horizontal Value Chain is the appropriate concept to use for this service. In the case study, we aspire to harness the well established, effective and efficient payments (debit and credit transactions) system of the Banks in Ghana to effect settlement of electricity bills to Electricity Company of Ghana (ECG), secondly, ECG already has agents who distribute hardcopy of bills to customers, and these activities will be done through customers mobile devices. Here, we refer to the on-line softcopy of bills as content. This analysis helps to understand the value creating activities of all potential stakeholders belonging to diverse industries (as depicted in figure 11) below, in order to observe their specific interests (please refer table 4) below. The idea is to map these activities onto the core business of revenue collection. This facilitates going into an agreement of collaboration that benefits each of them since they may be dealing with the same customer segment, offering their services through mobile phone thus reducing transaction cost.

15. HOW TO APPLY HVC TO THE ICT-DRIVEN REVENUE COLLECTION

Vertical Value Chain (VVC) is used to analyze and diagnose a firm's value adding activities. It connects the needs of internal departments and facilitates the inter-activities among them. The business dynamics is in a vertical direction mostly inside a single company. This VVC still needs to be applied to each single stakeholder for the utility service; however, with regard to the value adding activities, there may be some adjustments for some stakeholders in order to smoothly cooperate with other stakeholders in the chain. For example, the Mobile Network Operator (MNO) just needs to consider the mobile networks in the traditional VVC model. However, under convergent context, the MNO also needs to think about the interface of the other mobile networks and of other stakeholders (e.g. GSM, CDMA and HSDPA) and frequency interference issues. Therefore, some changes need to be made by MNO in order for the ICT driven revenue collection for the utility sector (ICT-RC) to be deployed. HVC's role in ICT-Driven Revenue Collection is as a facilitator to link all the stakeholders together and coordinate the value adding activities for smooth implementation of ICT-Driven Revenue Collection. In other words, it creates and maintains the cross-industry relation and optimizes the roles of all stakeholders in the chain. The

substitutability and complementarities will be the most critical variables in creating and optimizing cross-industry relation under convergence.

In order to optimize the structure, some existing roles will be substituted or reorganized by some other roles under convergence. With increased substitution on similar service attributes, horizontal competition from previously independent but now related industries is unavoidable. Complementarities on the other hand serve as a driver for cost-effective horizontal cross-industry expansion. In (Shapiro and Varian, 1999) [16] the authors hold their view that the mutual benefits that resulted from collaborating with another network can be expected as high as the square of original value thanks to network effects and collective switching costs. Today, most users can choose multiple networks to communicate with others. Namely, they could have multi-directional interactivity cross different networks. This scenario creates a user centric complementary between multiple networks and applications services. The complementary relation with mobile voice, traditional media service and other value added services can be easily discovered in the case of ICT-Driven Revenue Collection. The added value to users over diverse networks exists in their participation in interactive communication and services consumption. The network externalities can be best promoted by the interaction among users, platforms, service/products and devices. Therefore, a converged technical system of mobile communication and other industries (banking and utility sector) is needed to provide cost effective bandwidth utility and content delivery to mass market as well as enhance mobility and interactivity to end users. This system requires unified and coherent service provisioning (mobile billing system, content provision/aggregation and management, etc.). Of course, the handset should also support and be interoperable with both mobile and other networks. This complicated system should somehow be transparent to users. To make this happen, the cooperation among ICT-Driven Revenue Collection stakeholders is indispensable. It will assure the smoothness of deploying and running the ICT-driven Revenue Collection service while reducing cost and improving the quality of the service.

The new services will to some extent influence the existing applications. To this end, it is very important to consider the tradeoff between complimentarity and substitutability. The interaction between both the old and new services would benefit from indirect network effect (better quality and quantity of services availability for end users in both networks). This effect together with direct network effects lead to positive externalities of network. By having positive externalities, higher network value through complementarities among networks is then achieved.

The immediate benefit of this general framework is to provide a simple and unified way of thinking about all Multi Sided Platforms (MSPs), regardless of the industry(ies) in which they operate. However, the most useful practical application comes from using it systematically to analyze how the individual operational activities a company is (or should be) performing map into the fundamental MSP functions. It can help uncover valuable expansion opportunities and difficult tradeoffs that need to be made when designing MSPs. This is done in our specific situation in subsequent sections.

16. ISSUES AND STAKEHOLDERS IN ICT-DRIVEN REVENUE COLLECTION

As normal with Information communication and telecommunication (ICT) services, certain issues have to be considered in the ICT-Driven Revenue Collection Service. The most important issues are security, trust and privacy. Security is the resilience of the system against attacks and theft. In the context of the ICT-Driven Revenue Collection utility service, security means preventing unauthorized transaction and access to customers/account data. If customer data is compromised, private information and even money can be stolen. This will be disastrous for the system's reputation. Trust is the customer's subjective evaluation of the system's security and does not necessarily have much to do with the actual security of the system. Privacy is related to security but not identical to it. Privacy is the protection of the user's personal information which in the context of the ICT-Driven Revenue Collection utility system means that only the information that is strictly necessary to complete each transaction is used. The information is only delivered to the parties that need it to facilitate the transaction and the information is only kept for the period of time necessary to complete the transaction.

16.1 The Stakeholders

Deciding who the relevant stakeholders are, for the Multi- Sided Platform (MSP) and the fundamental services the platform needs to perform for its customers are critical to an MSP's success, even before it is launched. The value network of ICT-Driven Revenue Collection is divided into primary actors and secondary actors as shown in the figure 11.

16.2 Primary Actors

From the diagram above the primary actors are mobile handset user, content provider and content aggregator.

16.2.1 Mobile Handset User

The mobile handset user is the customer or user who utilizes the services provided and makes payments. The user can be anyone equipped with handset.

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16.2.3 Content Provider

The content provider provides the goods or services. With the advent of broadband technologies, Internet has become a fast distribution channel of multimedia content. The convergence across sectors brings other market roles' attention to content providers. Content providers have their particular competency and their brand image is one advantage that can help channels to sell the bundled services. In our proposed system, the content providers are Electricity Company of Ghana and the Banks. Here, we refer to the on-line softcopy of bills and Bank advices as content.

16.2.4 Content Aggregator

Content Aggregator facilitates the transactions. The content Aggregator plays the role of collecting and coordinating information and also plays very important role in terms of market competition. Content aggregating is not a new role, as it has existed in ICT sectors for years. The content aggregator in the revenue collection value network provides the needed multi-sided platform and plays the role of collecting and coordinating information and service offerings provided by the content providers (ECG) and the banks.

16.3 Secondary Actors

There are six main stakeholders and the roles of these stakeholders are discussed.
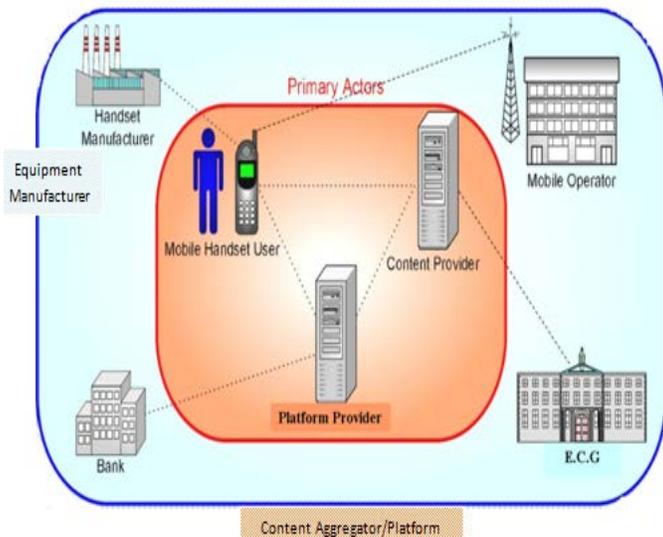

Figure 11: Primary and Secondary Actors of Value System in ICT-RC

16.3.1 Mobile Network Operators (MNOs)

Mobile Network Operators (MNOs) are the organizations who operate communication networks and offer telephony, short message, data communication and other services. Mobile operators have their own network infrastructures including backbone network and base stations. They also facilitate the transmission of data stream. Their main value-adding activities in the value network (industry-wide value chain) in the ICT driven revenue collection are as follows:

• Deploying network infrastructures
• Operating and maintaining networks
• Provision of communication services

Ghana currently benefit from the services of the following mobile operators: MTN, Tigo, Vodafone, Expresso, Glo and Airtel. Some of the mobile operators deploy the latest technologies and offer most advanced services. They also focus on the high-usage parts of the major cities like central business district. This strategy enables them to address the most profitable market segment with relatively small investment. By the coverage range of network infrastructures, some operators only provide the access services, while others operate the whole infrastructure set. Mobile network operators create and maintain the infrastructure required for the transaction thereby deciding on which types of traffic should be permitted between the stakeholders. As at October 2011, the National Communication Authority, released subscription trends of mobile phone usage/penetration in Ghana depicted below in figure 12 below:
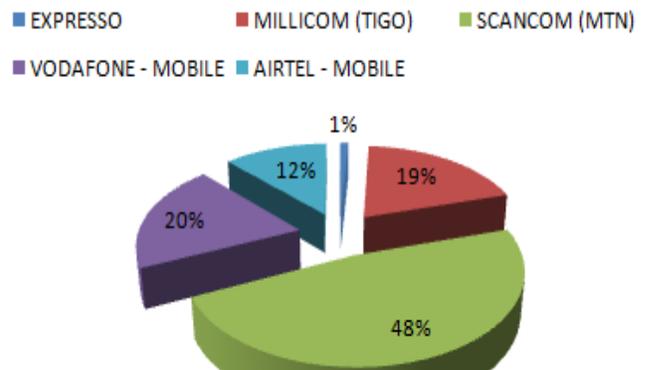

Figure 12: Mobile Telecom Subscription Trends (%) Ghana as at October, 2011,

Source: *http://nca.org.gh/downloads/subscriber_base_October_2011_web_version.pdf*

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16.3.2 Electricity Company of Ghana (ECG)

Electricity Company of Ghana is a utility company providing electricity (service) to the customers. The mandate of ECG is to provide quality and reliable service to customers. ECG provides billing data such as customer bills, particulars of defaulting customers, imminent power outage and disconnection notifications. ECG acts as content provider. In order to effectively participate in the value network for the revenue collection business, ECG plays the role of providing the content through content aggregator to mobile operator who delivers to the customers. ECG total customer population as at December 2008 was 1,722,936. Out of this 1,398,278 are the residential and commercial customers. These groups of customers represent 74% which are the target group [17].

16.3.3 The Banks

The Bank performs the actual withdrawal of money from the customer's account and also deposits the money into ECG account. The bank also provides statements, balances, withdrawals etc. of customers. The Banks will subsequently benefit from the partnership with mobile operators because they have a large group of customers who become the customers of the Banks as well since they have to open accounts with the banks before they can enjoy the utility services on their handsets. Banks will also have to provide content and interfaces with mobile operators through the content aggregator. Banks in the country are seeing the opportunity for using mobile phones as a personal secure payment terminal.

16.3.4 Equipment Providers

Equipment providers are those who supply network equipments to the operators and mobile devices to the customers. Equipment providers provide interoperable equipments to stakeholder's value network.

16.3.5 Customers

Customers are those who will pay and use the mobile utility service. The good thing for the users is that there are more opportunities for them to use their mobile phones. Thus they will have more content to play with and more services to choose from. The drawback is maybe they need to pay a little bit more than before. However, to meet and exceed their expectations is the ultimate goal of successfully developing the utility service.

16.3.6 The government

The presence of the central government in the value network is paramount since it may be absolutely necessary for the government to enact laws and regulations upon mobile utility services and even alter tariffs. In Ghana the central government has much influence over the role that ECG plays in the utility service.

17. ANALYSIS OF INTERESTS, STRENGTHS, WEAKNESSES AND VALUE CREATING ACTIVITIES OF STAKEHOLDERS

In order to identify the adequate business model, the interest, strengths, weakness and value creating activities of the various stakeholders involved within the ICT driven revenue collection value chain are analyzed in tables 4 and 5 respectively.

Table 4: Interests and Issues of Stakeholders

Stakeholders	Interests	Issues
Mobile Network Operators (MNOs)	• Want their SMS service to be used on a larger scale. • Eager to add new innovations like utility service to their menu of services in order to gain or maintain competitive advantage.	Strengths: • Have experience in controlling the mobile networks which directly access the end users' handsets. • Have large customer base • Have well developed payment mechanism. • Have large network infrastructures. Weaknesses: • Have limited access to the content. • Expect higher share of revenue

417

http://www.esjournals.org

		than the other stakeholders.
Electricity Company of Ghana (ECG)	• Wants to have an on-line distribution of bills through mobile phones. • Wants mobile payment. • System to reduce transaction cost. • Wants faster transaction time.	Strengths: • Long experience in Generating of Customers' bills. • Already have ICT Expertise. • Have Good business Relationship with the Banks and Customers. Weaknesses: • Government interference in deciding on tariffs and other vital issues.
Banks	• Wish to augment its cross-industry transactions. • Wish to increase its customer base. • Wish to have competitive advantages. • Wants payments and less cash transaction.	Strengths: • Already have strong customer base and banking facilities. Weaknesses: • Will want to protect the confidentiality of their customers which affects other shareholders who need certain information about customers.
Customers	• Wish to receive and settle bills in the comfort of using their mobile phone. • Wants interoperability among network operators, banks and devices. • Wants anonymity of payments.	Strengths: • Integrate all mobile payment services in one device. Weaknesses: • Convenience comes at a higher price.

Table 5: Value Creating Activities of Stakeholders

Stakeholder	Value Adding Activity
Electricity Company of Ghana (ECG)	• Producing customers' bills. • Delivering customers' bills to the content aggregator. • Receiving bank advices from the content aggregator.
The Banks	• Creating and maintaining accounts of customers. • Receiving authority from customers to deduct bill charges from their accounts. • Deducting customers' bill charges from their accounts. • Crediting ECG's account with Customer's bill charges. • Delivering bank advices to customers and ECG through the content aggregator.
Mobile Network Operator (MNOs)	• Delivering bills to customers. • Manage customer relationship. • Collection of service revenue from customers. • Receiving payment authority notes from customers to send to the banks.

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Customers	• Sending payment authority notes to mobile operator to send to the banks • Receiving bills on their mobile phones

18. ICT-DRIVEN REVENUE COLLECTION BUSINESS MODEL

18.1 Business Model Definition

From the definition of business model in our literature review, we can define a business model a kind of architecture describing different business actors. The main purpose of a business model is to help structure an organization in a way that it becomes more efficient, more flexible and responsive to customer demands. It also helps to increase a firm's ability to forecast possible future scenarios and to stay competitive in the field. A business model is an interdisciplinary concept because it covers areas from marketing, operations, technology and finance. It is a relative new term which emerged with the advent of e-business but has however, been regarded as a more crucial factor rather than technology for successful implementation of ICT services.

18.2 Core Factors for a Successful Business Model

According to (Debelak, 2007) [18] having a successful business model depends upon six key factors which help business to succeed or derail. These factors are:

18.2.1 Acquire High-Value Customers

The first key factor for a successful business model is to acquire high value customers. According to (Debelak, 2007) [18] high value customers don't necessary need to be rich but customers who can be easily located, willing to pay a profitable price for the product or service, willing to try the product or service after minimal marketing expenses and be able to generate enough business to meet the sales and profit objectives. ECG has a total customer population of about 1.75 million of which 74% are the residential and commercial customers which form the target group of this paper. The mobile operators have subscribers base of 20 million representing 83% of the total population and the Banks also have large group of customers. All the customers can be easily located with their identity number and also willing to pay for the service. ECG's partnership with the mobile operators and the Banks will attract large group of customers to pay bills and increase revenue.

18.2.2 Offer Significant Value to Customers

The second key factor is how to offer significant value to customers. The mobile operators always try to create unique and reliable services that will benefit customers. The partnership with ECG and Banks to deliver bills and make payments through mobile devices to customers can be a unique service. This will create a better distribution channel for bills delivery and also revenue collection. The distribution of bills and revenue collection can be fast and also efficient. ECG will be able to offer a better service to the customers and also increase its revenue collection base.

18.2.3 Deliver Products or Services with High Margins by Ensuring High Quality

The third key factor is how to make products or services most cost effective. Higher margins come from having a product or service that can be made from an improved process or by having features that provide significant value. High margins indicate higher profits which are mostly concerned by all business. The data service such as SMS delivered by mobile operators is a high margin service. The partnership with ECG and Banks by mobile operators can provide an improved process of distributing bills and also increase revenue collection. This channel can be more secure, fast, and reliable and also ensure high quality.

18.2.4 Customer Satisfaction

Customer satisfaction is the fourth key factor for a successful business model because customer satisfaction is always critical for business success. The existing method of distributing bills and revenue collection by ECG is not satisfactory to customers because it is cumbersome. The partnership of ECG with the mobile operators and banks will make the bills delivery and revenue collection more efficient and secure. Failure to achieve customer satisfaction greatly affects the revenue as well as the image of the company. With

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good policies to guarantee the quality of service, reliable support from the stakeholders and user-friendly interface a high customer satisfaction is achieved.

18.2.5 Balance the Business Funding With Good Investment

In any business the cost of starting the business, the operational cost, personnel cost and overhead cost are just a small percentage of the funding requirements. A good investment will always have a high return so it is critical to observe the Return of Investment (ROI) especially when a business is started. It is important that ROI should not be less than 25 percent in the first three years. If ROI is less than 25% then the business is at high risk. If incremental production of products or services requires substantial additional investments then the production needs to be re-evaluated. Also if less than 50 percent of the investment required is used in revenue producing areas, such as sales and production then the details of investment details need to be reconsidered and lastly if the industry as a whole has very poor ROI or poor profitability then the investment needs to be reconsidered. The key factor is how to make the investment have high returns and also how to keep the business growing without substantial new investments. This requires an efficient business model.

19. ANALYZING POSSIBLE POTENTIAL BUSINESS MODELS

As stated, a business model is said to be successful if all the factors described above are achievable. The business model discussed in this paper is the value network and it describes the relationships between the stakeholders and the processes taking place between them. In analyzing the value network business model the following key issues need to be considered: roles optimization, effective coordination, billing mechanism and content development. As stated in section 16, the primary actors are content provider, content aggregator and mobile operator and therefore three possible potential business models will be analyzed based on these three actors. The possible potential business models are mobile operator-centric model, content provider-centric with mobile operator model and content aggregator-centric with mobile operator model.

19.1 Mobile Operator-Centric Business Model

In the Mobile Operator-Centric Business Model, the mobile operator is centered as the core of the whole value network. The mobile operator is responsible for coordinating all the stakeholders in order to generate value for all stakeholders. There is a direct relationship between the customer and the mobile operator. The mobile network operator has the role of setting the price of the service. Content is offered by the content provider (ECG and Banks) and also facilitates all the business activities in the value network. The mobile operator will aggregate the content and package them to the customers. The content aggregator will be more or less part of the mobile operator. The mobile operator manages the customer relationship and carries out the billing issues. It collects the service revenues from customers and then shares the money with the content provider (ECG and Banks). Equipment providers get income by selling their equipments to the operators and end-users. The mobile operator-centric business model is shown in the figure 13.
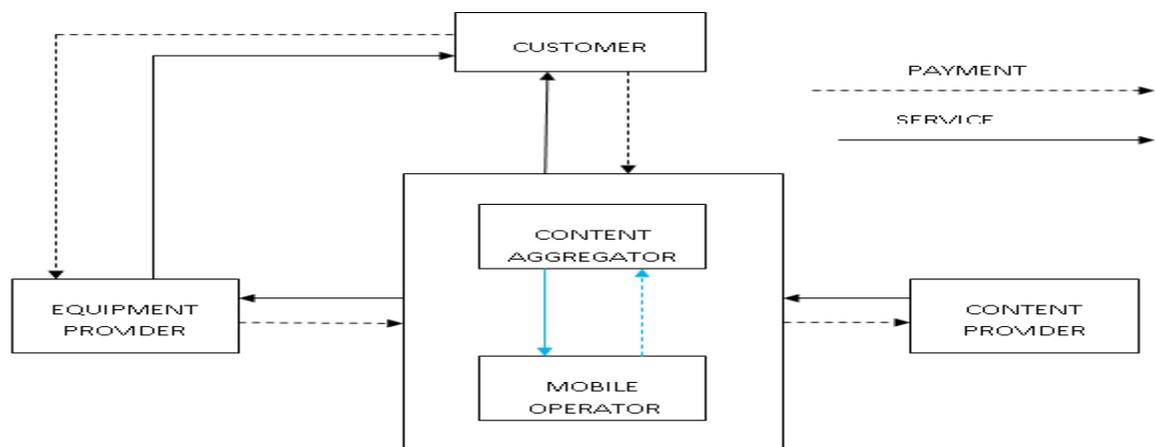

Figure 13: Mobile Operator-Centric Business Model

420

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The mobile operator in the Mobile Operator-Centric Model is the primary stakeholder while the content provider is the secondary stakeholder. The mobile operator makes sure that all the business activities are running smoothly. The main advantage of this model is billing mechanism. However, it is limited in content development and effective coordination because mobile operators will not have expertise in developing and aggregating the content and also will concentrate more on its core competencies like billing communication services, maintaining and upgrading large network infrastructures to satisfy the customers.

19.2 Content Provider Centric with Mobile Operator Business Model

In the Content Provider Centric with Mobile Operator Business Model, the content provider is responsible for all the business activities in the value network with some assistance from the mobile operator. The content provider is responsible for end relationship with the customers. The mobile operator already has the network installed which covers all the country and also has a good payment system. The network will be used in delivering the bills to the customers and in return receive payments from the customers through Banks using the network. ECG and Banks as content providers will take up the content aggregator. Currently, ECG distributes the bills to the customers free of charge. In this case, there must be a close relation between ECG, Banks and mobile operator. In this model ECG and the Banks as content providers will deliver the bills and other relevant information via the mobile operator network direct to the customer. As shown in the figure 14 there is a very close relationship between the content provider and mobile operator. The customer will subscribe through the mobile operator to receive bills and pay through Banks. The customer has various options for receiving contents and will be charged for the service. The role of Equipment Provider in this model is to sell the mobile equipments to both network operator and end users.
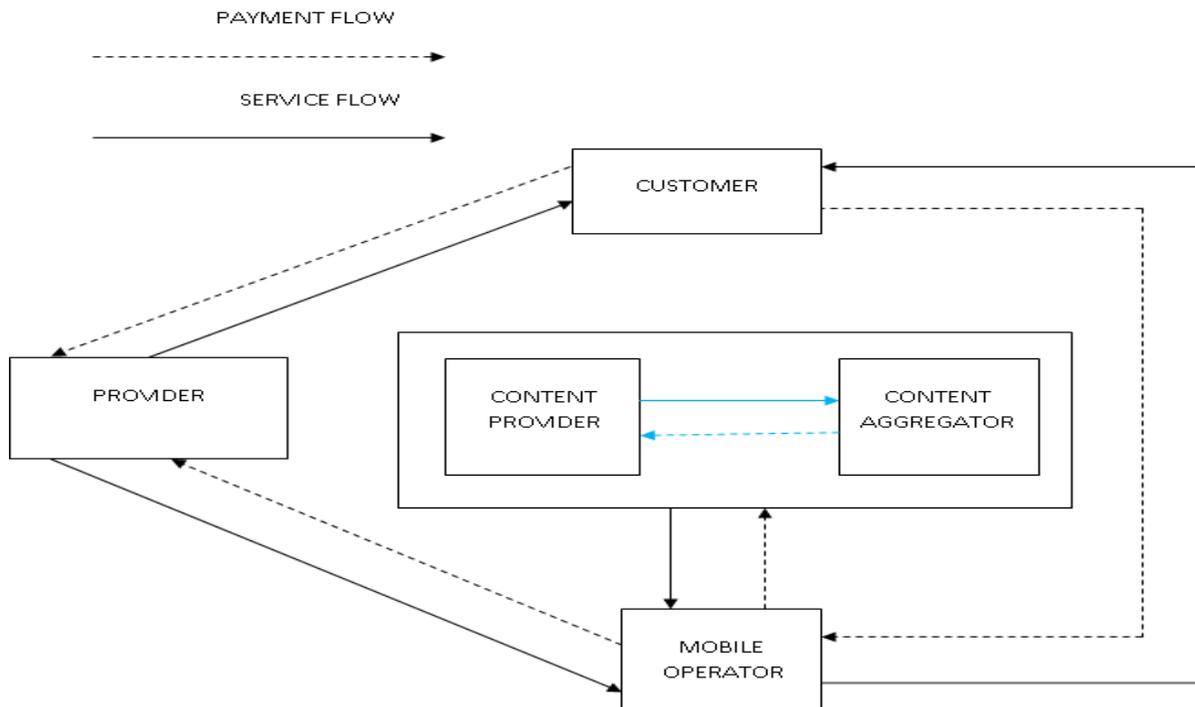

Figure 14: Content Provider-Centric with Mobile Operator Business Model

In this model the primary stakeholder is the content provider because it is its responsibility to make sure that all business activities in the value network are running smoothly. The content provider has to rely on the mobile operator for the billing of customers. The content provider may also not have as much experience in coordination as the mobile operator. Content providers would also concentrate on their core competencies. For example, ECG is more committed of providing quality and reliable supply of electricity, production of accurate bills and prompts delivery of bills to customers as well as maintaining and upgrading large electricity network infrastructures. The Banks also have their core competencies. In this case content development would also be limited.

19.3 Content Aggregator-Centric with Mobile Operator Business Model

In this model Content aggregator is responsible for aggregating the content and provide platform for all the

stakeholders with the help of mobile operator. The content aggregator organizes the content and provides platform to link both content provider (ECG and Banks) and mobile operator. The mobile operator only specifies the necessary interfaces, operates the technical architecture and handles the charging and collection process. The aggregator repackages the content based on the request from the customers. In this case the content aggregator can maximize value for customers according to what they really want. The customer has a direct relationship with the content aggregator and the mobile operator may also have a direct relationship with the customer. The content aggregator gets the content to be delivered to customers from content providers. The customer has various options for receiving contents and will be charged for the service. The role of equipment provider in this model is to sell the equipments to both network operator and the end users. Figure 15 shows content aggregator with mobile operator model.
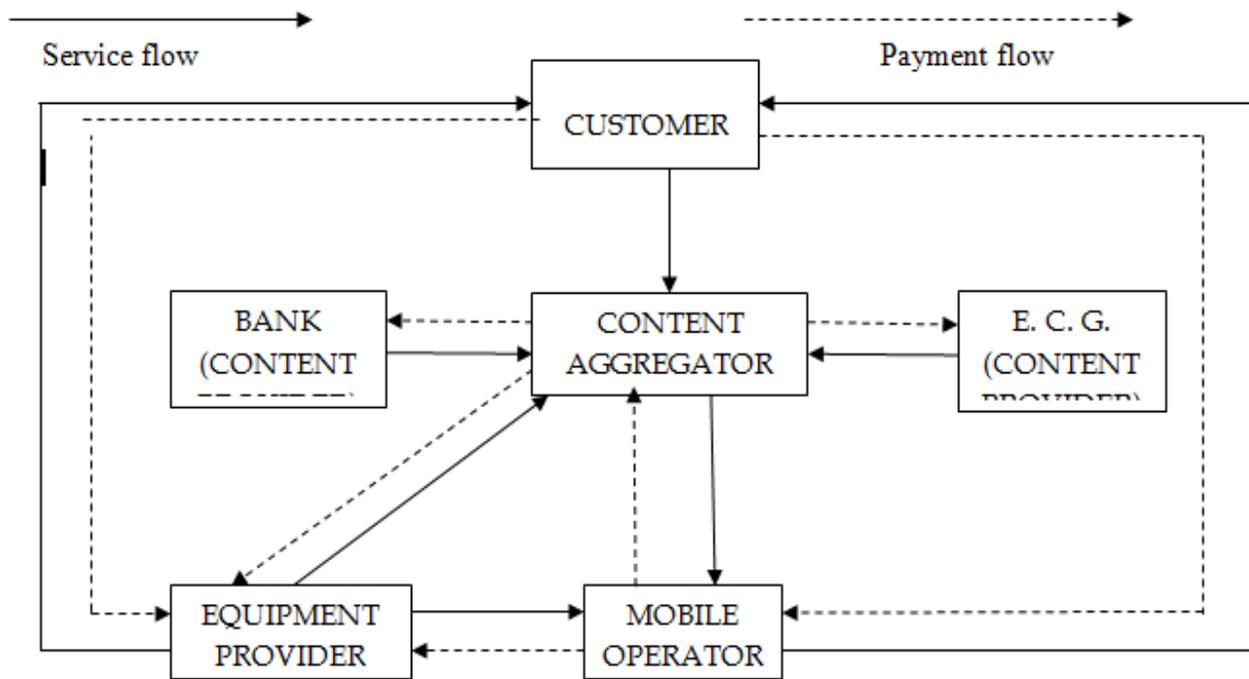

Figure 15: Content Aggregator-Centric with Mobile Operator Business Model

In this model, the content aggregator is the primary stakeholder while the mobile operator and the content provider are secondary stakeholders. The main advantages of this model

are content development and effective coordination. The content aggregator has profound experience in developing and aggregating contents. Also it may have much experience in coordinating other stakeholders because that would be their

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core competencies. However, content aggregator has to rely on mobile operator for the billing mechanism and also managing customer relation. The success really depends on how much support content aggregator could get from the mobile operator.

20. RECOMMENDED BUSINESS MODEL

In analyzing the possible potential business models for ICT-Driven Revenue Collection four key issues/factors were considered. The key issues were derived from the business model concepts discussed above. The aims of doing business are how profit is generated, maximize value to customers and minimize cost. It is therefore, as stated by [1] an essential feature of the business model to specify how the organization generates revenue and value creation as defined by [5]. The ICT-Driven Revenue Collection Business Model is an industry-wide and involves different stakeholders whose aim is to generate profit hence the billing mechanism or payment system is one of key issues to be considered. In value creation, content plays a very important role because it is the key to attract and bring maximum value to customers. The ICT-Driven Revenue Collection Business Model should be attractive, innovative and cost-effective content for customers and therefore development of the content is also a key issue to be considered. The contents are the bill charges, information relating to the charges, bank advices on payment of electricity, statement of accounts and any information relating to electricity.

In [4] and [6] description is given on the significance of a business model as the value network from the firm's perspective. In value network roles identification and coordination effectiveness are very important. The successful

industry-wide business model depends mostly on the effectiveness of the cooperation among the stakeholders and the role each stakeholder plays. The value creation is not within a single organization but spread over two or three organizations and with effective coordination a lean but quality-oriented service process and cooperation among stakeholders can lead to lower price and high quality service to customers. The stakeholders gain sustainable benefits and generate revenue. In effect, effective coordination maximizes value to both customers and stakeholders. These factors namely billing mechanism, content development and effective coordination are used to select a suitable industry wide business model for ICT-Driven Revenue Collection. Table 6 below gives the summary of the three factors that apply to the possible business models.

Table 6: Comparison of Business Models with Three Factors

Business Models	Content Development	Billing Mechanism	Effective Coordination
Mobile Operator Centric	Weak	Strong	Fair
Content Provider Centric	Fair	Weak	Fair
Content Aggregator Centric	Strong	Weak	Strong

From the table mobile operator-centric business model has very strong billing mechanism but weak content development and fair effective cooperation because the mobile operator would pay much attention on its core business. The development of content and the coordination between the stakeholders would not be much effective.

Content provider-centric with mobile operator business model has weak in billing mechanism fair in both content development and effective coordination. As stated, the model will rely heavily on the mobile operator for the billing or payment system. The content provider will not be effective so as to organize other stakeholders effectively. This model is obviously not being favorable.

Content aggregator-centric with mobile operator business model has its strength on content development and effective coordination but weak in billing mechanism.

Based on the above criteria, ***Content Aggregator-Centric*** with Mobile Operator Business Model is recommended as a business model for industry-wide ICT-Driven Revenue Collection Business Model.

21. DESIGN OF REVENUE COLLECTION BUSINESS MODEL FOR ECG

In this section the industry-wide business model for revenue collection will be studied from the four domains of (Faber et al., 2003) [7] business model concept.

21.1 Technology Design

The technology solution is also included in the business model because it determines not only the price and quality of the service but also the relationship of the different

stakeholders in the value network. The systems essential for the revenue collection provisioning on the whole include mobile communication network, content provider, content management platform and end user terminal. Figure 16 illustrates the architecture of the ICT driven revenue collection service provisioning.
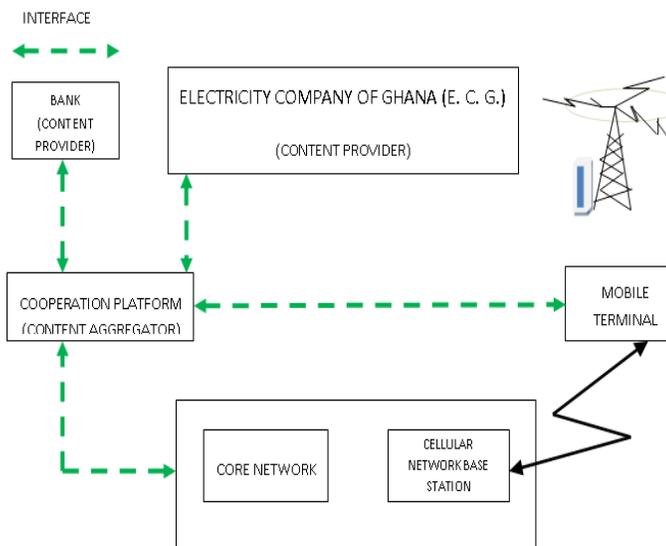

Figure 16: System Architecture for ICT-Driven Revenue Collection Service Provisioning

These technical resources are provided by mobile operator, content provider (ECG and Banks) and content aggregator. The technical resources of each stakeholder impose requirements on the holistic technical architecture and it is important that technical resource from different stakeholders can work together smoothly. The content management platform provided by content aggregator is such an element that it coordinates the flow of contents.

21.2 Service Design

The service design is the product or service that will be presented to the customer. Mobile operators currently provide services like voice, messaging, internet etc. to the customers. The new service will be receiving the electricity bill charges, other information related to the electricity, bank advices on payment of electricity from the banks etc. These new services will be the popular service among adults especially customers in both business and working environments.

21.3 Organization Design

The value network consists of mobile operator, content provider, content aggregator and equipment manufacturer. Each of the stakeholders has different resources and capabilities which determines the position in the business model. The mobile operator has the network infrastructure, large customer base, rich experience in customer relationship and also billing and accounting systems. ECG as content provider creates values which are not substitutable in the value network. ECG provides the electricity charges and any information relating to the electricity. ECG also has large customer base and operates in the southern part of the country. Banks in Ghana which are also content providers have a lot of branches set up in the country. Banks also have large customer base and deal with a lot of transactions. More than half of the country population have bank accounts and also have access to Banks. Content aggregator is good at content collection and management. The content aggregator provides the platform for other stakeholders to be interfaced. The equipment providers provide the versatile end-user equipments and other network equipments.

All the stakeholders involved have their own strategies and goals. ECG is eager to ensure prompt production and delivery of bills to the customers which is an efficient way to improve revenue collection. It is the responsibility of ECG to provide reliable and quality supply of electricity to satisfy customers. By so doing ECG will win customer satisfaction and increase revenue. Banks are eager to increase the customer base by introducing innovative service which will attract more customers to open accounts. Thus the content providers are eager to look for new distribution channels to satisfy numerous customers. Equipment Providers are active to support this ICT driven revenue collection because it brings them a lot of market opportunities ranging from network infrastructure to the end-user terminal. The main strategic goal of mobile operator is to attract more customers and also promote the Average Revenue Per User (ARPU) by mobile multimedia services.

The mobile operator can easily add this new service to the existing services deliver to customers and also can implement the billing and accounting mechanism based on their existing systems. The content aggregator would provide the platform for other stakeholders to be interfaced and also manage to aggregate and develop the content. As recommended earlier the business model for the ICT driven revenue collection should the Content Aggregator Centric with Mobile Operator Business Model as shown in figure 15.

21.4 Finance design

The finance design of business model involves all aspects such as investment, cost, revenue and risk. However, the finance design of ICT driven revenue collection business

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model in this section will only describe the payment flows among the stakeholders in the value network, subscription fees and possible tariff schema. As for the tariff, it is recommended that both monthly payment and pay-as-you-use should be offered as the way to pay for the service. The mobile operators in the country already have various tariffs for their services. It is better to charge customers by single account rather than fragmented bills. Single bill gives customers convenience. Figure 15 shows the payment flows among the stakeholders in the value network to deliver the service. As already stated, this is content aggregator-centric with mobile operator business model. The mobile operator manages the customer relationship, carries out the billing issues and collects the service revenues from the customers. Since each stakeholder will invest in infrastructure the revenues accrued from the mobile service of the revenue collection should be shared among the stakeholders in proportion as agreed. The equipment provider gets income by selling equipments to operators and customers.

22. SUMMARY AND DISCUSSIONS

In order to have a successful business model for ICT-Driven Revenue Collection, the definition and literature review of the business model were discussed first. The goal of this literature review is to understand what a business model could be and what elements it should be composed of. All the concepts of business model described by different authors focused much on a single company thereby providing a limited perspective on cross company collaboration in value networks. Since the ICT-Driven Revenue Collection Business Model is an industry-wide (Faber et al., 2003) [7] concept of business model was seen as the suitable one to use since it deals with a network of companies that intend to create and capture value from the employment of technological opportunities. Four key issues /factors were identified from the concepts of business model described which helped in the analysis of the possible potential business models for ICT-driven revenue collection. The four key factors are billing mechanism for revenue generation, content development for value creation, effective coordination and role identification for value networks.

For the business model analysis core factors developed by (Debelak, 2007) [18] the successful business model are discussed and these attract high value customers, offer much significant value to customers, deliver product/services with high margins, meet customer satisfaction and balance business findings. Three possible potential business models: mobile-centric, content provider-centric with mobile operator and content aggregator-centric with mobile operator were analyzed based on the four key issues identified. These possible potential models are based on the structure of the business, the strength and weakness of different stakeholders. In each model, the roles are defined and the relationship of each stakeholder is clarified.

To choose the most suitable business model for the ICT-Driven Revenue Collection, the three of the four keys issues/factors identified: content development, billing mechanism and effective coordination are compared with the three possible potential models. Content Aggregator Centric with Mobile Operator Business Model is selected because two of the identifiers are favorable in this model. The content aggregator-centric with mobile operator is strong in content development and effective coordination while weak in billing mechanism. After selection, the recommended business model is designed using (Faber et al., 2003) [7] business model concept.

23. CONCLUSIONS

23.1 Achievement of Objectives

The main research question of this paper is how to develop an appropriate business model for collection of revenue for the utility sector. This is done by showing how the various stakeholders involved can be organized in a multi-sided platform in order to reduce transaction cost, maximize value creation and gain sustainable revenue for almost all stakeholders. This question is answered as follows:

23.2 Challenges and Findings Relating to the Existing Method of Revenue Collection

It has been found out that the distribution of bills is one of the critical components in ECG because it has a direct impact on the revenue stream. The distribution of bills is done through human agents and a delay in the distribution of bills greatly affects the revenue collection. ECG in its effort to increase revenue collection has adopted several methods in collecting revenue. In all these methods customers have to visit ECG pay points to make payments. It is clear that the distribution of bills and process of revenue collection has a high number of human interventions. A well defined and efficient way is needed to create enabling environment to help ECG to deliver bills so as to improve revenue collection.

23.3 Relationship Between Technologies, Value Chain and the Business Models.

Since the focus of our paper is on the potentials in mobile payment for services rendered to customers in the utility sector, an overview of mobile network technologies and the services that are likely to be used to facilitate revenue collection was undertaken. It covered only the relevant technologies

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involved in a mobile payment solution in our case study, including GSM and its GPRS, EDGE data overlay networks, CDMA, Short Messaging Service (SMS), Instant Messaging (IM) and Unstructured Supplementary Service Delivery (USSD).

Based on the characteristics of the revenue collection for the utility service, the value chain analysis was conducted. This concept stresses maximization of value creation in conjunction with minimization of costs. The value chain introduced by [14] could be regarded as Vertical Value Chain (VVC). VVC is a tool to organize all value adding activities in a single firm. However, for the revenue collection service, the value creation is not only within a single firm but is spread over three stakeholders in different firms; therefore, the traditional VVC is not able to analyze the value system. Instead, a Horizontal Value Chain (HVC) which consists of a group of firms working together to satisfy customer demands and maximize values is developed. VVC is still needed because every single stakeholder needs to use it for their internal value adding activities of the revenue collection service whereas HVC is then needed to link all the stakeholders together and coordinate the value adding activities for smoothly implementing the revenue collection service. In other words, it creates, optimizes, and maintains the cross-industry relation and the roles of all stakeholders in the chain. Consequently, different roles, interest, strengths and weaknesses of different stakeholders were identified.

23.4 Appropriate Business Model for Revenue Collection for the Utility Service

The goal of this research paper was to develop a favorable industry level business model in order to organize involved stakeholders in an efficient way and finally benefit for all or at least most stakeholders in the entire value chain. Based on the four key factors: billing mechanism for revenue generation, content development for value creation, effective coordination and the role identification for value network, three possible models: mobile operator centric, content provider centric with mobile operator and the content aggregator centric with mobile operator were analyzed. In order to contrast and compare these models, the aforementioned three factors were used. Content aggregator centric with mobile operator was chosen since its strength lies in two of the three factors: content development and effective coordination. This answers one of the research questions: What type of business model should be developed for ICT-Driven Revenue Collection?

23.5 Impact of the New Technology on Revenue Collection

The new technologies will not only change the way of doing business but also reduces the risk of handling money by cashiers of ECG and transaction cost of processing and delivery bills to ECG customers. It will also relieve customers of hustle and bustle of settling their bills at ECG pay points. Also customers will receive their bills on schedule. All these will result into customer satisfaction and confidence in paying bills promptly so as to increase revenue.

24. FUTURE WORK AND LIMITATIONS

ECG has recently adopted pre paid metering system as a way of increasing revenue. Our research could not elaborate on it since it is confined to post paid metering however there could be future work on this. Since ICT-Driven Revenue Collection is a network of companies that intends to create and capture value, the tradition Vertical Value Chain (VVC) could not handle the multi sided platform. HVC was used to develop the relationship analysis and roles identification. The core is the industry level value chain studies, details of VVC analysis for each single stakeholder was not elaborated in the paper.

25. RECOMMENDATIONS

Since this is a young and emerging technology a lot of education and publicity need to be carried out by all the stakeholders before implementation. Mobile payment system is an emerging technology and there is no regulatory framework currently in Ghana. We recommend that government should come out with policies and regulatory framework of using mobile payment system. The government should also put a legislation to make mobile payment legal tender.

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